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Radio-TV EXPERIMENTER

WHITE'S RADIO LOG
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JUNE-JULY 75¢

Science and Electronics

How FAST can you throw a baseball?

Build S/E's fun-packed chronograph—clock curves, sliders, fastballs up to 120 mph!

Easy-to-follow plans on page 59

How to put your CB club on the map

How to give your phonos super sound

w to design your own solid-state gear

e sun sets on Britain's Rad

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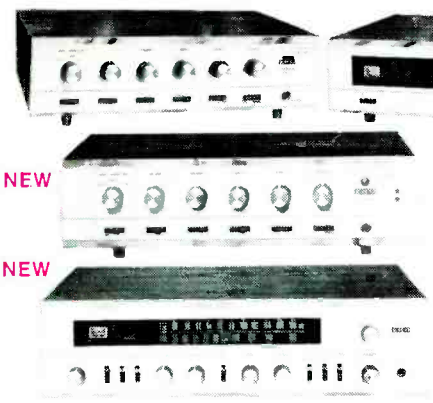

NEW

NEW

Cortina Stereo

THE VERDICT IS IN. High fidelity authorities agree: Cortina's engineering excellence, 100% capability, and compact dramatic esthetics all add up to Total Stereo Performance at lowest cost.

A Silicon Solid-State 70-Watt Stereo Amplifier for $99.95 kit, $139.95 wired, including cabinet. Cortina 3070

A Solid-State FM Stereo Tuner for $99.95 kit, $139.95 wired, including cabinet. Cortina 3200.

A 70-Watt Solid-State FM Stereo Receiver for $169.95 kit, $259.95 wired, including cabinet. Cortina 3570.

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Fun to build and use. Expandable, interconnectable. Great as "jiffy" projects and as introductions to electronics. No technical experience needed. Finest parts, pre-drilled etched printed circuit boards, step-by-step instructions.

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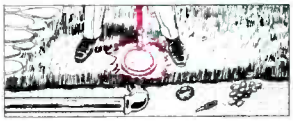

6 EXCITING NEW PROJECTS
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EC-1900 "Treasure Finder" $9.95,
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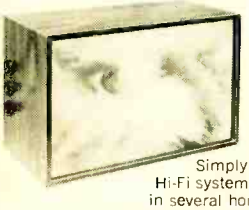
EC-2200 Electronic "Magic" Switch $9.95

Color n' Sound



Add a new dimension to your music system. Introducing the first inexpensive solid-state electronic system which provides true synchronization of color with sound. Watch the music you love spring to life as a vibrant, ever shifting interplay of colors. Simply connect to speaker leads of your Hi-Fi system (or radio). Kit can be assembled in several hours — no technical knowledge or experience necessary. Kit $49.95, Wired $79.95.

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For all 6V/12V systems; 4, 6, 8-cyl. engines.

Now you can keep your car or boat engine in tip-top shape with this solid-state, portable, self-powered universal engine analyzer. Completely tests your *total* ignition/electrical system.

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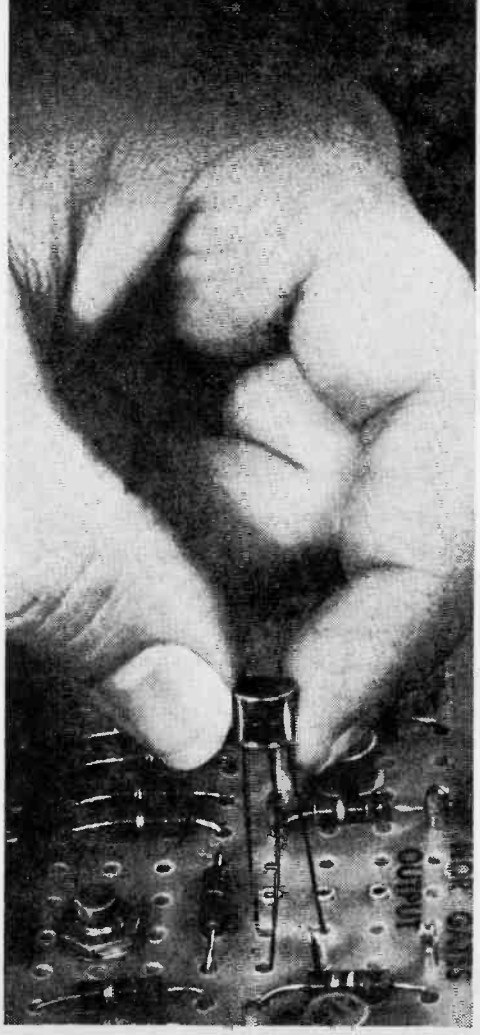

NTS digs deep into electronics. Proof? Look at the close-up at the left. It's the first transistorized digital computer-trainer ever offered by a home study school.

Fascinating to assemble, the NTS Compu-Trainer ® introduces you to the exciting world of computer electronics. Its design includes advanced solid-state NOR circuitry, flip-flops, astable multivibrators and reset circuits. Plus two zener and transistorized voltage-regulated power supplies. The NTS Compu-Trainer can perform 50,000 operations per second, and is only one of many **ultra-advanced** kits we offer to give you incomparable, in-depth career training.

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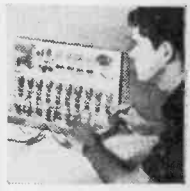
Included in Color TV servicing courses. Building this advanced receiver gets you deep into color circuitry—advances you into this profitable field of servicing—the easy way. Color is the future of television, and your future, too!



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Radio-TV and Science and Electronics EXPERIMENTER

June/July 1969

Cover drawing by Len Goldberg

Radio-TV EXPERIMENTER and Science and Electronics

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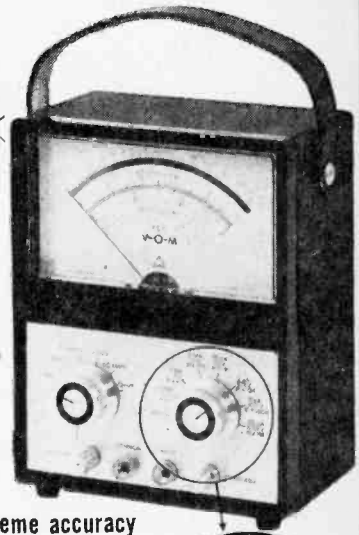

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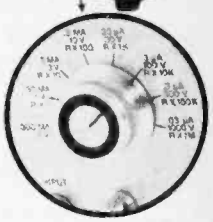

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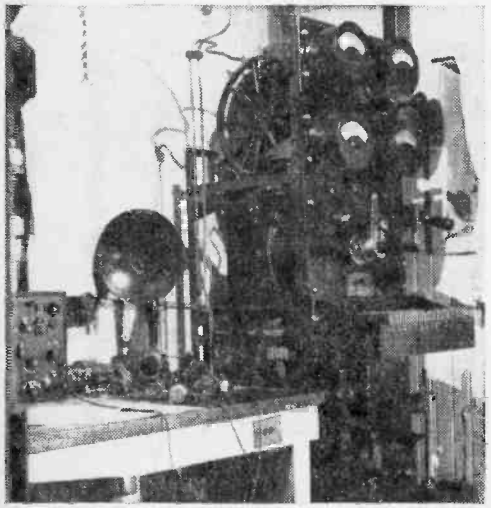
POSITIVE FEEDBACK

Julian M. Sienkiewicz
EDITOR-IN-CHIEF

From time to time a very interesting photo crosses this Editor's desk. Most recent example is of a very old 2-kilowatt, quenched-gap spark transmitter (see below) used aboard merchant and war ships for many, many years. Naturally quenched-gap sparks went the way of all horses and buggies (their final demise came on December 31, 1939, when the federal law prohibited their use).

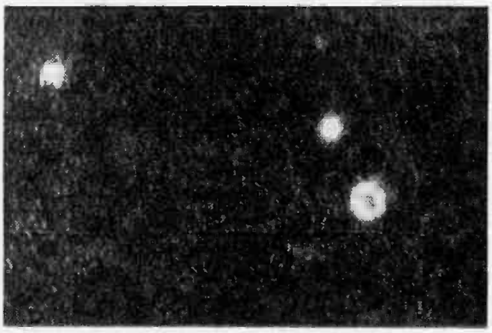
However, federal law could not stop the large number of nostalgic stories that kept cropping up whenever old-timers got together. Spark transmitters may be gone but they're not forgotten. Illustrated below is a photo that started this editorial off. Not being an old-timer, I look at it with awe and am simply amazed with its antiquity. If there are any old-timers reading this editorial, I would like to know some facts about the old rig shown in the photo. And toss in a couple of old sea stories about spark transmitters. Any interesting letters received will have their facts revealed in this column. So get busy now—I want to hear from you old-timers soon!



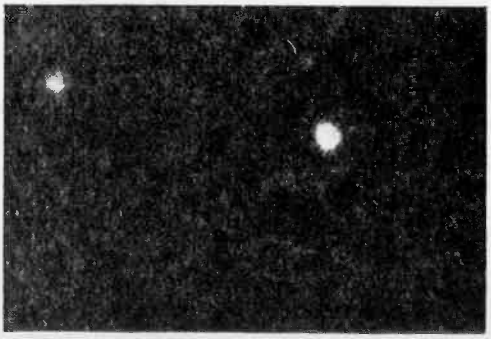
When we stop to think about our modern-day electronic equipment with advanced vacuum-tube design and solid-state devices, one wonders how radio made it through the early days with quenched-gap spark transmitters like the one shown above.

There It Is, Isn't! The Lick Observatory, high atop Mount Hamilton near San Jose in California, has pointed its large telescope at the heavens and photographed the winking of a pulsar across the vast reaches of space. This is the first pulsar, located in space between the earth and Crab Nebula, to be unequivocally associated with an observable star.

The star photographed and shown in the photos below had been thought to be an ordinary star, though it actually flashes at a speed of 33 times a second. Reason is that this comparatively rapid blinking is unob-



"Now you see it" (top), "now you don't (bottom) is the story told by the video storage camera that peeked at a pulsar. Electronics did the peeking, because the human eye cannot see the star or its blinking, nor can ordinary photographic techniques be used. Photos were taken with the aid of the 120-in. Lick Observatory telescope. The pulsar is NP 0532 in the Crab nebula.



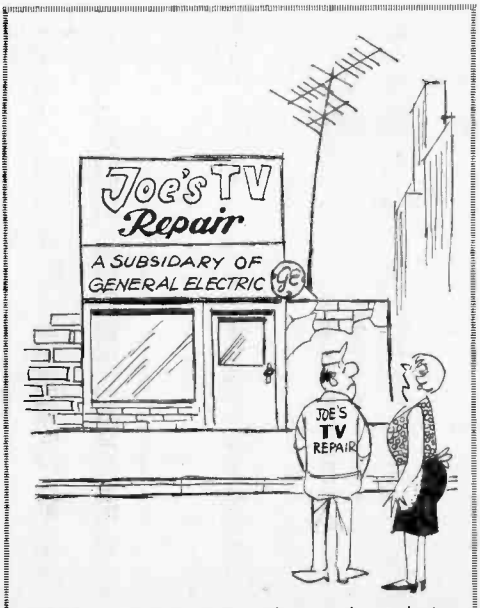
servable to the human eye or most conventional photographic techniques. To photograph the pulsar it was necessary, in effect, to slow down the blinking rate.

The photography was done by spinning a disc in front of the star's image as projected by the Observatory's 120-in. telescope. A hole in the disc permitted light from the star to penetrate once each revolution.

Now the trick in seeing the star was quite simple. The disc was spun slightly slower than the flash rate of the pulsar, so that the flashes would shine through the hole for a period and then be obscured till they again occurred when aligned with the hole. A simple television scanner stored sufficient light from successive pulses to produce a usable photographic image. This work was done by Drs. E. Joseph Wampler and Joseph S. Miller. Through their efforts they have proven, beyond a doubt even to the biggest sceptics, that there are more stars in space pulsing at a finite rate than meet the eye—or a telescope.

The exact mechanism which turns a star *on* and *off* is unknown at the present time. When any reasonable theory can be postulated for lay people to understand, you can expect an explanation for pulsars to appear in this column.

(Continued on page 104)



"I know we got five shares, Joe—but I know it'll get us in trouble!"

POWER FOR YOUR BENCH

Lafayette's Stock No. 99-5077 is a DC lab-type power supply which features automatic protection against overloads and shorts. Unit is very handy in servicing portable transistor and auto transistor radios, recharging small batteries, and where a stable, low-ripple, DC voltage is required. It has a dual range, continuously variable DC voltage of 5-13 or 12-20 V at up to 2 amperes. Less than 5 mV rms ripple at full load. Regulation: ±1%. The output voltage and current are monitored by two D'Arsonval meters. Input and output of supply are fused for full protection. Input: 115 or 230 VAC ±10%, 50-60 Hz. In a rugged steel case with rubber feet, the size is 6½ x 4½ x 8¾ in., weight 9 lb. Price of No. 99-5077 is $39.95 at Lafayette Stores, or write to Lafayette Radio Electronics, 111 Jericho Tpke., Syosset, N. Y. 11791.

Lafayette No. 99-5077 Power Supply

WALK-AROUND TAPE KIT

This deluxe tape-recordist's starter kit, numbered as SKA-2, comes in a vinyl attache case, and is chuck full of tapists' needs. To begin with, there's a 28-page guide to successful tape editing and splicing. Also: three 7-in. reels of 1200 ft. of Robins' "Brand 5" 1.5 mil acetate recording tape; a 7-in. takeup reel; a tape splicer with splicing tape; a head demagnetizer; 75 tape clips; 2 oz. of head cleaner and 2 oz. of head and guide lubricant; 240 self-stick, color-coded title labels; four 7-in. tape storage boxes; 3 tape editing and cueing pencils. All this goes for $33.00, and if you want to know more, write to Robins Industries Corp., 15-58 127th St., College Point, N. Y. 11356.

Robins SKA-2 Tape Recordist's Kit

NEW! IMPROVED!

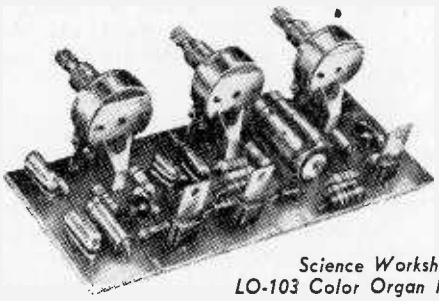
Chemtronics has brought out an improved version of their *Tun-O-Wash* tuner restorer. The improved formula causes none of the freezing effect of the original *Tun-O-Wash* formula, plus the new version has 100% more cleaning action. *Tun-O-Wash* is a power spray aerosol designed to remove grease, oil, and other lubricants left by other tuner sprays. The lubricant residue de-tunes tuners, causing the color carrier to shift in frequency. By getting rid of all foreign elements *Tun-O-Wash* restores original tuner alignment. In addition to TV tuners, *Tun-O-Wash* is also suitable for use in cleaning tape recorders, phonographs, motors, fan blowers, carburetors, air conditioner filters,

Chemtronics Improved Tun-O-Wash

movie projectors. Price is $3.25, and the source is Chemtronics Inc., 1260 Ralph Ave., Brooklyn, N. Y. 11236.

FILLMORE EAST IN YOUR OWN MUSIC ROOM

This Color Organ Kit, model LO-103, includes only the electronics, or the heart of a color organ. You supply standard high intensity lamps, filament transformer, line cord, switch



Science Workshop LO-103 Color Organ Kit

and light box. This means that hobbyists can build it into any type or size equipment of their choice. The LO-103 uses frequency selective networks to divide the audio spectrum into 3 channels—high, medium, and low. Each channel has its own intensity control plus a silicon-controlled rectifier which controls the intensity of a color lamp connected at its output terminals (phono, tuner, or amplifier). The mixture of the 3 colors (red, green, and blue) synchronized with the music produces a constantly changing pattern of colored lights. Size when assembled is 5⅝ x 3 x 1½ in., and for $12.95, or about what it would cost you and your date to go to a discotheque, you can have Fillmore East at home! Write to the manufacturer for further information—Science Workshop, Box 393, Bethpage, N. Y. 11714.

PLANS FOR DO-IT-YOURSELF ANTENNA

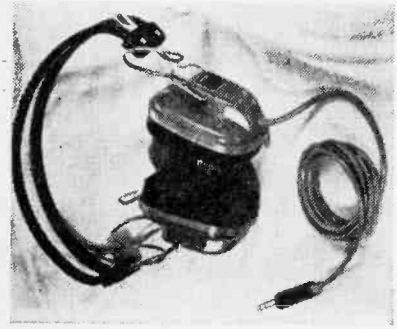
For $1.00 you can get the plans for Mini-Lini (for miniaturized co-linear), an omnidirectional CB antenna. Enterprising hams can prune the dimensions by 10% and use it for 10-meter communications from difficult locations. By stacking two of the easy-to-make modules the Mini-Lini antenna can be constructed to rise from ground level to the maximum of 20 ft. allowed by the FCC for CBers. Hams can stack any number. Feature of the antenna is a short coax dead design that reduces cable attenuation to a minimum while presenting a maximum number of elements for signal radiation

Carlson Mini-Lini Plans

and pickup. For a copy of the plans send $1.00 and a stamped, self-addressed envelope to Carlson Electronics, Box 151, Cocoa, Fla. 32922.

ASSEMBLE YOUR OWN HEADSET

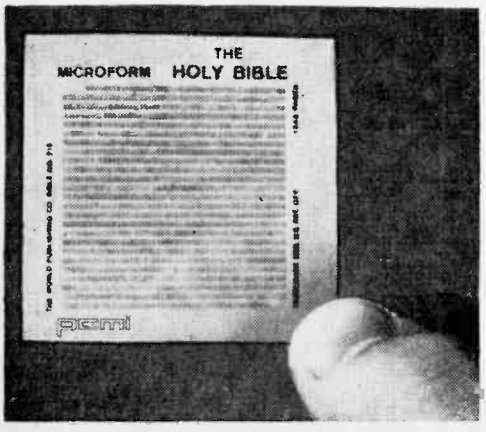
You can make your very own private concert hall with these Knight-Kit KG-801 stereo headphones. They will reproduce stereo with fidelity of response covering a range of 20 to 20,000 Hz. Light in weight, they have an adjustable headband and padded ear cushions for your comfortable listening. Said to be quickly assembled by anyone, the KG-801 kit is priced at $5.95, with 6-ft. cord, standard ¼-in. plug, and, of course, instructions. This kit is listed in the 1969 Winter Sale Book No. 283 from Allied Radio Corp., 100 N. Western Ave., Chicago, Ill. 60680.



Knight-Kit KG-801 Stereo Headphones

MICRO BIBLE

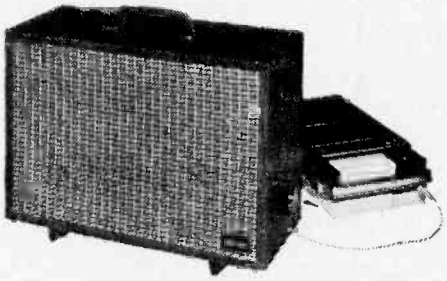
Here's a wee something to carry around in your pocket and amaze your friends with. Edmund Scientific has transferred all 1245 pages of the Old and New Testaments to a 1 5/16-in. sq. piece of film! It's actually a reduction of 48,400 to 1—each full page of the Bible is reduced to about 0.022 in. This feat is a product of a newly discovered photochromic, micro-image technique that begins where microfilm leaves off. Each of the Bible's pages becomes a tiny micro-image on a photochromic dye and is transferred by contact print to a high resolution photographic plate. This plate is used to print the Bible on a tiny plastic square. You have to have a 100-power microscope to read this weensy Bible (Edmund will sell you their No. 70,008 microscope for $16.50). Order, with check or money order for $2.00, Stock No. 41,191, from Edmund Scientific Co., 380 Edscorp Bldg., Barrington, N. J. 08007.



Edmund Scientific No. 41,191 Micro Bible

MAKE THAT CASETTE CARRY!

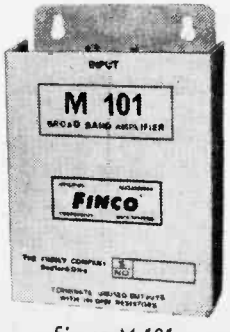
With the Dynaphonics Amplifier/Speaker you can extend the sound of any cassette recorder so that large groups in large rooms can hear. The integrated amplifier and speaker has a heavy-duty 6-in. speaker which can also convert a pocket radio into a full-range sound system. With a microphone attached to the cassette it becomes a full-fledged PA system. And if you're amplifying speeches on the PA system, they can be simultaneously recorded on cassettes. The Amplifier/Speaker system weighs 4 lbs., is 12 x 8¾ x 5 in., uses a 9-volt transistor radio battery, and frequency response is 40 to 10,000 Hz. Price of the unit is $34.95 and for more dope, write Dynaphonics, Inc., 2975 Far Hills Ave., Dayton, Ohio 45419.



Dynaphonics Amplifier/Speaker

VHF-TV/FM AMPLIFIER

Seems there's a growing demand for multiple television outlets in our affluent society, so the Finney Company has come out with Model M-101, a transistorized 4-outlet vhf-TV/FM amplifier. The M-101 amplifier can be placed in any convenient location: attic or roof space, garage wall, or

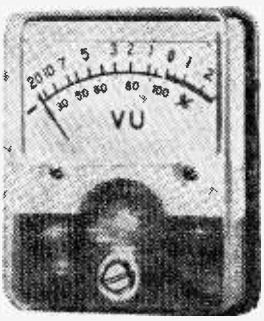


Finney M-101 VHF-TV/FM Amplifier

joist in the basement where antenna lead usually enters. From the four pairs of marked terminals suitable lengths of 300-ohm lead can be taken to the living room, rec room, patio, or wherever. With a gain of 6 dB to each of the four outputs, the amplifier will supply a signal approximately 50% greater than that at the antenna to each of the four outlets. Each receiver may be tuned separately to any channel normally received in the area. Further, the fourth outlet can be used to feed an FM receiver or tuner and will bring in many more FM stations than previously received. The M-101 is priced at $42.50 and for more information write the Finney Co., 34 W. Interstate St., Bedford, Ohio 44146.

VU! WE SEE YOU!

For all you burgeoning tape recordists who want to make like the professionals, here is a VU meter which will improve recordings by eliminating guesswork in recording level control. Model TVU-1 has a two-color scale with modulation from 0 to 100%. Other specs: VU of −20 to −3 dB; ohm impedance, 2700; 0 VU from 1.2 V. There are dual impedance inputs; the basic movement is 500 mA. TVU-1 measures $1\frac{11}{16}$ x 2 in. and has 4 threaded mounting screws with ¼-in. terminals. Instructions and a mounting template are supplied. Price is $6.95 and you can learn more about it by writing Robins Industries Corp., 15-58 127th St., College Point, N. Y. 11356.



Robins TVU-1 VU Meter

125-WATT STEREO AMPLIFIER

Putting out more than 60 watts per channel, here comes Lafayette's LA-125TA solid-state stereo amplifier. It features their Computor-Matic circuit for instant protection of output transistors against short circuits and overloads. Frequency response is 22 to 20,000 Hz ± 1dB at 1 watt. Power bandwidth, 20-40,000 Hz. Harmonic distortion is less than 1% at rated power at 1 kHz. Unit has front and rear panel tape outputs, front panel headphone output jack and a microphone/musical input, low and high frequency filters. Not to mention 8 additional controls: speaker mode, amplifier mode, program

(Continued on page 105)

Covering All Bases

Which would be the most economical way to receive frequencies from 10 kHz to 54 MHz? Would the old Hallicrafters model covering all bands including FM (can't remember the number but it came out after the SX62) be better than an HRO-50 (with the use of converters) or would some of the surplus receivers that are around be better? I can only spend around $200 right now.

—C.L.H., Washington, D.C.

Covering 10 kHz to 54 MHz with the same receiver isn't easy. What's on the air below 18 kHz? Even at 18 kHz all you'll hear is a standard reference frequency. And military communications in the ELF and VLF bands are not for eavesdroppers, friend.

There are a lot of communications receivers covering 540 kHz to 30 MHz. To receive higher frequencies, use a converter. A few communications receivers are tunable above 30 MHz, but these are rare. The best way to grade a receiver is in terms of microvolts input for a 10-dB signal-to-noise ratio, and with regard to selectivity. Compare spec sheets and then make up your mind.

Power Problem

I am confused by the different ways power ratings have been juggled and changed by manufacturers. Rms and peak values I understand; EIA music power, IHF music power I don't! Whatever happened to universally understood ratings such as rms (.707 peak), peak, and average (.637 peak)?

—E. L. McC., U.S. Navy

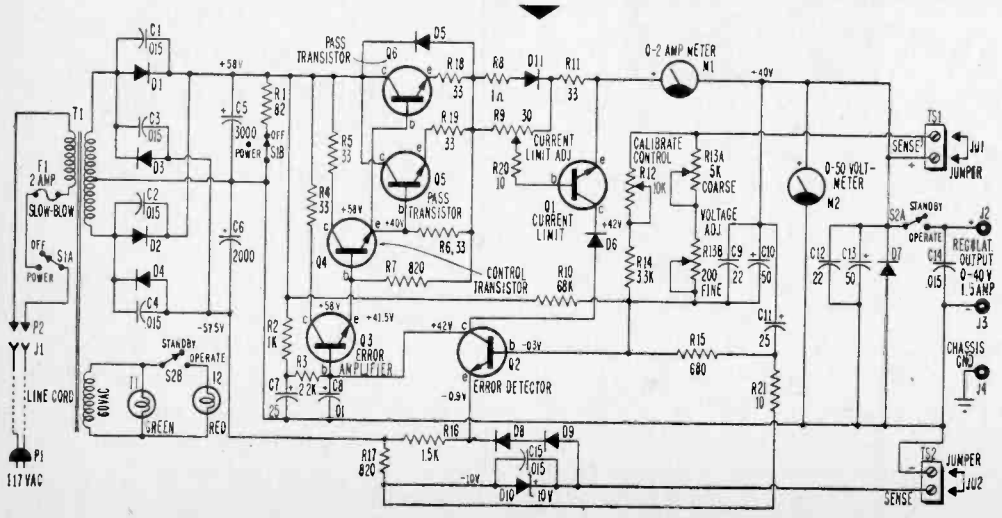
The purpose of the new ratings (Electronic Industries Assoc., Institute of High Fidelity) is to make the ratings sound more impressive. There is *some* validity, however, for their use. Music is always a complex waveform with great dynamic range and power peaks can be enormous. But the rms power (actual, continuous electrical power) is much lower than so-called music power. High fidelity equipment must be able to handle peak power with minimum distortion. It makes no difference what the average power level is.

Power Play

Please give me a schematic for a transistor DC power supply which meets the following requirements: good regulation, variable output of 0-24 V and 0-1.5 A with variable current-limiting control at all voltages, separate meters for monitoring of both voltage and current, low AC ripple and hum, and finally, an operate/standby feature to allow a voltage to be preset with the load disconnected.

—W. L., San Francisco, Calif.

Here's a schematic of the Knight KG-663 Regulated DC Power Supply which meets your requirements quite closely. Its output can be set at any value from 0 to 40 VDC and from 0 to

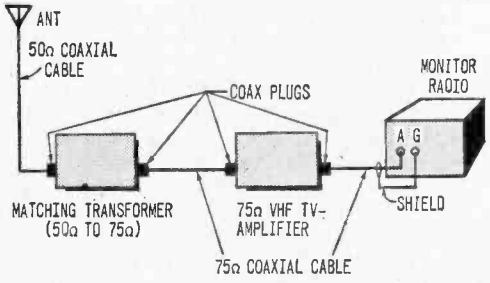


1.5 A. The unit is metered, and ripple is less than 0.6 millivolts under all load conditions.

Booster Stage

I have a Regency MR10 monitor radio for the 152 to 174-MHz band and use a ground-plane antenna 35 ft. high. Reception is only fair 25 miles from Rochester, so I need an RF preselector (or preamplifier) ahead of the receiver. Can you suggest something?

—R. B., Mumford, Conn.



Try using a vhf TV preamplifier connected as shown. It should have a 75-ohm input and output, and should amplify all frequencies in the vhf range (54 to 216 MHz). Use a 75-to-50-ohm matching transformer (Regency) as shown. Since the receiver will be fed through a 75-ohm cable, repeak the receiver's antenna trimmer to offset the mismatch.

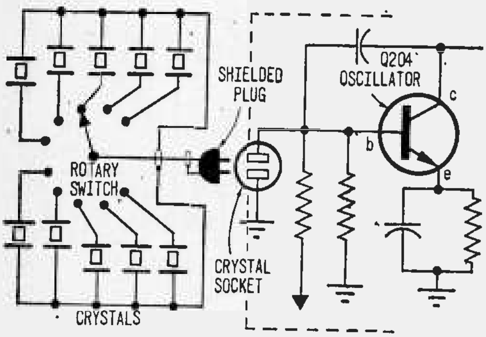
Crystal Ball

I would like to incorporate crystal switching for the oscillator stage in my Lafayette PB-50 monitor receiver. My plans include using a good

"Now beat two signals together in the mixer with oscillator at 2.455 MHz . . ."

10-position, ceramic rotary switch enclosed in a metal shield, and connecting the switch to the existing crystal socket with coax. Are there any other circuit changes or precautions I must observe?

—D. E. J., Bethesda, Md.

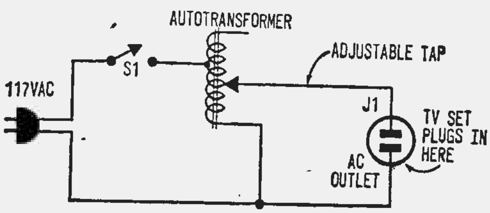


You can wire the crystal selector switch as shown in the diagram. Keep the coax as short as possible and make sure the metal shield has a good ground connection.

No Poop!

I have a Motorola color TV receiver which is giving me a very poor picture because of low line voltage in this area. Several servicemen have informed me that this can only be corrected by using a voltage regulator. However, the two models that I have found available are limited to 300 watts and my receiver draws 390 watts. Where can I find a regulator to suit my needs at a moderate price?

—E. J. S., Jr., Weirton, W.Va.



High capacity regulators are quite expensive. But you could use a Variac, Powerstat, or similar variable autotransformer connected as shown. Your local radio parts distributor can order one for you, or you can get one from Allied Radio, 100 N. Western Ave., Chicago, Ill. 60680.

Old Waves

What was the first broadcasting station in the U.S.? Both KDKA in Pittsburgh and WWJ in Detroit claim the title. Also, was it 1920 or 1921?

D. H., Metairie, La.

The way we heard it, it was KQW in San Jose in 1913. Before that DeForest broadcast live opera in New York. And before that it was just ghosts in the attic.

Command Post

In the Feb./Mar. 1968 issue of RADIO-TV EXPERIMENTER *you have a write-up on "Hot Line to the Weatherman." In it you mention a vhf FM receiver used by IBM electricians to receive their orders. I would like to know the name and address of the company that makes them, and also the address of the company that makes the Unimetrics FM Minivox.*

—G. C., Baltimore, Md.

IBM uses pocket receivers made by Motorola, Inc., 4501 West Augusta Blvd., Chicago, Ill. The Minivox is distributed by Unimetrics, Inc., 38 Werman Court, Plainview, N. Y.

Geiger and Muller

Can you tell me where I can buy a 300-V Geiger tube?

—J. W. P., South Bend, Ind.

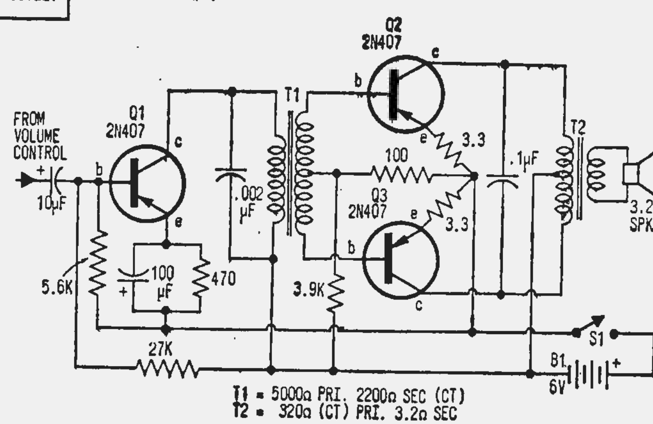
Since it won't cost but a few pence, why don't you phone Allied Radio in Chicago—they carry a fantastic inventory. If they don't have it in stock, they undoubtedly can get it for you. Geiger counters seem to have been *out* for some time. Maybe now they're back *in?*

Lotsa Gain

I need a schematic for a transistor audio amplifier that has an output of about 400 mW and is sensitive enough to operate from a receiver's detector output.

—A. W., China Lake, Calif.

▼

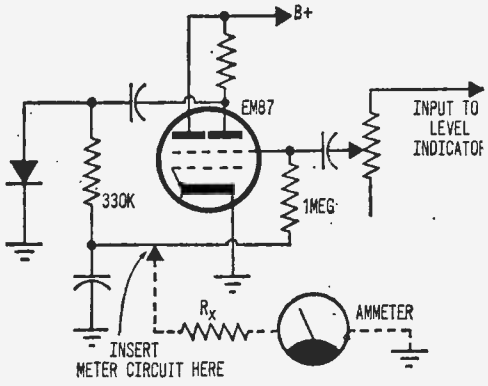


Our diagram shows the circuit of a two-stage transistor amplifier. You should be able to get the components at any parts distributors in the Los Angeles area. Double check your wiring before connecting the battery and be sure to use heat sinks with Q2 and Q3.

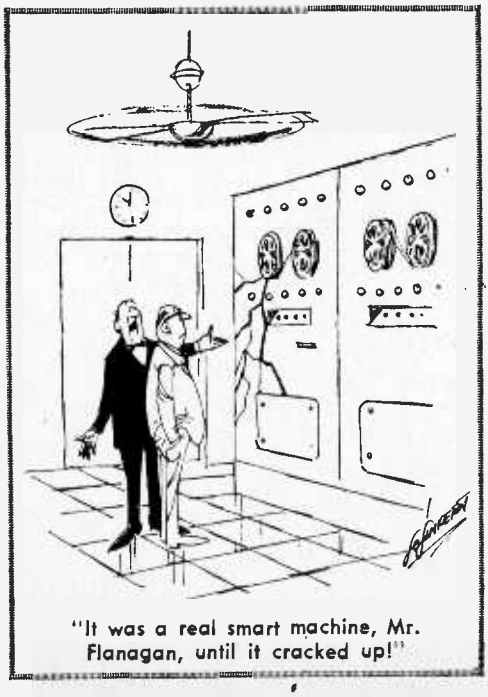
Eye Gets the Needle!

I am enclosing the schematic of the recording level indicator in my tape recorder. How can I convert this "magic eye" monitor to a meter? There is plenty of room for a small meter on the chassis and I would prefer to use one.

—G. T., London, Ont.



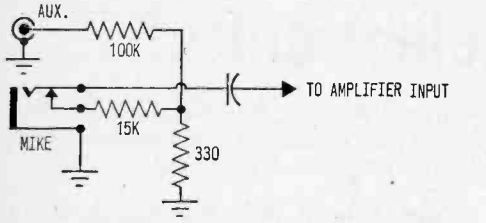
Try adding a 0-100 DC microammeter to the circuit at the point indicated. Try various values for resistor Rx so that the meter doesn't go off



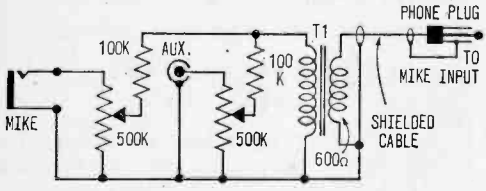
scale at maximum volume. You can start with a 100,000-ohm resistor and work from there.

High or Low

I recently bought a tape deck. When I got around to using it I made a few sad discoveries. First, the mike jack shorts out auxiliary inputs so they can't all be used simultaneously. I really need this, so the machine is far less useful to me. Next, the low impedance mike inputs turned out to be 600 ohms—which I can't match. My inputs are either lower or higher. I wrote to the manufacturer asking what I could do about this but got no answer. Any suggestions?



ORIGINAL INPUT FOR EACH CHANNEL



EXTERNAL MIXER FOR EACH CHANNEL

—C. D. J., Sheboygan, Wis.

The first diagram is a simplified version of the input circuitry for each stereo channel. As you say, when you plug in the mike, the auxiliary input is cut out. One solution is to add an external mixer. A schematic for a simple one is given. It plugs into the tape recorder mike jack.

Transformer T1 is a 600-ohm line-to-grid model. The pots control the level of each input, while the series resistors provide isolation. You've still got a problem of matching into this high-impedance mixer, however. It is not an ideal solution, but a more sophisticated model involves considerable money.

Talking with Light!

While looking for a science project Card SMC! for next year I ran into your article in the June-July (1967) RADIO-TV EXPERIMENTER *called "Talk On An Invisible Light Beam!" Who can I write to for information about a gallium-arsenide diode?*

—E.E.C., Jr., New Bern, N.C.

We have had many inquiries about this project. For information about the diode try Philco-Ford Corporation, Lansdale Division, Philadelphia, Pa. 19134.

Stay Loose

Is it possible to hook up a Knight-Kit X-10 100-kHz crystal calibrator to a Heathkit GR-64 receiver? If so, could you show me how?

—D. M., Detroit, Mich.

No problem. Just place the calibrator inside the set very close to the mixer, connect the voltage supply leads and an on-off switch. The 100-kHz signal will be loosely coupled to the receiver's front end and the harmonics should appear every 100 kHz on the dial.

Line for Line

Can you tell me where I can get a second-hand color TV set in America and at what cost? The set need not be in working order but should have a good CRT so it can be converted from the American NTSC system to the PAL-1 25 line system in England.

—N. W. P., Leeds, England

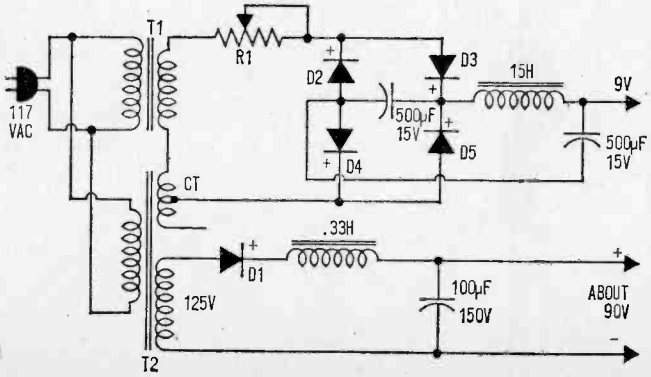
You can find second-hand sets at thousands of TV shops and at bargain prices. But, there's the problem of export packing and shipping. Anyone who wants to sell a color TV set to N.W.P. should write him at 88 Shaftsbury Avenue, Leeds 8, England.

New Blood

I have an Admiral radio that operates on 9- and 90-V batteries. These are hard to get and quite expensive. Is there any way I could operate the radio on 12 VDC?

—T. H., Chicago, Ill.

No, but you can build an AC adaptor using the circuit shown. Except for fun and games, why not buy a transistor radio for $5 or so? Transformer T1 is a 6.3-V filament transformer and T2 is a 125-V power transformer with a 6.3-V filament winding. The diodes can be almost any type of silicon power rectifier. For

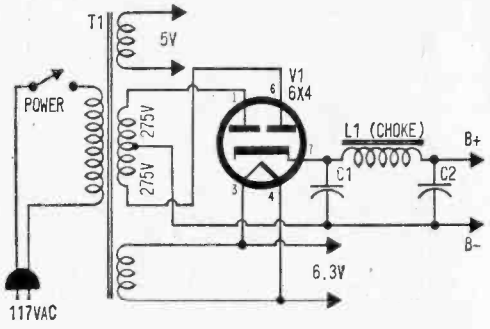


R1, use a wirewound rheostat. Its value depends upon the current you need at 9 V. Adjust it until you get 9 V with the receiver turned on.

Power Play

Can you tell me how to hook up a power transformer with 275-0-275 VAC leads and 6.3-V and 5-V filament leads to a 6X4 vacuum tube? Also, where do I place the choke?

—W. O. R., London, Ont.



Hook up the transformer as shown in the diagram. Connect the choke (L1) and the electrolytic capacitors C1 and C2 as shown; the electrolytics should be *u*F or more. Just ignore the 5-V tap.

Sea Whip

What kind of antenna should I use for a vhf FM marine radio? I plan to install it myself on a small outboard cruiser.

—N. T., New Orleans, La.

Get a special marine vhf antenna. There are now several on the market (GAM, Columbia, Webster, Mark, etc.). The most effective models run from 8 to 12 ft. in length, are encased in fiberglass, and do not require a hull ground.

"... it was just a minor adjustment!"

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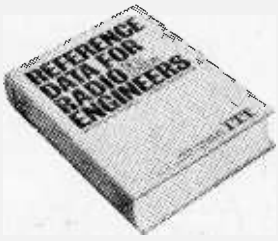

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for comprehensive, up-to-date information, the brochure has grown into a book length volume, which is now expanded to its fifth edition, published by Howard W. Sams, subsidiary of ITT.

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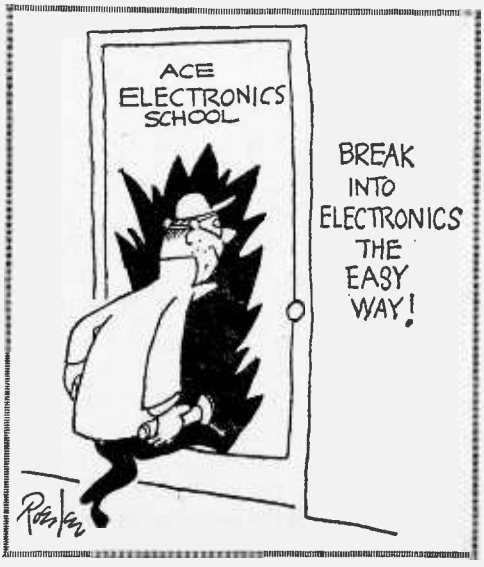

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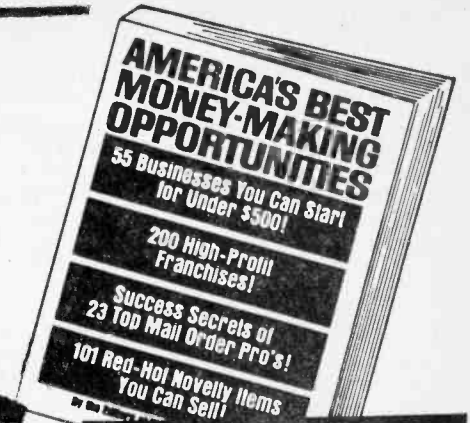

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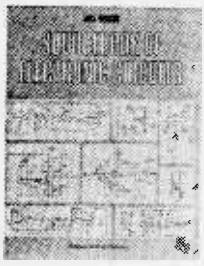

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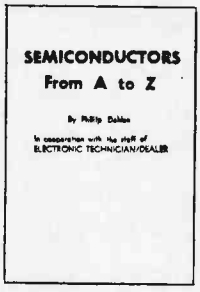
Further information on *Sourcebook of Electronic Circuits* may be obtained from the McGraw-Hill Book Information Service, 327 West 41st Street, New York, N. Y. 10036.

Solid-State Wrap Up. If you don't know what a solid-state whatchamacallit is, you need *Semiconductors, From A to Z,* by Phillip Dahlen. This tome has everything one needs to know about the entire range of transistors and semiconductors used today—from basic diodes and transistors to FETs, MOS FETs, tunnel diodes, integrated circuits, varicaps, light-sensitive devices, incandescent and luminescent optic-electronic circuits, field-effect diodes, SCR and zener diodes, etc. Written in language anyone can understand, it explains how these various devices work and how they are used, with complete descriptions of all the common and unique circuits used in modern semiconductor technology. With the wealth of knowledge incorporated in this book, the reader will be qualified to service solid-state equipment.

The content begins with a review of how basic semiconductors work, including types and function, how a transistor conveys a signal, transistor biasing and self-biasing techniques, effects of temperature on operation, factors limiting transistor frequency response, etc. Succeeding chapters delve into the mystical arena of field-effect transistors by explaining the dif-



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ference between FETs and regular transistors; junction FET applications, frequency response, temperature effects, and depletion-type and enhancement-type MOS FETs. There's much more in *Semiconductors, From A to Z,* but our space is limited. Remember, if solid-state is your bag, this book is for you. The Publisher will be happy to send additional information. Write to Tab Books, Blue Ridge Summit, Pa. 17214 today!

Ham It, Darn It. It seems everyone these days is pushing for an upgrading in "technical competence" in ham circles. While incentive licensing and the overall goal of an engineer-like ham society may be popular at the moment, it has also resulted in a dramatic plunge in the number of easy-to-build construction projects that once added excitement to the pages of the electronics and ham publications.

In fact, many articles published today would frustrate a would-be ham—to say nothing of the effect these "state-of-the-art" construction reports are having on amateurs not inclined to spend $1200 for parts for a device he is liable to err in building.

This, then, represents one of the primary considerations the authors (Tom Brown K2ZSO and Tom Kneitel K2AES/WB2AAI) considered prior to the writing of *101 Easy Ham Radio Projects.* The format is simple: short descriptions with construction hints, parts list, and diagrams. If you are looking for some sem-

Soft cover
159 pages
$3.95

blance of order, forget it. The book—unlike any others—is one you can open at any point, gather your components and soldering gun, and start building. Like a cookbook, you will find a one-evening recipe for all occasions.

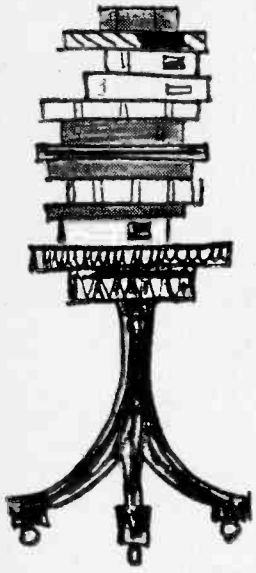
Using many parts that you probably already have, you should be able to build just about any project you like for under $5.00. How about building a simple 80-meter CW rig (you can complete it in one evening) for that budding Novice down the street? Interested? Then write to the Publisher, Howard W. Sams Co., Inc., 4300 West 62nd Street, Indianapolis, Ind. 46206.

• *Dictionary of Electronic Terms.* Allied Radio Corp., 100 N. Western Ave., Chicago, Ill. 60680. Paper, $1.00. 112 pp.

This, the 8th edition, contains over 4800 definitions and hundreds of illustrations of the most up-to-date language of electronics.

"I can remember the old days when you rob a bank with an old fashioned note, but today you need an IBM card."

LITERATURE



ELECTRONIC PARTS

★135. Get with ICs! *RCA's* new integrated Circuit Experimenter's Kit KD2112 is the first of its kind and should be a part of your next project. Get all the facts direct from *RCA*. Circle 135.

★140. How cheap is cheap? Well, take a gander at *Cornell Electronics'* latest catalog. It's packed with bargains like 6W4, 12AX7, 5U4, etc., tubes for only 33¢. You've got to see this one to believe it!

★2. Now, get the all-new 512-page, fully illustrated *Lafayette Radio* 1969 catalog. Discover the latest in CB gear, test equipment, ham gear, tools, books, hi-fi components and gifts. Do it now!

★5. *Edmund Scientific's* new catalog contains over 4000 products that embrace many interests and fields. It's a 148-page buyers' guide for Science Fair fans.

★4. *Olson's* catalog is a multi-colored newspaper that's packed with more bargains than a phone book has names. Don't believe us? Get a copy.

★7. Before you build from scratch, check the *Fair Radio Sales* latest catalog for electronic gear that can be modified to your needs. *Fair* way to save cash.

8. Get it now! *John Meshna, Jr.'s* new 46-page catalog is jam packed with surplus buys—surplus radios, new parts, computer parts, etc.

1. *Allied's* catalog is so widely used as a reference book, that it's regarded as a standard by people in the electronics industry. Don't *you* have the 1969 *Allied Radio* catalog? The surprising thing is that it's free!

23. No electronics bargain hunter should be caught without the 1969 copy of *Radio Shack's* catalog. Some equipment and kit offers are so low, they look like misprints. Buying is believing.

10. *Burstein-Applebee* offers a new giant catalog containing 100s of big pages crammed with savings including hundreds of bargains on hi-fi kits, power tools, tubes, and parts.

11. Now available from *EDI (Electronic Distributors, Inc.)*: a catalog containing hundreds of electronic items. *EDI* will be happy to place you on their mailing list.

106. With 70 million TV and 240 million radios somebody somewhere will need a vacuum tube replacement at the rate of one a second! Get *Universal Tube Co.'s* Troubleshooting Chart and facts on their $1.50 flat rate per tube.

6. Bargains galore, that's what's in store! *Poly-Paks Co.* will send you their latest eight-page flyer listing the latest in available merchandise, including a giant $1 special sale.

TOOLS

★78. Scrulox square recess screws pose no problems for the serviceman who carries either of *Xcelite's* two new Compact Scrulox screwdriving sets in his pocket or tool box—Bulletin N467 explains all.

118. Secure coax cables, speaker wires, phone wires, etc., with *Arrow* staple gun tackers. 3 models for wires and cables from 3/16" to 1/2" dia. Get fact-full Arrow literature.

CB—AMATEUR RADIO—SHORTWAVE RADIO

102. No never mind what brand your CB set is. *Sentry* has the crystal you need. Same goes for ham rigs. Seeing is believing, so get *Sentry's* catalog today. Circle 102.

146. It may be the *first*—*Gilfer's* speciality catalog catering to the SWL. Books, rigs, what-nots—everything you need for your listening post. Go *Gilfer*, circle 146!

100. You can get increased CB range and clarity using the "Cobra-23" transceiver with speech compressor—receiver sensitivity is excellent. Catalog sheet will be mailed by *B&K Division of Dynascan Corporation.*

141. Newly-designed CB antenna catalog by *Antenna Specialists* has been sectionalized to facilitate the picking of an antenna or accessory from a handy index system. Man, *Antenna Specialists* makes the pickin' easy.

130. Bone up on the CB with the latest *Sams* books. Titles range from "ABC's of CB Radio" to "99 Ways to Improve your CB Radio." So Circle 130 and get the facts from *Sams*.

107. Want a deluxe CB base station? Then get the specs on *Tram's* all new Titan II—it's the SSB/AM rig you've been waiting for!

96. Get your copy of *E. F. Johnson's* new booklet, "Can *Johnson* 2-Way Radio Help Me?" Aimed for business use, the booklet is useful to everyone.

129. Boy, oh boy—if you want to read about a flock of CB winners, get your hands on *Lafayette's* new 1969 catalog. *Lafayette* has CB sets for all pocketbooks.

46. Pick up *Hallicrafters'* new four-page illustrated brochure describing Hallicrafters' line of monitor receivers —police, fire, ambulance, emergency, weather, business radio, all yours at the flip of a dial.

116. Pep-up your CB rig's performance with *Turner's* M+2 mobile microphone. Get complete spec sheets and data on other *Turner* mikes.

48. *Hy-Gain's* new CB antenna catalog is packed full of useful information and product data that every CBer should know. Get a copy.

111. Get the scoop on *Versa-Tronics'* Versa-Tenna with instant magnetic mounting. Antenna models available for CBers, hams and mobile units from 27 MHz to 1000 MHz.

45. CBers, Hams, SWLs—get your copy of *World Radio Labs'* 1969 catalog. If you're a wireless nut or experimenter, you'll take to this catalog.

101. If it's a CB product, chances are *International Crystal* has it listed in their colorful catalog. Whether kit or wired, accessory or test gear, this CB-oriented company can be relied on to fill the bill.

103. *Squires-Sanders* would like you to know about their CB transceivers, the "23'er" and the new "S5S." Also, CB accessories that add versatility to their 5-watters.

ELECTRONIC PRODUCTS

143. Bring new life to your hobby. Exciting plans for new projects—let Electronics Hobby Shop give you the dope. Circle 143, now.

144. Hear today the organ with the "Sound-of-Tomorrow," the Melo-Sonic by *Whippany Electronics*. It's portable—take it anywhere. Send for pics and descriptive literature.

109. *Seco* offers a line of specialized and standard test equipment that's ideal for the home experimenter and pro. Get specs and prices today.

42. Here's colorful 116 page catalog containing a wide assortment of electronic kits. You'll find something for any interest, any budget. And *Heath Co.* will happily send you a copy.

128. If you can hammer a nail and miss your thumb, you can assemble *Schober* organ. To prove the point, *Schober* will send you their catalog and a 7-in. disc recording.

12. *C. B. Hanson* new Automatic Control records both sides of a telephone call automatically—turns off automatically, too! Get all the details —today!

LIBRARY...

★ Starred items indicate advertisers in this issue. Consult their ads for additional information and specifications.

★44. Kit builder? Like wired products? *EICO's* 1969 catalog takes care of both breeds of buyers. 32 pages full of hi-fi, test, CB, ham, SWL, automotive and hobby kits and products —do you have a copy?

★126. *Delta Products* new capacitive discharge ignition system in kit form will pep up your car. Designed to cut gas costs and reduce point and plug wear. Get *Delta's* details in full-color literature.

9. Troubleshooting without test gear? Get with it—let Accurate Instrument clue you in on some great buys. Why do without?

145. *Alco Electronic Products* has 28 circuit ideas using their remote control relay. Get 100-and-one odd jobs done at home without calling an electrician. Get all the facts today!

SCHOOLS AND EDUCATIONAL

★74. Get two free books—"How to Get a Commercial FCC License" and "How to Succeed in Electronics"—from *Cleveland Institute of Electronics*. Begin your future today!

★3. Get all the facts on Progressive Edu-Kits Home Radio Course. Build 20 radios and electronic circuits; parts, tools and instructions come with course.

142. *Radio-Television Training of America* prepares you for a career—not a job. 16 big kits help you learn as you build. 120 lessons. Get all the facts today!

114. Prepare for tomorrow by studying at home with *Technical Training International*. Get the facts today on how you can step up in your present job.

★136. *International Correspondence Schools* has a 384-page manual explaining the function, operation, and objectives of *ICS*. Get the facts on 266 courses of study currently available. Sorry, offer may expire soon.

★137. For success in communications, broadcasting and electronics get your First Class FCC license and *Grantham School of Electronics* will show you how. Interesting booklets are yours for the asking.

HI-FI/AUDIO

104. You can't hear FM stereo unless your FM antenna can pull 'em in. Learn more and discover what's available from *Finco's* 6-pages "Third Dimensional Sound."

119. *Kenwood* puts it right on the line. The all-new *Kenwood* FM-stereo receivers are described in a colorful 16-page booklet complete with easy-to-read-and-compare spec data. Get your copy today!

30. *Shure's* business is hi-fi — cartridges, tone arms, and headphone amps. Make it your business to know *Shure!*

134. Discover *PlayTape*—America's newest tape cartridge and tape players. Unit priced at under $17 with cartridges at 45-disc prices. *PlayTape* has one of America's largest recorded libraries.

17. Mikes, speakers, amps, receivers—you name it, *Electro-Voice* makes it and makes it good. Get the straight poop from *E-V* today.

99. Get the inside info on why *Koss/Acoustech's* solid-state amplifiers are the rage of the experts. Colorful brochure answers all your questions.

26. The all new, lavishly-illustrated, full-color brochure, "At Home With Stereo" clues you in on *H.H. Scott's* 1969 stereo consoles. Discover how to pick a hi-fi console for your living room.

TAPE RECORDERS AND TAPE

123. Yours for the asking—*Elpa's* new "The Tape Recording Omnibook." 16 jam-packed pages on facts and tips you should know about before you buy a tape recorder.

31. All the facts about *Concord Electronics Corp.* tape recorders are yours for the asking in a free booklet. Portable, battery operated to four-track, fully transistorized stereos cover every recording need.

32. "Everybody's Tape Recording Handbook" is the title of a booklet that *Sarkes-Tarzian* will send you. It's 24-pages jam-packed with info for the home recording enthusiast. Includes a valuable table of recording times for various tapes.

34. "All the Best from *Sony*" is an 8-page booklet describing *Sony-Superscope* products—tape recorders, microphones, tape and accessories. Get a copy today before you buy!

35. If you are a serious tape audiophile, you will be interested in the all new *Viking/Telex* line of quality tape recorders.

TELEVISION

★70. Need a new TV set? Then assemble a *Heath* TV kit. *Heath* has all sizes. B&W and color, portable and fixed. Why not build the next TV you watch?

127. *National Schools* will help you learn all about color TV as you assemble their 25-in. color TV kit. Just one of *National's* many exciting and rewarding courses.

SCIENCE and ELECTRONICS
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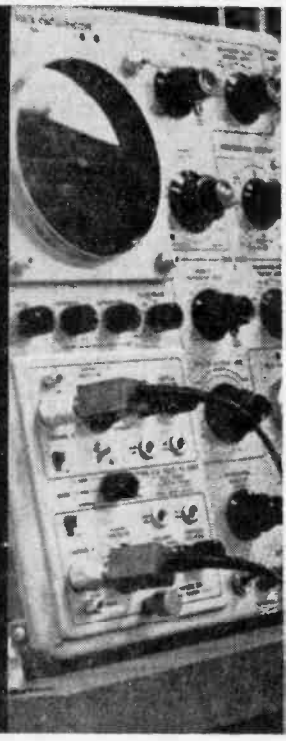
How to become a "Non-Degree Engineer"



In today's electronics boom the demand for men with technical education is far greater than the supply of graduate engineers. Thousands of real engineering jobs are being filled by men without engineering degrees—provided they are thoroughly trained in basic electronic theory and modern application. The pay is good, the future is bright... and the training can now be acquired at home—on your own time.

THE ELECTRONICS BOOM has created new breed of professional man—the no degree engineer. Depending on the bran of electronics he's in, he may "ride her over a flock of computers, run a powerf TV transmitter, supervise a service maintenance department, or work side side with distinguished scientists on a ne discovery.

But you do need to know more th soldering connections, testing circuits a replacing components. You need to real know the fundamentals of electronics.

How can you pick up this necessa knowledge? Many of today's non-degr engineers learned their electronics home. In fact, some authorities feel th a home study course is the *best* way. *Po ular Electronics* said:

"By its very nature, home study deve ops your ability to analyze and extract i formation as well as to strengthen yo sense of responsibility and initiative."

Cleveland Method Makes It Easy

If you do decide to advance your care through home study, it's best to pick school that *specializes* in the home stu method. Electronics is complicat enough without trying to learn it fro texts and lessons that were designed f the classroom instead of the home.

Cleveland Institute of Electronics co centrates on home study exclusively. Ov the last 30 years it has developed tec

niques that make learning at home easy, even if you once had trouble studying. Your instructor gives the lessons and questions you send in his undivided personal attention—it's like being the only only student in his "class." He not only grades your work, he analyzes it. And he mails back his corrections and comments the same day he gets your lessons, so you read his notations while everything is still fresh in your mind.

Students who have taken other courses often comment on how much more they learn from CIE. Says Mark E. Newland of Santa Maria, Calif.:

"Of 11 different correspondence courses I've taken, CIE's was the best prepared, most interesting, and easiest to understand. I passed my 1st Class FCC exam after completing my course, and have increased my earnings by $120 a month."

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Because of rapid developments in electronics, CIE courses are constantly being revised. This year's courses include up-to-the-minute lessons in Microminiaturization, Laser Theory and Application, Suppressed Carrier Modulation, Single Sideband Techniques, Logical Troubleshooting, Boolean Algebra, Pulse Theory, Timebase Generators...and many more.

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The Cleveland method of training is so successful that better than *9 out of 10 CIE graduates who take the FCC exam pass it.* This is despite the fact that, among non-CIE men, 2 out of every 3 who take the exam fail! That's why CIE can promise in writing to refund your tuition in full if you complete one of its FCC courses and fail to pass the licensing exam.

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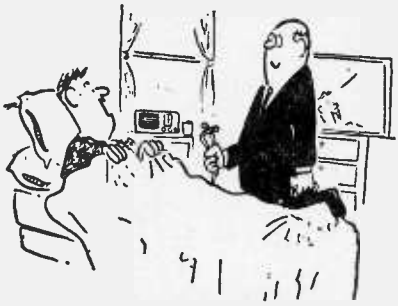
EX-32

FRINGE BENEFITS

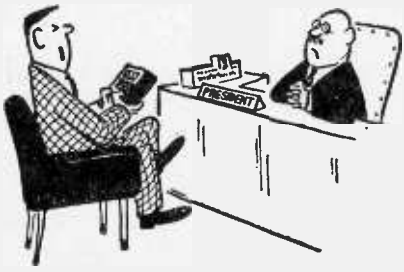
By Jack Schmidt

"They're the new matched BZ-2X hi-fi speakers. Wait'll you hear 'I Love You' in stereo—with reverb."

"We're stuck in a big traffic jam near Lake Road—be tied up for hours . . ."



"I can't tell you how much I appreciate the house call, Doc . . . and I'll check that color set first thing Monday."



"Before we talk about my raise, Boss, I'd like to play back a few comments you made at our last office party."

Throw away those rose-colored glasses—the world will look better through an

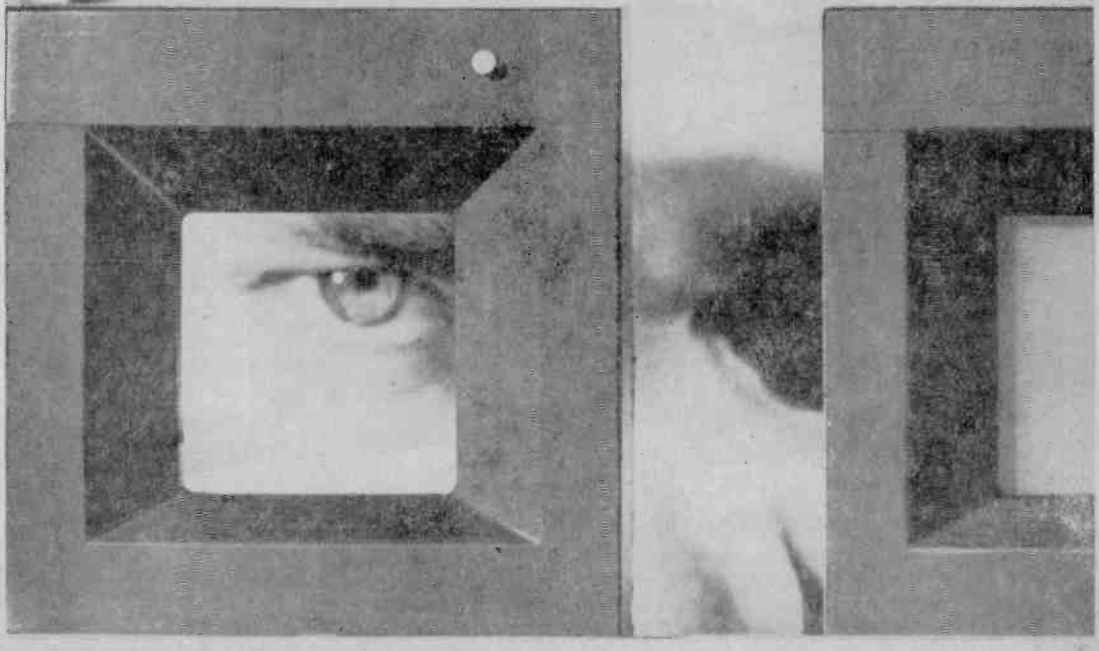
ELECTRONIC LIQUID WINDOW

SCIENCE AND ELECTRONICS

By Jorma Hyypia

The Marks Brothers have been looking through your window and have decided that your deplorable living conditions must be changed. That ugly TV set must be relegated to a dark closet. Those abominable window shades and Venetian blinds must be ripped down. Your lighting fixtures hurt the Marks Brothers' eyes, there are glare spots on your walls, and the colors in your rooms are unnatural. What's more, your camera "clicks" too loudly.

Brothers Alvin and Mortimer—the rebellious Marks duo—are not misguided interior decorators (Continued overleaf)



ELECTRONIC LIQUID WINDOW

bent on taking us all back to pre-Edison days. Quite the contrary. These two engineer-researchers are the top brass of Marks Polarized Corporation (Whitestone, N. Y.), a company engaged in developing some very unusual electro-optic devices for military and civilian uses.

One especially intriguing product of the company is an electronic window, called *VARAD*, which can exhibit variable transmittance, absorbance and/or reflectance of light radiation in response to an applied electric field. The turn of a control button immediately reduces or increases the amount of light passed by the window.

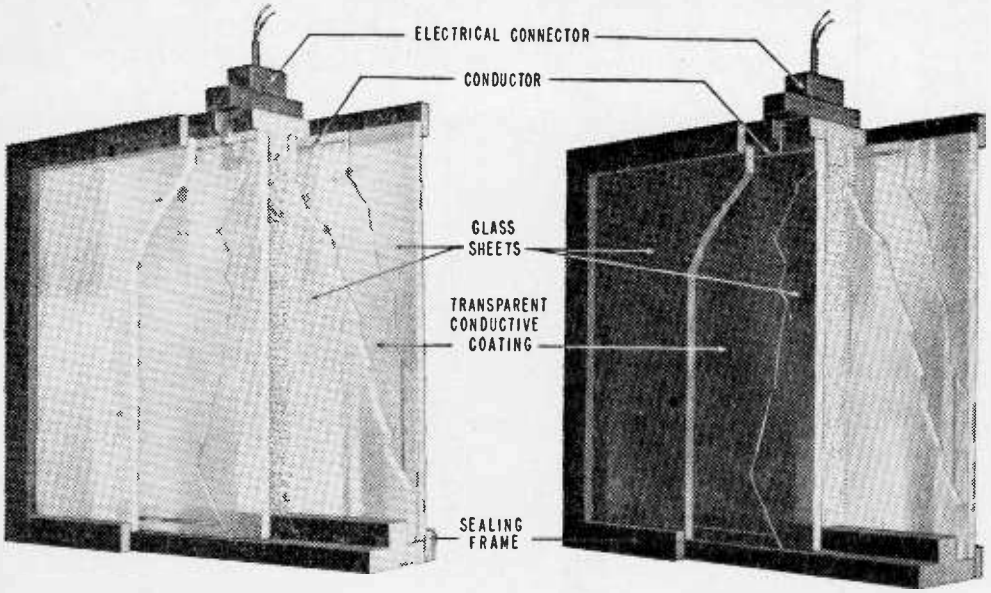
Invisible Blinds. Homes and offices fitted with *VARAD* systems instead of ordinary glass will require no shades or venetian blinds for light control. The electronic windows offer several important advantages: uniform light control over the entire window area at all times; unobstructed viewing through a partially dimmed window; complete elimination of the cleaning and maintenance chores imposed by conventional shades and blinds.

The system can be set up for both manual and automatic light control. The manual control can be used at any time to set the light level in a room at any desired intensity. A photosensor mounted on the outside of the building, near the window, will thereafter maintain the predetermined light level regardless of changes in the outside light intensity. Such automatic light control would be especially desirable in hospitals where patients are not able to make shade and blind adjustments.

Chameleon Houses. If someday in the future you chance to see a house change color while you watch, don't rush to a psychiatrist or eye doctor. You are just seeing another Marks idea put to use.

Electro-optical *panels* on the walls and ceilings of buildings will be made to darken in the winter to absorb the sun's radiation, and become pastel-color, white or silvery in the summer to reflect away the sun's heat. Although the "dynamic esthetics" of such a chameleon building would surely interest architects, the primary purpose of creating color changes is to reduce fuel requirements for seasonal heating and cooling of buildings.

The cost of electro-optical panels will be from five to ten times greater than the cost of glass alone. However, over the life of the building, substantial savings will be realized on investments in heating and cooling equip-



TRANSPARENT STATE
WITH DIPOLES ALIGNED BY ELECTRIC FIELD

OPAQUE STATE
WITH DIPOLES AT RANDOM

Now you see it, now you don't! Window at left is perfectly clear when a 400-VAC is impressed across the transparent conducting plates. Window becomes opaque (right) when voltage is removed.

ment, reduced maintenance and other factors.

On-the-wall TV. The Marks brothers say that *VARAD*, in a modified form, is a practical solution to the long-pondered problem of on-the-wall TV display panels. Thin electro-optical panels would simply hang on the wall, taking no more room than an oil painting. They would do away with the clumsy, conically-shaped TV picture tubes now in use.

Since the "box" would no longer be needed to contain the picture tube, the electronic guts of a TV set could be stashed away in a closet or attic. A small control box on the table, near your favorite chair, would be used to turn the set *on* and *off* and make the usual focus adjustments. The box might also have a control knob with which to dim the light coming in through your *VARAD* window for better daytime viewing of TV.

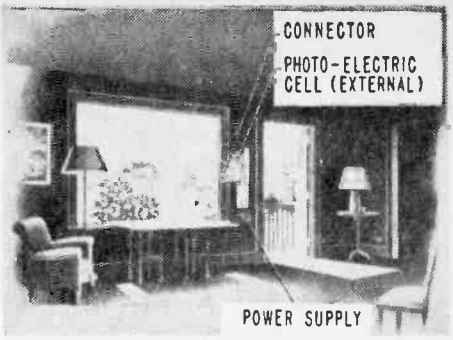
Such display panels would have many other uses. They would be ideal for the cramped quarters of aircraft and space vehicles. Two-dimensional and 3-D electronic advertising display systems are well within the realm of possibility.

Camera Shutters. The *VARAD* system can be used to design non-mechanical electro-optical camera shutters unlike anything seen before. These would be noiseless, long lasting and probably very accurate because there would be no moving parts to wear out. Perhaps the most novel feature of the shutter would be the variable density filter integrated with the shutter. Like the *VARAD* window, the shutter could be preset to transmit only whatever amount of light would be required to properly expose a film in any given situation. This adjustment could be done automatically by a photosensor built into the camera.

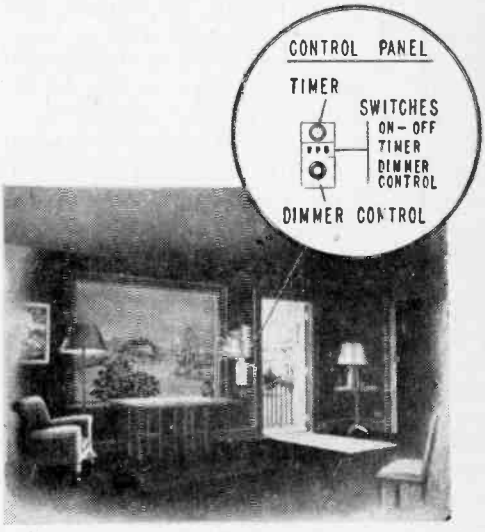
Other Applications. The potential applications of *VARAD* seem virtually endless. For example, the system could be used immediately for variable transmittance eyeglasses or goggles providing automatic light intensity control of sunlight, flashes from nuclear or other explosions, welding torch arcs and the like

Other uses now being researched include such other photographic applications as masking, contrast control, photo-copying, "instantaneous" pictures. Electronic display applications include 2-D and 3-D TV and radar displays, blocking screens, light amplifiers.

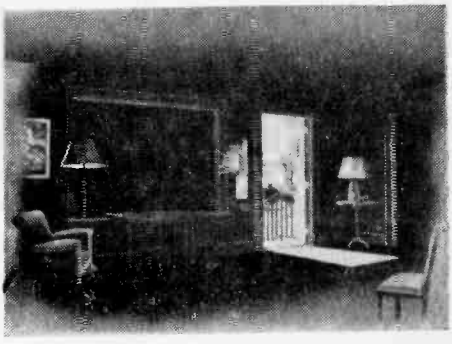
How It Works. Basically, the *VARAD*



COMPLETE TRANSMITTANCE



PARTIALLY DIMMED



FULLY DIMMED

Home of future (and it's just around the corner) will have a *VARAD* picture window to control room lighting during day. Window controls with optional timer bring window from full transparency (top) to fully dimmed (bottom) with any level of partial dimness desired (middle). Fact is, *VARAD* window works fine on moon glow, too—for lovers!

ELECTRONIC LIQUID WINDOW

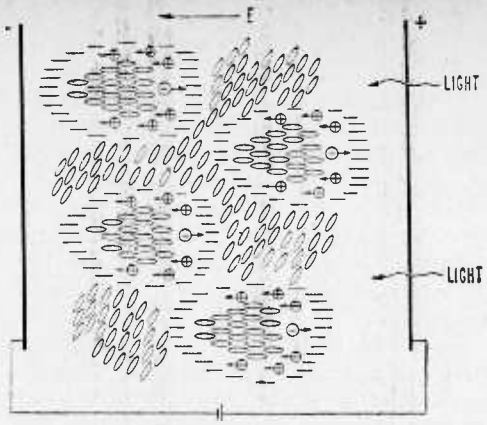
system consists of two layers of glass or plastic sheet, each coated with a transparent electrically-conductive film. A special liquid is sealed between these two laminations.

The liquid is opaque until a voltage difference is applied to the conductive coatings on each side of the liquid layer. A variable voltage control is used to adjust light transmission to any desired level within the limits of the system.

The required potential is 400 volts AC with a current of 0.27 milliamperes per square centimeter. This would mean about 5000 watts to control an ordinary ranch-type window. However, the current is substantially 90 degrees out of phase with the voltage; thus negligible power is required because the load is essentially capacitive and of nearly infinite resistance.

The optimum operating frequency is determined by the electrical characteristics of inductance and the capacitance of the *VARAD* low voltage cell. Usually the electric circuit comprises an oscillator supplying a stepup transformer which has inductance. The capacitance of the *VARAD* cell depends on area and thickness. The transformer output inductance, and *VARAD* cell capacitance, determine a resonant frequency for maximum voltage across the cell. In general, a frequency in excess of 10 kHz is preferred.

The transmission characteristics of the system are defined in terms of the *electrodichroic ratio*—the ratio of optical density closed (Dc) to optical density open (Do) at a given applied voltage. The ratio is directly proportional to the applied voltage. An electrodichroic ratio of 15 is obtained



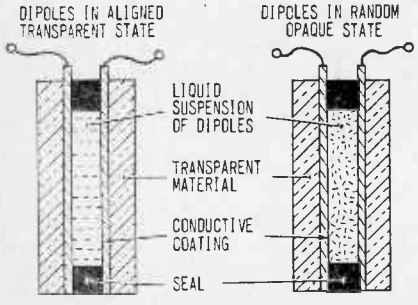
RCA has its own way of doing things. In their electronic window, light passes through when no voltage is on conducting panes of glass.

with a panel using 400 volts at a frequency of 25 kHz.

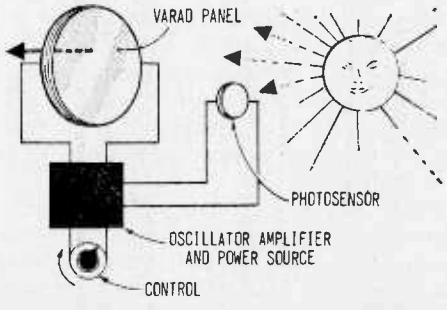
The thickness of the liquid layer also affects the range of light transmission. A system having an electrodichroic ratio of 15 might transmit 63% of incident light when open and 0.1% when closed. The same system, using a thicker liquid layer, might transmit 31.5% when open, only 1.3 x 10^{-5}% closed.

The opening time is 100 microseconds; closing time is 5 milliseconds. Boiled down to simple talk, the window can go from full transmission to optical blanking faster than you can blink.

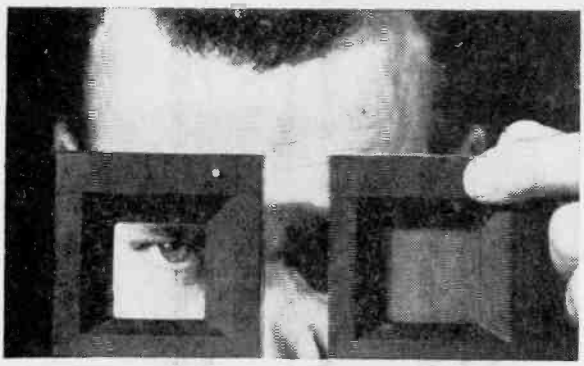
Dipole Light Baffles. Suspended in the liquid (of undisclosed, proprietary nature) are literally billions of invisible, submicroscopic light baffles consisting of thin, needle-like crystals of iodo-quinine sulfate. Think of these needles as being tiny, free-floating slats of a venetian blind.

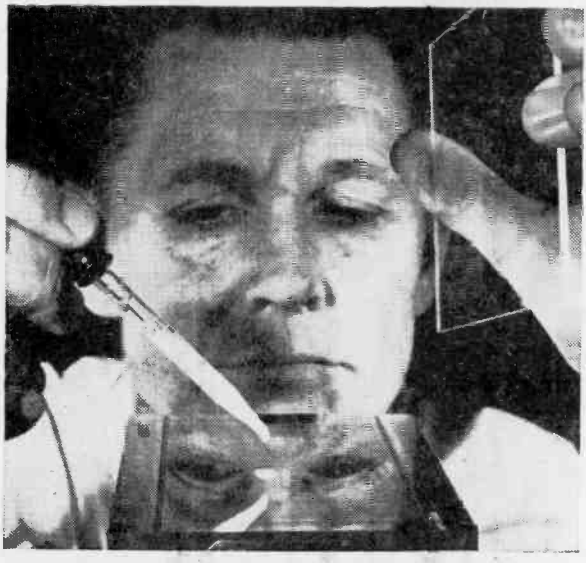


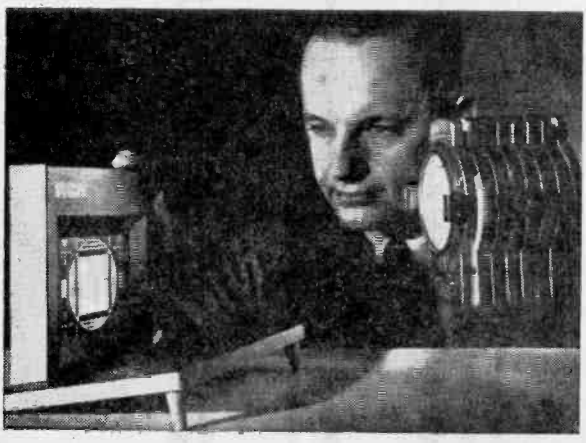
Looking at VARAD system sideways shows details of construction. Conductive coating on glass is very thin and is transparent, too!



Electronic window may be controlled by solid-state photo sensor. As sun comes up, photo sensor actually darkens VARAD panel.







Here are some highlights of RCA liquid window. Top photo shows two windows: left one is clear; right one is opaque. Middle photo shows scientist putting drop of liquid crystal between two plates. Bottom photo shows potential TV application giving bright and clear picture even though window is illuminated by a 500-watt stage floodlight.

If no electric field is applied to the liquid, these needles are randomly oriented and light transmission is blocked. When the voltage is applied, the needles become aligned along the line of sight, at right angles to the window surface. They then present a minimum of reflective surface to the incident light, much of which can pass through unimpeded. Obviously, 100% transmission is not possible. Ordinary window glass never exceeds 95% transmission.

If the applied voltage is cut off completely, the needles quickly return to random orientations as a result of thermal molecular impacts. A partial voltage will align only a part of the needles—or perhaps align all of them only to a limited degree—and thus permit an intermediate degree of light transmission.

Why do these particles respond to electrical fields in this way? Because the molecules of this chemical have a permanent separation of their positive and negative centers of electrical charge, and the centers of gravity of these charges do not coincide. Such materials are called polar molecules, or simply *dipoles.**

TV Trick. The preceding discussion explains how the *VARAD* windows, camera shutters, eyeglasses and similar devices work. But this does not yet explain how the system can generate a TV picture.

In most applications the *VARAD* fluid is actuated *uniformly* over its entire surface. However, if the continuous conducting film on the glass is broken down into a raster of closely spaced conducting *lines*, *point-by-point* activation becomes possible. Under these conditions a sweep circuitry can be used to generate a continuous tone TV image. A high degree of resolution is said to be possible by the use of closely spaced raster lines.

Reverse Twist. First cousin to *VARAD*, and apparently competitive in many potential applications, is a new thin-screen display system recently revealed by RCA. The RCA system uses so-called "liquid crystals"—organic compounds that look like liquids but whose molecules tend to form orderly arrays similar to those that characterize normally solid crystal structures. The "nematic" type crystals used by RCA tend to form parallel

(Continued on page 106)

* If the centers of gravity of the positive and negative portions of a molecule do coincide, the molecule is non-polar and has a dielectric moment (dipole moment) of zero. Such materials do not normally respond to electric fields, although some non-polar materials can acquire a temporary polar character by induction.

COMPUTER GRAPHICS

☐ Computers are cold calculating electronic devices that perform difficult and complex mathematical operations with fantastic speed. Yet, to the eye of a human beholder, some of their output are works of art. Giant mechanical plotters that turn out detailed automotive design or weather forecast maps can be programmed to make the exotic computer graphics seen here. Five are original plots made on California Computer Products (CalComp) computer-plotters. They are so good, in fact, that they, along with a computer rendering of a famous woodcut have been displayed at London's Institute of Contemporary Art. As a further whet, CalComp is sponsoring an international art competition with $5000 as top prize. ■

PROGRAMMED ART

1 "Test Pattern"

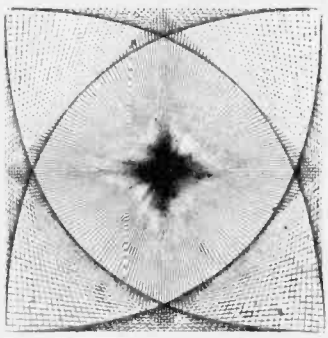
2 "Crest"

3 "Symplexity"

4 "Hummingbird"

5 "The Fisherman"

6 Woodcut by Utamaro



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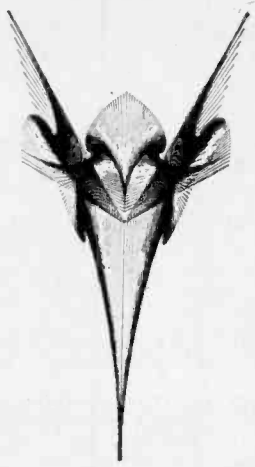

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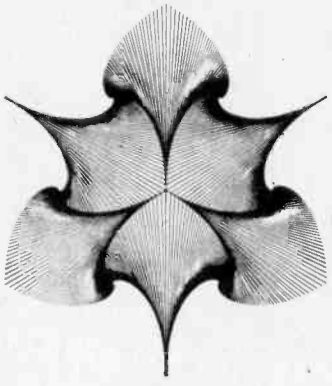

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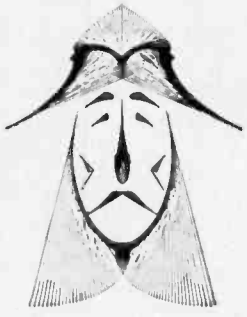

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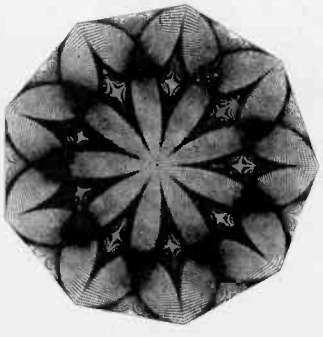

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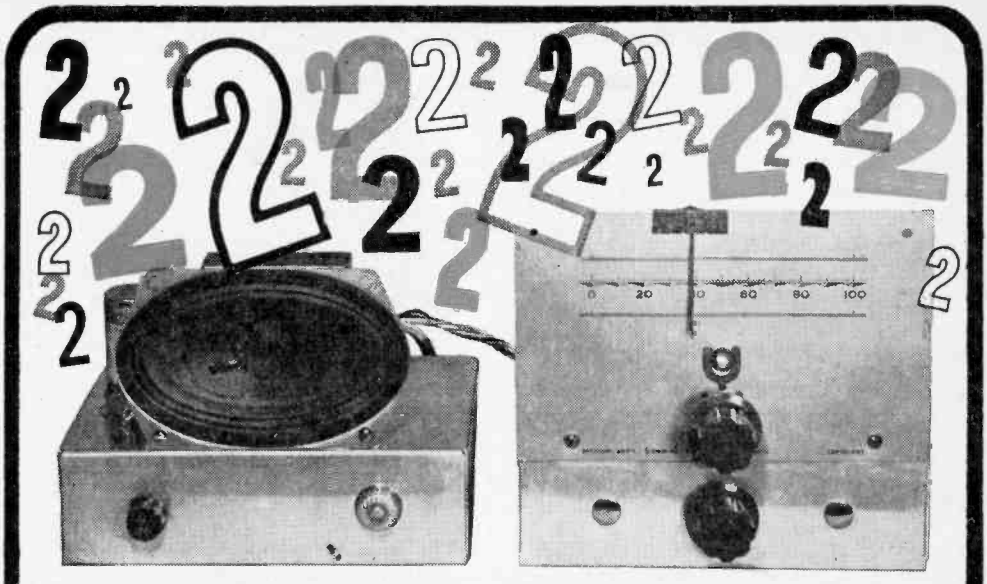


Build TWOFER-FLEX

Here's a two-for-one project! In addition to trying your hand with a reflex circuit, you wind up with a universal B-plus power supply.

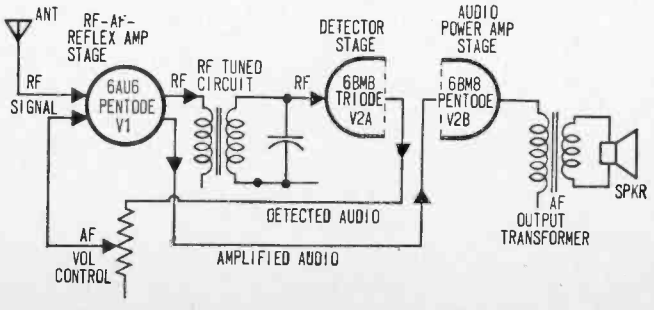
by Charles Green, W6FFQ

☐ Everyone is interested in getting something for nothing. How would you, as an experimenter, like to work with a circuit that gives the performance of four tubes but uses only two? It's easy if you use a reflex circuit, which was popular in the early days of radio when vacuum tubes and components were much more costly than they are now. Experimenting with reflex circuits is still interesting. By constructing our *Twofer-Flex* you can determine first hand how to achieve efficient circuits with fewer components.

Two for One. A tube can simultaneously amplify two different frequencies, such as RF and AF, if proper filtering is used. In this way we make one tube do the work of two.

The *Twofer-Flex* uses the reflex principle in a two-tube broadcast band receiver.

(Continued overleaf)



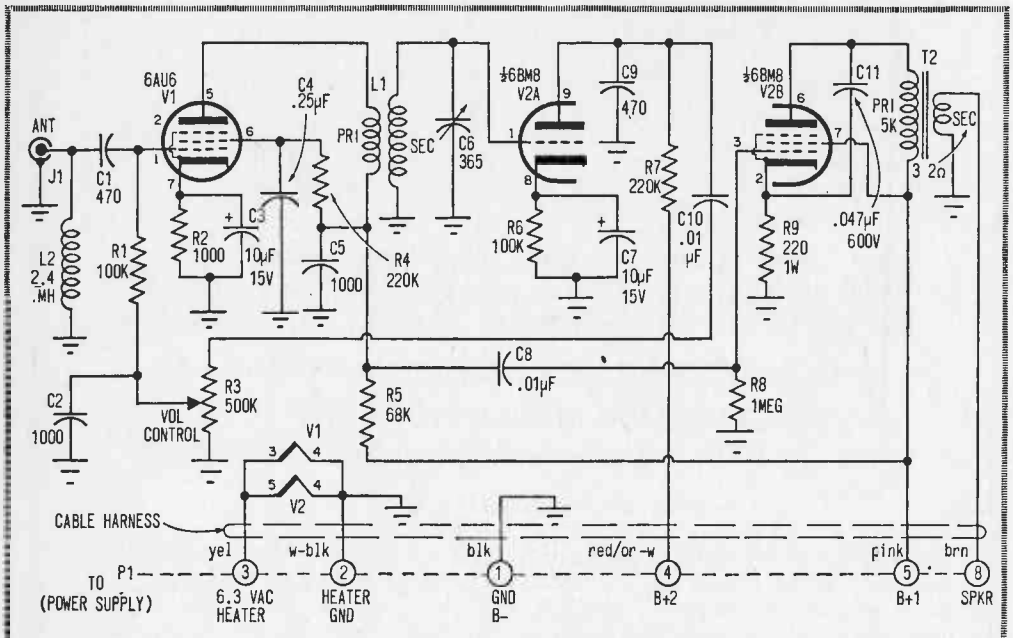
Block diagram showing signal flow and multiple function of tubes in reflex circuit. First tube serves both as an RF and then as an AF amplifier. Second tube serves as detector and output.

TWOFER-FLEX

By referring to the block diagram, you can see that a pentode (V1) acts both as an untuned RF amplifier and as an AF amplifier. The triode half (V2A) of the 6BM8 tube serves as a plate detector and the pentode half (V2B) of this tube is the AF power amplifier, which delivers sufficient power to drive the speaker.

Construction. We built the *Twofer-Flex* on two identical chassis, one containing the power supply and the other containing the RF breadboard. The power supply employs a conventional half-wave circuit, using a silicon diode and RC filtering. In addition to supplying high DC plate voltages, it also furnishes the 6.3 VAC for the tube heaters. Note that the speaker is mounted on the power-supply chassis.

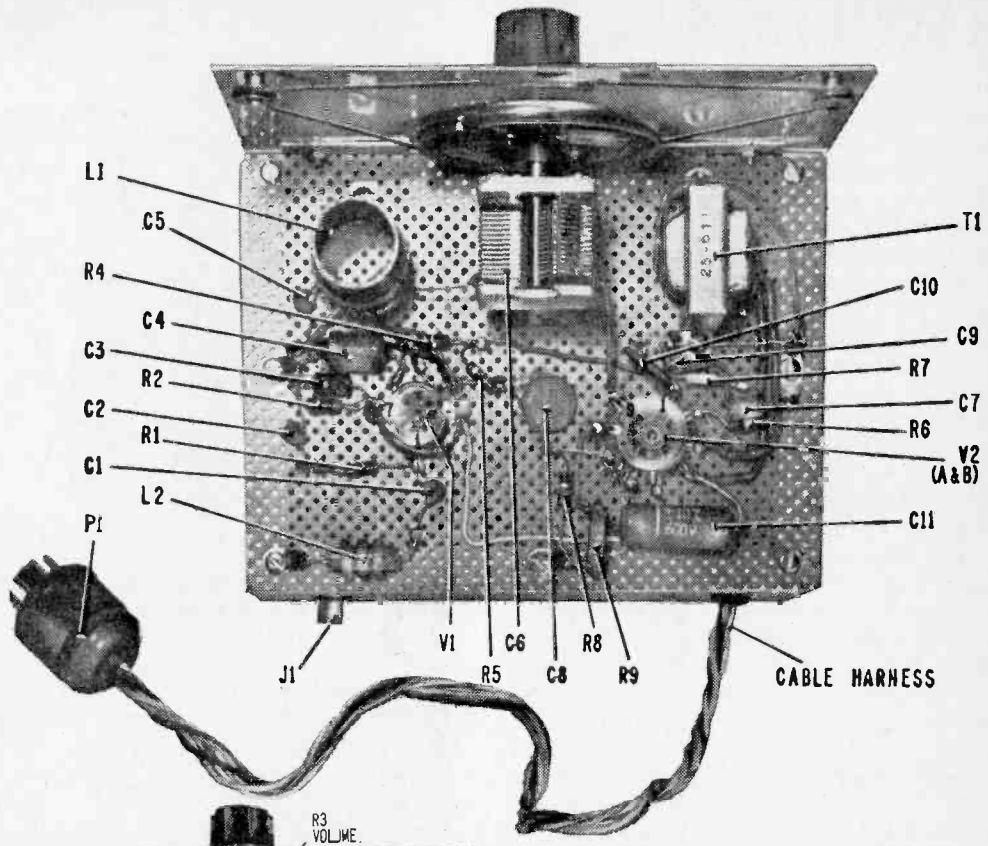
The RF breadboard is constructed on a standard perforated board employing push-in terminals to mount the components to the

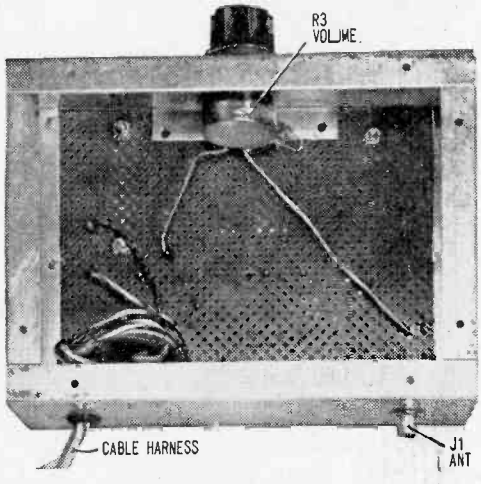


PARTS LIST FOR TWOFER-FLEX RF BREADBOARD

C1, C9—470-pF, 1000-V ceramic disc capacitor
C2, C5—1000-pF, 100-V ceramic disc capacitor
C3, C7—10-uF, 15-V electrolytic capacitor
C4—.25-uF, 200-V paper capacitor
C6—365-pF variable capacitor (J.W. Miller 2111 or equiv.)
C8, C10—.01-uF, 1000-V ceramic disc capacitor
C11—.47-uF, 600-V paper capacitor
J1—Phono jack (Switchcraft 3501F jack or equiv.)
P1—Octal plug with cable connector shell (Amphenol 78R58 or equiv.)
L2—2.4-mH RF choke (J.W. Miller 4666 or equiv.)
R1, R6—100,000-ohm, ½-watt resistor
R2—1000-ohm, ½-watt resistor
R3—500,000-ohm audio taper potentiometer (Mallory U-48-1 or equiv.)
R4, R7—220,000-ohm, ½-watt resistor
R5—68,000-ohm, ½-watt resistor
R8—1-megohm ½-watt resistor
R9—220-ohm, 1-watt resistor
L1—Broadcast band RF coil (J.W. Miller 20RF or equiv.)
T2—Output transformer, 5000-ohm pri. to 3.2-ohm sec. (Allied 54C2064 or equiv.)
V1—6AU6 tube
V2—6BM8 tube
1—7 x 4¼-in. slide rule dial (J.W. Miller SL-16 or equiv.)
1—7-pin miniature printed circuit socket (Lafayette 33T8712 or equiv.)
1—9-pin miniature printed circuit socket (Lafayette 33T8713 or equiv.)
2—Aluminum chassis, 5 x 7 x 2-in. (Bud AC-402 or equiv.)
1—5 x 7-in. bottom plate for power supply chassis (Bud BPA1589 or equiv.)

Misc.—Push-in terminals, knobs, hook-up wire, hardware, solder, etc.





Top and bottom views of RF chassis showing components and layout of chassis for efficient wiring. If your finished unit looks like the author's, it should work fine.

board and to make the circuit connections to them. The full chassis width slide-rule dial, which is mounted on the front of the aluminum chassis base, serves both as a front panel and as an RF shield. Power for the RF breadboard as well as the AF from the output stage of the receiver is conveyed between the two chassis by a cable harness that is permanently wired to the RF board and plugged into the power-supply chassis.

Let's get the hard work done first. Then the balance of the construction project will be easy and will add to the pleasure of building a receiver, learning about new circuits, and achieving a job well done.

RF Chassis. The top surface of the RF aluminum chassis is cut out to provide a clear mounting space for the perforated board containing the components for the RF portion. Cut out the top of the 5 x 7 x 2-in. aluminum chassis, leaving a ½-in. flange all around. Slit the flange on the front edge of the chassis 1½-in. from each end and bend up two tabs, which are used to mount the slide-rule dial, as shown in our photo. Our chassis has two extra ⅜-in. holes in the front of the chassis 1½-in. from each end for future experimentation. These are not required for the *Twofer-Flex* receiver; therefore, it is not necessary to drill them.

Cut a 5 x 7-in. section of perforated board and mount it to the top flange of the chassis,

TWOFER-FLEX

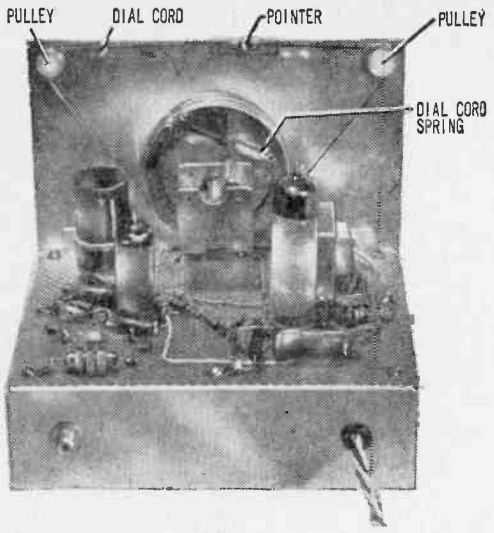
using sheet metal screws. Drill holes, if needed, to mount the receiver components to the perforated board.

Wiring and layout are critical even though the receiver operates in the broadcast band. For best results, follow the photos for the most convenient component layout.

A 2 x 1¼-in. aluminum strip is fastened to the front of the frame of tuning capacitor C6. This assembly is then fastened to a ½ x ½ x 1¼-in. aluminum angle section that has been mounted on the top of the front flange of the chassis. Mounting holes in the angle section to which this assembly is fastened are slotted in order to adjust the position of C6 for proper alignment with the slide rule dial hub.

The tube sockets are mounted on the perforated board with push-in terminals which are then soldered to the socket contact lugs. Position the sockets as shown in photo. If printed-circuit type sockets are not available, standard chassis mounting sockets can be used by cutting off the mounting flange or shell.

Cable Harness. Make up the cable harness by twisting and taping together 18-in. lengths of stranded hook-up wire, using colors shown in the schematic diagrams. Feed one end of the harness through a hole in the rear of the chassis base, knot it so that it will not slip out of the hole, and connect the various colored leads to the components. The free end of the cable harness is soldered to an 8-prong plug following the color code and pin arrangement of the schematic. A word of warning—be sure to slip the protective cover for the plug over the harness before soldering the wire leads to the plug pins.

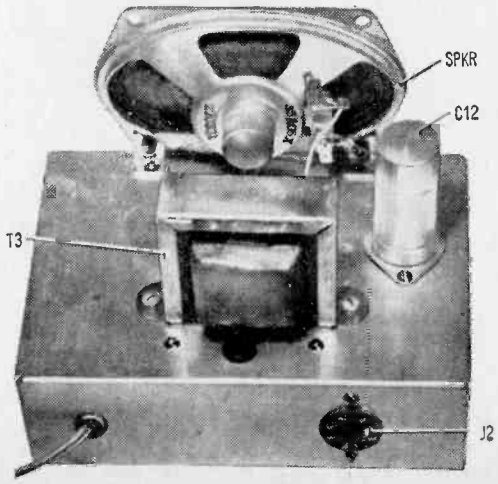


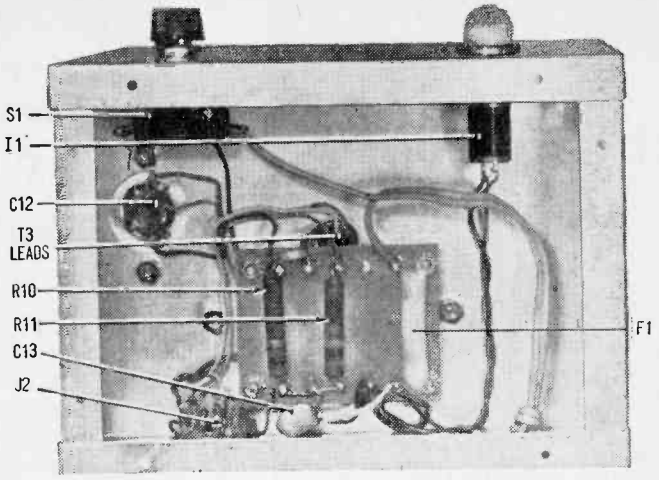
Rear view of RF chassis pointing out the various parts of the dial assembly and detailing the stringing of the dial cord.

Power Supply. The power supply, which is constructed on a 5 x 7 x 2-in. chassis identical to the RF chassis, is protected from accidental shorts by a 5 x 7-in. aluminum bottom plate. Small components are mounted on a terminal board and then to the chas-

PARTS LIST FOR TWOFER-FLEX POWER SUPPLY

C12A, B, C—Triple-section 40-30-20uF, 150-VDC electrolytic capacitor (Sprague TVL-3438 or equiv.)
C13—5000-pF, 1000-V ceramic disc capacitor
D1—1N2070 silicon diode
F1—1-amp pigtail fuse
I1—Neon lamp assembly (Dialco 52-0463 and NE-51H lamp, panel mounting or equiv.)
J2—Octal socket (Amphenol 78R58 or equiv.)
R10—1000-ohm, 2-watt, 10% resistor
R11—10,000-ohm, 2-watt, 10% resistor
SPKR—3 x 5-in. oval PM speaker, 3.2-ohm voice coil
S1—Spst power switch, rotary or toggle
T3—125-V, 50 mA with 6.3-V, 2-amp sec. power transformer (Allied 54C2064 or equiv.)
1—5 x 7 x 2 in. chassis
Misc.—Speaker grille, AC cord, bottom plate, grommets, etc.





Bottom view of power supply with protective cover removed showing location of mounting board containing components.

sis, using ½-in. spacers to raise it from the chassis metal. Locate the heavier components, drill their mounting holes, and fasten them to the chassis using rubber grommets to protect the T3 leads and the AC power cord. The speaker is mounted to the chassis with two ½-in. angle brackets fastened to the front top of the chassis. A piece of perforated board can be used to protect the speaker cone. Wire the components in accord with the power-supply schematic.

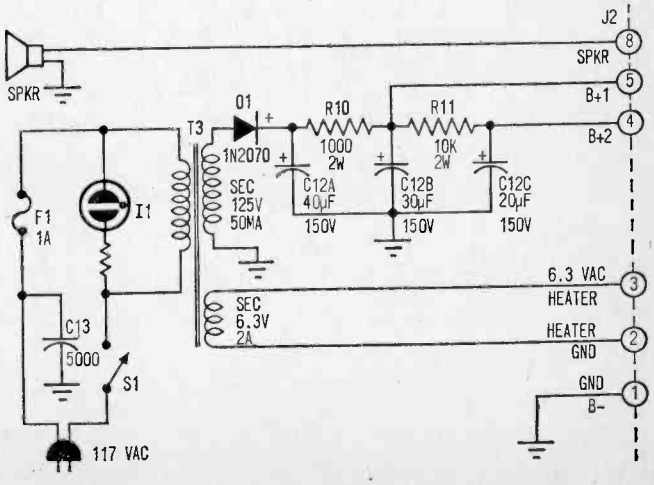
Operation. Now that the hard work has been completed, you're ready to check-out and enjoy the receiver. You will, of course need an antenna, which can be just a 6-ft. length of hook-up wire if you are located near stations producing strong signals. If you are in a fringe area, a good outside antenna and ground will be required.

With the tubes in their sockets, the antenna connected, the harness plugged into the power supply chassis, and the AC cord plugged into an outlet, you are all set to operate the receiver. When the power switch is turned on, pilot lamp I1 indicates AC power is flowing into the power supply. Allow the tubes time to warm up and then check AC and DC voltages with a VOM.

Tune the receiver to a station and adjust the volume control to a suitable level. Since there is only one tuned circuit in the *Twofer-Flex*, selectivity will not be as sharp as in receivers having multiple tuned circuits. The broad tuning and the use of a plate detector, which does not load a tuned circuit as do other types of detectors, accounts for the excellent tone of the *Twofer-Flex*.

The L1 primary winding should be positioned down over the coil lugs for maximum selectivity and minimum coupling. For higher selectivity, regeneration can be achieved by bringing the antenna lead near the top of T2. If there is too much coupling, oscillation will occur, which can be stopped by raising the antenna lead further from the top of the coil. ■

Power supply chassis layout. Parts location is not critical. However, power transformer should be located for free air circulation around it. Twofer-Flex is fitted with cable to be plugged into rear socket.



Power supply schematic. The circled numbers refer to output socket pin numbers. Before plugging in cable harness from RF chassis, make certain that cable wires are connected properly to match connections on this socket.

Propagation Forecast

By C. M. Stanbury II

June/July 1969

☐ The winter of 1968-69 was a real DX surprise in that it produced unusually good trans-equatorial reception. Stations in the southern hemisphere, where it was summer, not only rode over northern hemisphere QRM on the upper bands, but often provided good signal strength on lower frequencies where the best DX catches are usually found. This is not the first mention of such happenings in Propagation Forecast.

Now while no one can say for certain, it seems reasonable that, as optimum (winter) conditions currently prevail over the southern hemisphere, we can expect some really tremendous reception from this half of the earth. Areas and times to particularly watch are Africa, south of the Sahara at 2100-0200 EST, and on the west coast only at 0600-0700 PST, South Pacific at 0000-0600 and 0900-1800 EST, and South America below the equator 24 hours a day. (Want some hot listening tips? Turn to the shortwave section of White's Radio Log on page 83.)

Unfortunately, just how good reception really is, at least below 7 MHz, will partly be determined by just how bad that local summer noise level is at your particular listening post. ■

June/July 1969 LISTENER'S STANDARD TIME	ASIA (except Near East)	EUROPE, NEAR EAST & AFRICA (N. of the Sahara)	AFRICA (S. of the Sahara)	SOUTH PACIFIC	LATIN AMERICA
0000-0300	19, 25	25, 31	49, 60e, (90e)	31, 41w, (90)	49, 60
0300-0600	31, 41, (49)	31	31	49, 60	49, 60
0600-0900	19, 25, (41w)	16, 19	19, (60w)	25, 31	25, 31
0900-1200	16, 19	16, 19	19, 25	19, 25	19, (31)
1200-1500	16, 19	16, 19	19, 25	19, 25	19
1500-1800	16, 19	(19), 25, 31	31, 49, 60e	19	(25), 31
1800-2100	16, 19	25, 31	25, 31, (60w)	16, 19	25, 49, 60
2100-2400	16, 19	25, 31	60, 90	19, 25	(31), 49, 60

To use the table put your finger on the region you want to hear and log, move your finger down until it is alongside the local standard time at which you will be listening and lift your finger. Underneath your pointing digit will be the shortwave band or bands that will give the best DX results. The time in the above propagation table is given in *standard time* at the listener's location, which effectively compensates for differences in propagation characteristics between the East and West Coasts of North America. Abbreviations: w—Western North America and e—Eastern North America. When w or e follow a band listing, it means the band is only good for that part of the continent. The shortwave bands in brackets are suggested as possible second choices. Refer to White's Radio Log for our world-wide Shortwave list.

FROM JUNK PILE TO HI-FI

One Evening Project

by Lars Jorgenson

Phono Rescued from Terrible Fate on Trash Heap by Three Modules!

☐ It's spring (or fall) clean-up time around the house and your better half pleads "please get rid of all that old junk, those old cabinets, etc., etc., etc." OK—but look what you found in that pile under the stairs—Junior's old record player. When it was new, and working, it really sounded great. So, when it stopped working, you tossed it aside, intending to fix it up one of these days—no hurry, since Junior lost interest in playing records then.

Next fall he will be going away to school, and a record player will be a must item to take along; maybe you can salvage that old player. When a new catalog arrived recently you remember being intrigued by some newly-designed solid state modules that you would like to try out when you have an application for them. Well now, here is a good reason to order those new modules, so just put that old phono on the bench for the moment and get on with the clean-up job.

Salvaging. The amplifier long ago gasped its last breath. Even though you are capable of repairing it, discard it. The cost in time searching for the off-beat or obsolete components, plus their actual purchase price, if you should be fortunate enough to locate them, is not worth it. Replace the old amplifier with the new solid state modules. Amplifier and power supply modules can be purchased for $10.85.

Junk Pile To Hi-Fi

Originally you selected that record player because it was compact, sturdy (due to its solid plywood cabinet) and had very good tone, considering its modest price. There is no question that the main reason for the good tone was the manufacturer's selection of a speaker that matched the resonance of the wood cabinet. Since the speaker was especially selected for the cabinet let's use it, especially since the cabinet can easily be refurbished.

By now, most likely, the crystal cartridge and its stylus are useless. Besides, the age of the phono tells you that the original tone arm assembly is one of the older, heavy, record-damaging ones. Replace the old tone arm with a new featherweight stereo arm. It can be used for mono records and you may want to add another amplifier and speaker for stereo at a later date. These tone arms can be purchased from parts suppliers for about $2.00.

If the turntable is a 2- or 3-speed one, clean it up, lubricate the motor bearings and use it. You may want to replace it if it plays records at just one speed. A new 4-speed assembly can be purchased from the same supplier for less than $5.00.

Rebuilding. You should be able to complete the conversion in less than one evening, providing there are no interruptions from the neighbors. Before starting the project, therefore, you should have all the material in your shop.

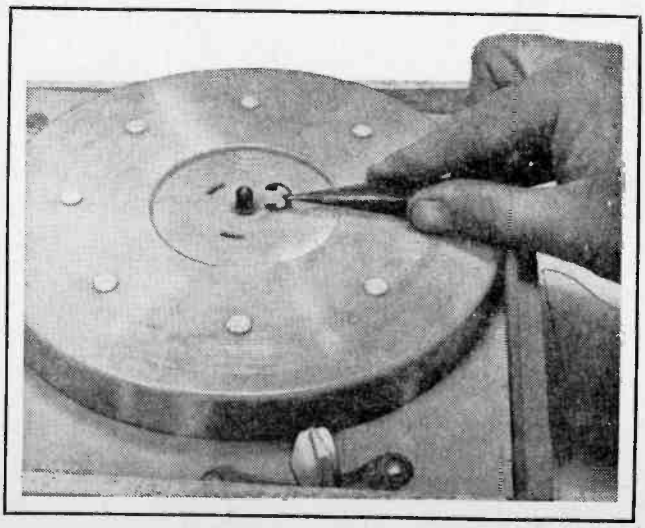
The first step is to remove the motor board, which usually has fastened to it the tone arm, amplifier and controls, speaker and turntable assembly. Having removed the motor board, put the cabinet aside as its refurbishing should be the final step in the conversion. Remove the old amplifier and tone arm. In the event you decide to replace the single-speed turntable motor with a multiple speed one, most likely you will be able to exchange the two motors without having to drill new mounting holes.

It should not be necessary to remove the speaker. In the event you do, when you re-install it on the motor board do not attempt to relocate it. The original location most likely was selected to permit high output level without creating acoustic feedback between the speaker and the tone arm. You may experience some now at the highest volume levels because of the very light stylus pressure of the new tone arm and the high output of the amplifier.

Mounting the Components. You now are ready to mount the amplifier and power supply modules. The amplifier module should be placed as near to the volume control as possible to reduce the possibility of spurious noise being induced into the leads. The volume control specified is a 500k pot. You might find one in your surplus parts box in your shop. The resistance required is not too critical so you can use one from 500k to 2 megs. You may have to remove the turntable to have access for mounting screws for the new modules. To do this remove the "C" washer on the turntable spindle (see photos).

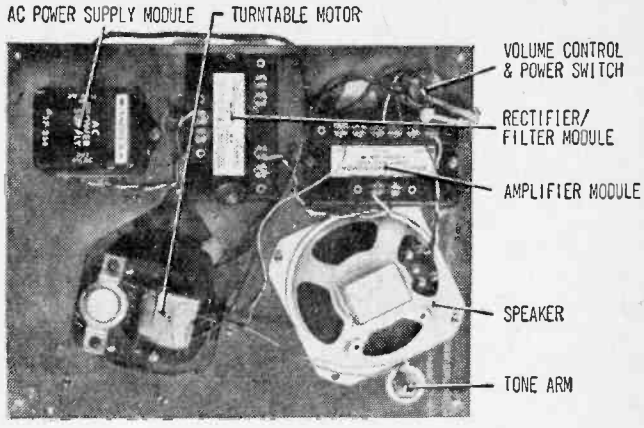
The power supply modules consist of a 110 VAC to 6 VAC shielded step-down transformer and a rectifier/filter module. The isolation step-down transformer assures safety in that no high voltage is applied to any of the parts. Location of these two modules is not critical; they can be fastened in any convenient spot on the underside of the motor board.

The new tone arm will mount in the same hole used for the old one. This is the only



To remove turntable, find C-washer located on spindle; pry off with a small screwdriver or needlenose pliers.

Underside view of motor board shows modules at top. Slack AC wires will fall away from parts since board is inside cabinet.

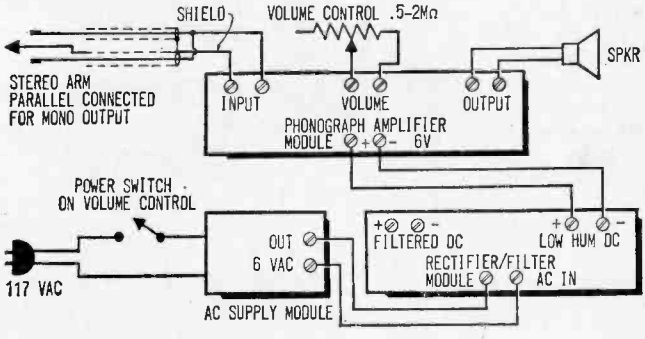


component requiring shielded wire to connect it to the amplifier. Unless you plan on making a stereo unit at this conversion, the two shielded leads coming from the pick-up should be connected in parallel (shield to shield and inner conductor to inner conductor) for monaural operation. Connect both shields to the extreme left input terminal of the amplifier module, and the two inner conductors to the other input terminal.

Wiring. The connections shown for the volume control in the diagram supplied with the amplifier are not correct and will result in reverse operation of the control. Connect the arm of the pot to the left volume terminal of the amplifier module and the other amplifier terminal should be connected to the left hand terminal of the volume control (when looking at the rear of the control).

The speaker leads are connected to the output terminals of the amplifier module and the 6 V plus and minus leads of this module are connected to the low hum output leads of the rectifier/filter module, being careful to observe correct polarity.

The only other connections required are low voltage AC from the output of the AC power supply to the AC input terminals of the rectifier/filter module, and the power cord. In connecting the power cord one side of the turntable motor and one side of the 110 V input of the AC power supply module are connected together directly to one of the leads from the power cord. The other power cord lead is connected to one side of a power switch and the other side of the switch is



PARTS LIST

1—Discarded portable vacuum tube record player
1—AC power supply module (Radio Shack 277-258 or equiv.)
1—Rectifier-electronic filter module (Radio Shack 277-259 or equiv.)
1—Phonograph amplifier module (Radio Shack 277-261 or equiv.)
1—Stereo featherweight tone arm (Olson RP-220 or equiv.)
1—500 k to 2 meg potentiometer
1—Power switch (may be part of potentiometer)
Misc.—Hook-up wire
1—Multiple-speed turntable assembly (optional) (Olson MO-120 or equiv.)
1—Phono amplifier module (Radio Shack 277-261 or equiv.)
1—500 K to 2 meg potentiometer
1—4- or 5-in. speaker and housing

Junk Pile To Hi-Fi

connected to the remaining motor and AC supply module input leads.

At this point, after double-checking your wiring for correctness and tight connections, you are ready to make a quick check-out of your conversion job. Connect the power cord to an AC outlet, turn the power switch *on* and observe if the turntable motor is running. Next set the volume control to mid position and flick the stylus gently with your finger. If you can hear a rubbing sound in the speaker your connections are all OK and you are now ready to tackle the cabinet clean-up.

Any of the new cleaning fluids (Fantastic, Whistle, Mr. Clean, etc.) should do a fine job of cleaning and restoring the finish of the cabinet, whether it be plastic covered or varnished wood. If wood, you may want to fill the scratches with scratch remover and protect the finish with a good furniture polish.

Reaping the Rewards. You are now on the last lap. Install the motor board in the cabinet and then play your favorite record. You really will be pleased with the results—good clean, hum-free music with volume to spare—didn't think it was possible, did you? You now have a record player that looks good and certainly has better volume and tone than the flimsy plastic cabineted ones being sold today.

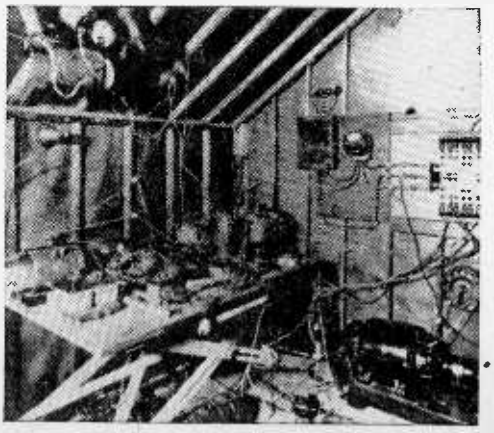
Easy Stereo Conversion. One last word: in the event you want to make the record player into a stereo player you will need an additional amplifier module, volume control, and speaker and housing. The power supply module has ample capacity to power the additional amplifier and the new pick-up is designed to play stereo records.

Remove one of the pick-up leads from the amplifier and connect them to the second new amplifier input terminals. Connect the new speaker to the second amplifier output and connect this amplifier to the power supply and a separate volume control, all in the same manner as the first amplifier. ■

Three modules are an AC power supply (left) a Phono amplifier (bottom) and a Rectifier-filter. Unlike conventional phonos, this one uses a transformer in the power supply to provide line isolation and thus reduces shock hazard. For conversion to stereo, two amps and speakers are needed to complete the system. One amp provides 2-watt output.

Shack That Shocked Grampa

☐ Even back in the 1920s radio space was scarce. So hams were "kicked upstairs" to make room on valuable low frequencies for commercial stations. Did the hams take it lying down? You can bet a dead diode they didn't. Operating on an extremely high frequency considered useless, the station shown here spanned the Atlantic in 1923. A kilowatt rig operated by 1BCG, it proved that frequencies above 200 meters were not only useful but had the capacity to permit fast growth in radio. That *high* frequency was 1.5 MHz, which lies near the top of today's standard AM band. Present-day communications systems are reaching frequencies about 20,000 times higher. ■



What Is Your ELECTRICAL I.Q.?

By Dr. P. Carbone

How much do you know about electricity? Are you a live wire on the subject or are you in the short-circuit league? Here's a quiz that is designed to test your knowledge. So pull the switch and see how many sparks you can shed on the subject. Don't peek at the answers on the next page. □

TRUE or FALSE (underline one)

1. You will get less light with one 200-watt bulb than you will with eight 25-watt bulbs. *True. False.*
2. Thomas A. Edison, famed wizard of Menlo Park, created the first electric light. *True. False.*
3. A fluorescent lamp would give off too much light if the tube were made of clear glass. Thus coated glass is used to reduce the intensity of the light. *True. False.*
4. A storage battery is so named because it stores electricity. *True. False.*
5. The magnet, vital in the production of electricity, gets its name from the city of Magnesia in Asia Minor. *True. False.*
6. Guglielmo Marconi created the first electric cell. *True. False.*
7. Wilhelm Roentgen discovered X-rays. *True. False.*
8. Status, A Roman philosopher was walking on a thick carpet one day when he touched a beautiful slave girl. A spark resulted and that's how static electricity was discovered. *True. False.*
9. In an ordinary electric light bulb, the light comes from the glow of a hot wire. *True. False.*
10. Electromagnets are usually wound on cores of copper. *True. False.*

MULTIPLE CHOICE (circle choice)

11. Benjamin Franklin's famous kite-flying experiment proved:
    A. a kite is a poor conductor of electricity
    B. electricity can be generated by kites
    C. lightning and electricity are the same thing
12. This man pulled a magnet through a coil of wire and produced an electric current, thus discovering the basic facts underlying the auto generator and self-starter. He was
    A. Charles Kettering
    B. Michael Faraday
    C. Henry Ford
13. The electrical term volt is named after its discoverer:
    A. Voltaire
    B. Allesandro Volta
    C. John B. Volt
14. You can expect an ordinary light bulb to burn:
    A. 3,500 hours
    B. 400 hours
    C. 1,000 hours
15. The correct definition of a watt is:
    A. a measure of the flow of electricity
    B. a unit measuring the consumption of electrical power
    C. a measurement of electrical pressure

ELECTRICAL I.Q.

16. Nikola Tesla is the name of the man who:
A. discovered electromagnetic waves
B. devised alternating current induction electric motor
C. discovered X-rays

17. The first successful wireless telegraphy system was developed by:
A. Thomas Edison
B. Guglielmo Marconi
C. Alexander Graham Bell

18. How well do you know the wattage of home appliances? Draw lines to match the appliance at left with the correct wattage it uses on the right

electric clock	*4,500 to 8,500*
refrigerator	*225 to 350*
flatiron	*1 to 3*
home electric fan	*25 to 75*
electric stove	*550 to 1,000*

WHO SAID IT? **(give inventor's name)**

19. "What hath God wrought?"_____

_____.

20. "Mr. Watson, come here, I want you."

_____.

ANSWERS TO THE ELECTRICAL IQ.

1. *False.* One 200-watt bulb gives 80 percent more light than eight 25-watters. A 200-watt sheds 3,700 initial lumens of light. Each 25-watt bulb gives only 260, a total of 2,080 for the eight.

2. *False.* Edison invented the first electric incandescent lamp but it was Sir Humphrey Davy, in 1800, who first discovered illumination by electricity.

3. *False.* Fluorescent lamps emit ultraviolet light which would hardly be visible if clear glass tubes were used. Bright glow results from fluorescent powder inside tube which glows when ultraviolet light shines on it.

4. *False.* There is no electricity in a storage battery when not in use. When terminals are connected, chemical changes take place, resulting in creation of electricity.

5. *True.*

6. *False.* It was Count Alessandro Volta who created the first electric cell when he connected two dissimilar metals in series with the tissue of a frog's leg. Later he assembled simple chemical cells.

7. *True.*

8. *False.* Thales, ancient Greek, is believed to be the discoverer of static electricity. He found that when he rubbed amber, straws and dried leaves were attracted to it.

9. *True.* In fact, light in photographic work is rated in degrees Kelvin.

10. *False.* Electromagnets are wound on soft iron.

11. *C*—Lightning and electricity are the same thing.

12. *B*—Michael Farraday. Kettering invented the self-starter.

13. *B*—Allesandro Volta, Italian physics professor who died in 1827.

14. *C*—1,000 hours

15. *B*—Watt is a unit measuring consumption of electric power. Volt is measurement of electrical pressure. Amperè is measurement of the flow of electricity.

16. *B*—Nikola Testa devised the alternating current induction electric motor.

17. *B*—Guglielmo Marconi.

18. Electric clock, 1 to 3; refrigerator, 225 to 350; flatiron, 550 to 1,000; home electric fan, 25 to 75; electric stove, 4,500 to 8,500.

19. *Samuel F. B. Morse* uttered these words over the world's first long-distance telegraph line between Baltimore and Washington in 1844.

20. First words spoken over telephone by its inventor, *Alexander Graham Bell,* in 1876.

SCORING

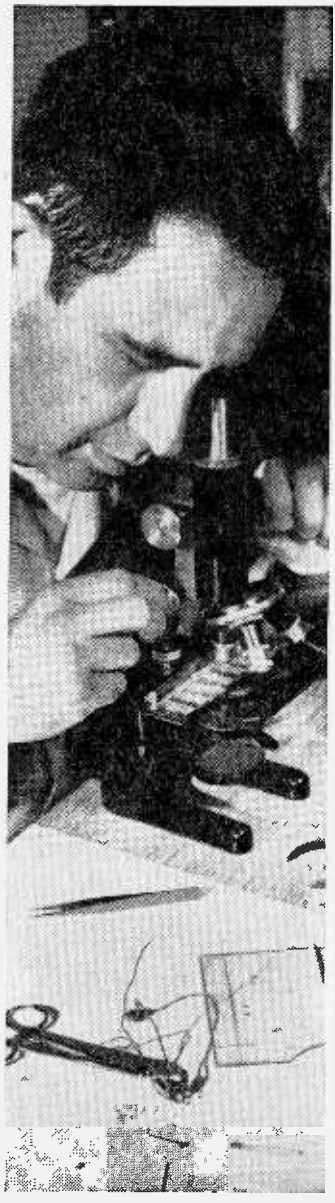
0-30: You're top short-circuit man
35-55: You've got your wires crossed
60-80: Electrician first class
85-100: New Wizard of Menlo Park

The Micro-Invasion

Now even a bug can be bugged. Read what an expert has to say about your disappearing private life!

☐ "Privacy is dead!" proclaimed eavesdropping expert Bernard Spindel in his book *The Ominous Ear* (Award House, 1968), and subsequent events have continued to substantiate his prophecy. As one of the foremost private practitioners involved in the detection and prevention of eavesdropping and wiretapping, Mr. Spindel engages solely in eavesdropping which is of a defensive nature. In the course of 25 years of practice, he has consistently fought the invasion of privacy and the destruction of the citizen's constitutional rights, as provided for by the Fifth Amendment—rights which are infringed upon by the development of miniature wireless electronic eavesdropping equipment.

Mr. Spindel's lab in Holmes (Sherlock?), N.Y., testifies to the death of privacy—a death induced by transistorized amplifiers, wireless wiretaps, and microscopic microphones. Among the equipment in the lab is a micro-micro miniature amplifier or chip, which, although measuring only ¼ x ⅜ x ⅛ in., is capable of transmitting a signal 50 miles over ordinary telephone wire.

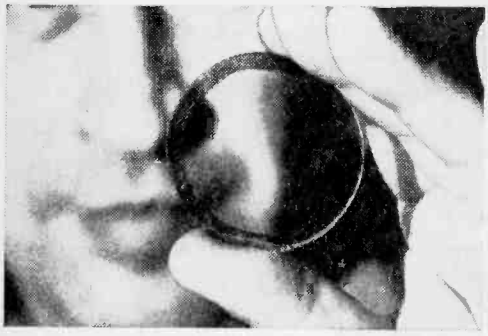


Other eavesdropping tools which may be found in the Spindel lab includes spools of "sneak" wire and pieces of glass which have been coated with "conductive invisible paint." The "sneak" wire, which is ten-thousandths of an inch in diameter and therefore invisible to the human eye, even under magnification, is used for connections and for cross-connections of wiretaps. The glass, which foils inspection because there are no visible wires, permits the eavesdropper to practice his craft without fear of discovery.

For the citizen the greatest inherent danger of up-to-date eavesdropping equipment lies in its size. Because the equipment presently being used by eavesdroppers is microscopic in size, the individual has been left wholly unprotected and vulnerable to wiretapping activities. He is defenseless when competing with amplifiers the size of a match head or with microphone and amplifier combinations which can be held between the ends of a tweezer. Accordingly, he is the victim of a technically legal, although not morally tenable, invasion of privacy.

(Continued overleaf)

Micro-Invasion



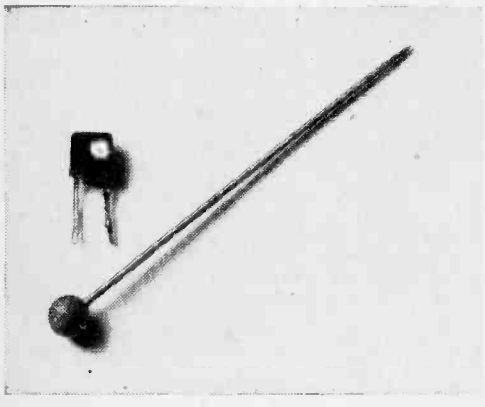
Mr. Super Snooper himself, Bernard Spindel, inspects a test rim of glass which has been coated with conductive invisible paint. Paint foils inspection—there's no trace.

It takes a lot of patience and steady hands (not to mention good eyes) to assemble a 1/4 x 3/8 x 1/8-in. device that will transmit a signal over 50 miles of phone line.

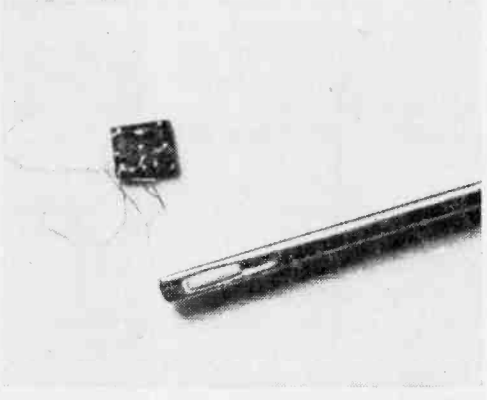
No Chance! For example, there is no way for a private citizen to discern the differences between a "bugged" and a normal telephone terminal block. By inserting a miniature microphone and a sealed-in transistorized amplifier into an ordinary telephone block, that block can be converted into a live wiretap. The complete installation is merely the size of a postage stamp. Similarly, a laser "listener" can convert an ordinary window into a microphone, enabling only double windows to ward off sound.

In *The Ominous Ear* Mr. Spindel describes the confusing and often contradictory laws which presently regulate eavesdropping and wiretapping. At the same time, he offers recommendations for new legislation designed to protect the private individual. His fascinating and frightening book seems especially pertinent in the light of the recent passage of the "Omnibus Control and Safe Streets Act of 1968."

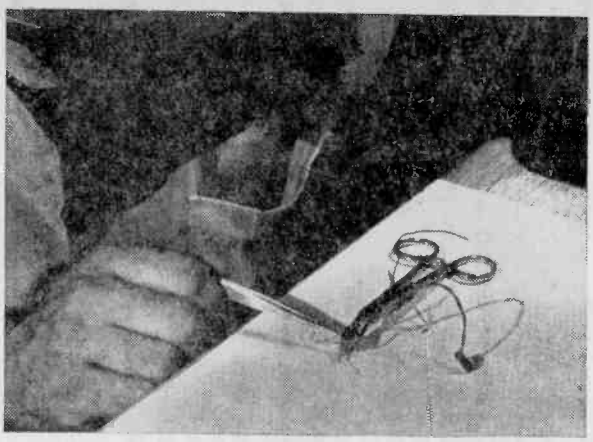
This act, which consists of eleven titles or sections, contains a provision concerning the authorization of wiretapping and electronic surveillance. According to Title 3 of the Act, any investigative or law enforce-



Here's a hideaway amplifier unit with built-in microphone photographed with an ordinary round-head pin. Two leads supply power and take off the amplified audio signal.



You may not be able to pass a camel through the eye of a needle, but you sure can pass a six-stage, solid-state amplifier. Don't believe us—take a good hard look at the photo.



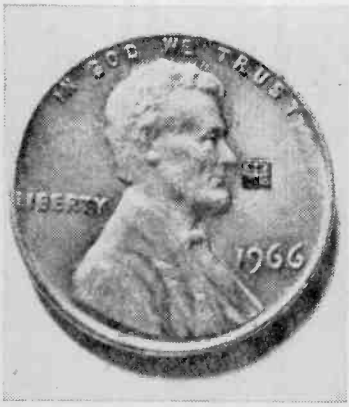
No, this is not a biologist dissecting an insect—it's Mr. Spindel going through the final wiring stages of a micro-micro miniature amplifier designed for scuba diving.

You can expect the assembly of mini amps to be partially executed under a microscope. After this amplifier is done it will be sealed in helium to prevent deterioration.

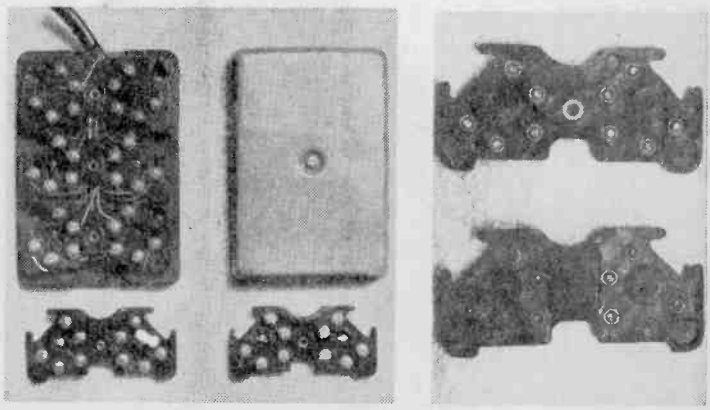
stables, Internal Revenue, Food and Drug /ment officer, including policemen, con- Administration, and Securities and Exchange Commission investigators, may conduct wiretaps and/or "bug" anybody's home or office. Furthermore, they may do so without a court order and for any crime punishable by more than one year. Since many states punish social as well as criminal acts by more than one year, the law permits police officers and investigators to wiretap for a wide-ranging and ambiguous series of offenses.

On the other hand, although the act gives the private citizen the right to record his own oral or telephonic communications for purposes of self-defense, it prohibits the manufacture, distribution, possession, or advertising of wire or oral interception devices. Violation of the law is punishable by a $10,000 fine, five years in prison, or both.

Mr. Spindel maintains that Title 3 of the Omnibus Act will be declared unconstitutional when tested in court. In the meantime, the terrifying world of electronic eavesdropping has gone one step further in disarming the citizen from the right to self-defense.



Here's a bugged penny. It's not practical, but the photo does offer a good size comparison.



If you think you're smart enough to de-bug a bugged room, let's take some of the wind out of your sails. At left is a telephone wall installation with terminal blocks. Which of the two units at right is bugged? Bottom views at right shows a mike.

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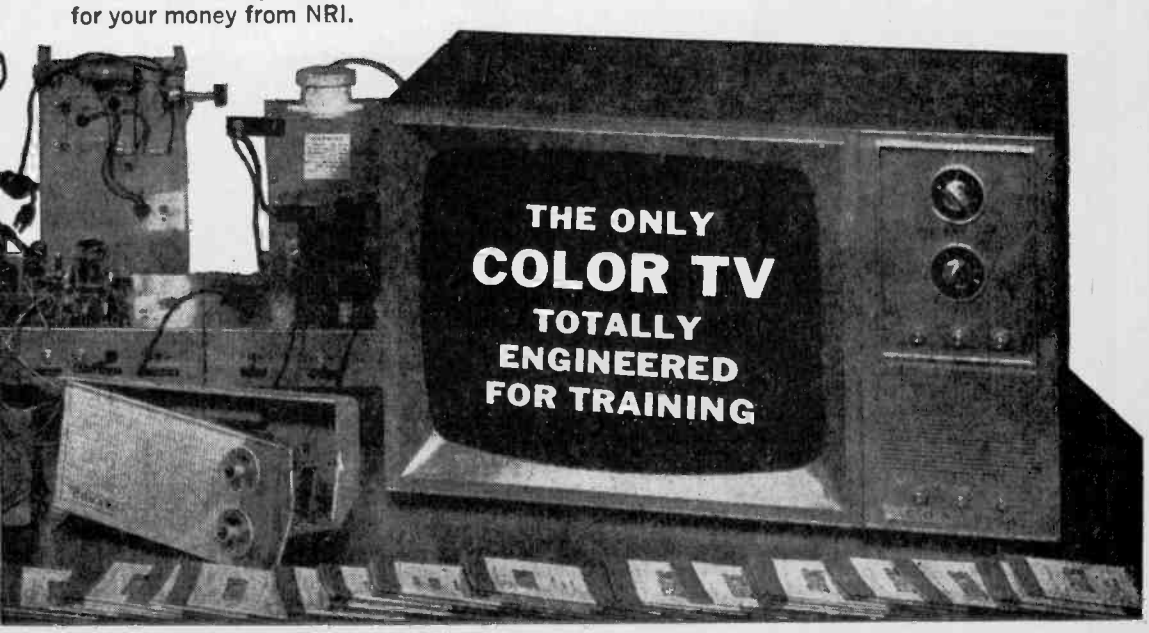


Subways are for two-way radios

☐ Let's say that a shoplifting takes place during a typical rush hour on a typical day in good ol' New York City. And let's say the suspect is seen to enter one of the 400-plus stations of the city's subway system and that he's traced to a certain train. Next move in apprehending him depends on communications. Perhaps a walkie-talkie or a car motorman's transmitter will alert Transit Authority Headquarters or call for reinforcements. In any event, a radio network proves the vital link.

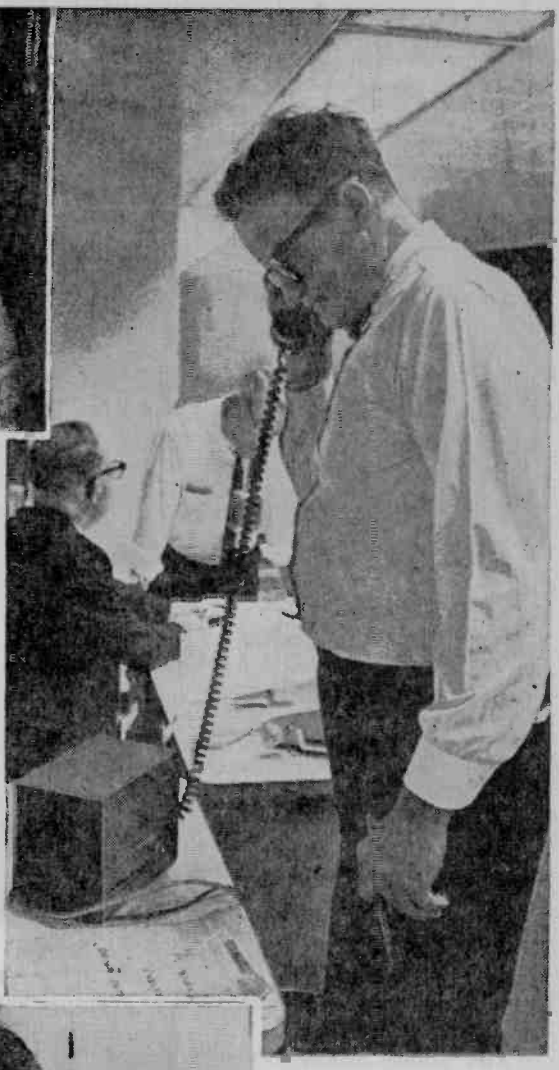
From felonious assaults to teenage

Transit patrolman Louis Schijano (top) relays emergency message via two-way radio to TA command headquarters (above). Fellow officers at headquarters immediately send assistance.

Motorman Michael Tighe reports switch trouble to system's dispatcher room.

vandalism to switch troubles and derailments, subway emergencies of every sort rely on this complex network. And at TA Headquarters in Brooklyn, a group of men are braced for just such emergencies. Situated in the dispatching room with a master subway map, Chief Dispatcher George Dipple boasts a direct line to the police. Adjacent to him is a huge board locating each of the patrolmen with walkie-talkies.

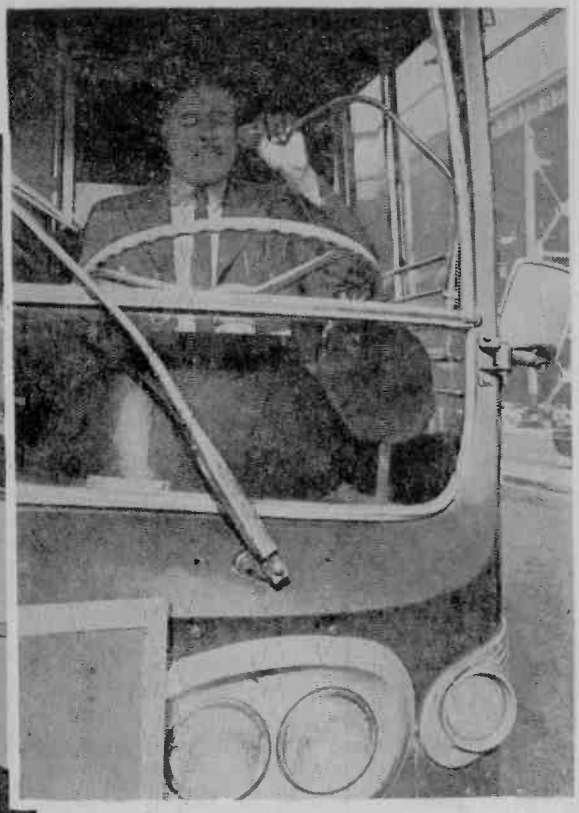
As the ultimate step in the subway communications, a yardmaster can contact Municipal Station WNYC di-



Chief dispatcher George Dipple has direct line to police and uses it whenever need arises. Patrolmen alerting headquarters of emergencies must first give name, badge number, and station location, then accurate description of situation.

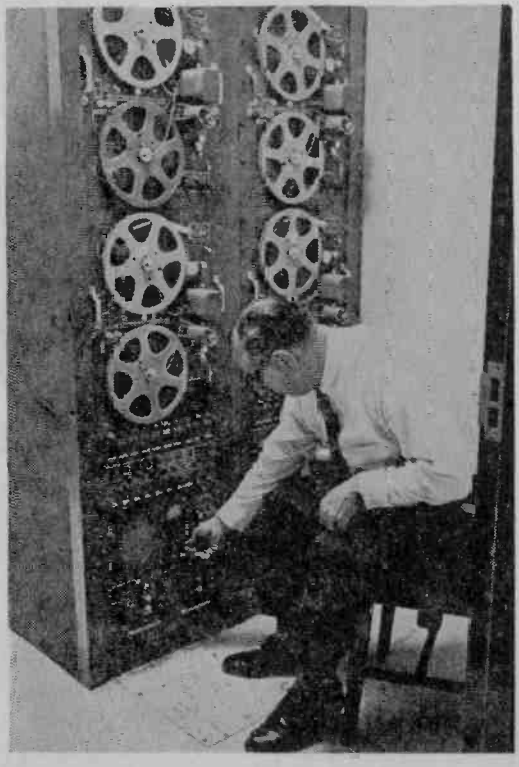
Yardmaster Thomas Hannon alerts riding public to serious delays anywhere in system via direct announcements over city's own radio station, WNYC. Other stations are also advised.

...and buses too!



rectly. His message, recorded on tape, will serve to relate an emergency to every other radio station in the New York area.

The Transit Authority's other prime responsibility is for buses. When an emergency occurs on one of the surface transit routes, the bus driver places his foot on a side pedal and his relay radio turns *on*. He then can address either passengers inside the bus or the people assembled outside, should he want to call on them for help. Also, he can communicate to Headquarters and relay details of what aid he requires. ■



Second phase of TA's emergency communications concerns buses. Any bus operator (that's Peter Richberg at right, above) can use mike to talk to persons inside or outside of bus; transmitter also enables him to contact TA headquarters when need arises. Tapes at right store data on accident reports.

COVER STORY

BUILD S/E'S... BASEBALL VELOCITY TIMER

. . . and find out how fast you can throw a strike!

by Ron Michaels

☐ How would you and your Little Leaguer like to be the kingpins in your neighborhood? You can be if you build our Baseball Velocity Timer. A sizzling fast ball is probably the ultimate weapon in the arsenal of most successful pitchers. But just what is the velocity of a fast ball? Fast balls can be clocked by elaborate timing devices called chronographs. Our timer is a scaled-down version of elaborate electronic chonographs used to measure the velocity of high-speed objects.

DETERMINING VELOCITY. A chronograph is a timing device that measures the interval of time between two specific related actions (e.g., start-stop, raise-lower, etc.). Velocity of any moving object can be determined by applying the formula:

Distance × *Time* = *Velocity*

Our Baseball Velocity Timer employs two aluminum foil strips, spaced two feet apart, as a basic measuring device to determine the *(turn page)*

BASEBALL VELOCITY TIMER

time the ball takes to travel a fixed distance. When a pitched ball breaks the first strip, timing action is started; when it breaks the second strip, timing action is stopped. Thus we are able to easily acquire the values required to determine the velocity of the ball.

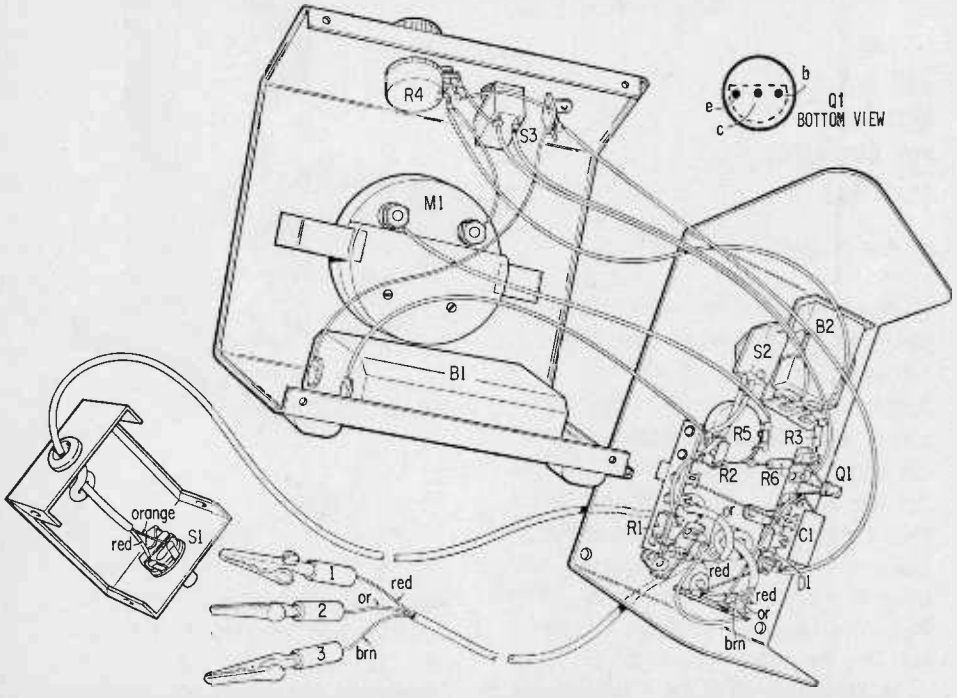
The aluminum foil strips that trigger the measurement of the time interval from start to stop of the baseball's travel are mounted on a simple wooden frame. They are held in position by separate pairs of #3 spring clips (purchased at your local stationery supplier). The wooden frame is constructed with the two foil supporting members accurately spaced two feet apart.

The heart of the timer is a high-impedance DC voltmeter. It measures the amount of electricity stored in electrolytic capacitor C1 immediately after its charging is stopped by the breaking of the second foil. In general, if a constant current charges a capacitor, the resultant voltage on the capacitor is proportional to the charging time. Therefore, the voltage of the charge can be converted to time, which is the one unknown quantity we require to apply the formula used to calculate velocity of the tossed ball.

In our timer the source of a steady constant current is 45 V battery B1. When the first foil strip is broken by the ball, the short circuit created by the foil strip connected across the capacitor is removed and the capacitor is charged. Charging of the capacitor stops when the second strip is broken by the ball. This breaks the battery connection.

In addition to starting the timing operation, switch S1 disconnects battery B1 from the circuit when the timer is not being used. If this switch were not in the circuit, battery B1 and current limiting resistors R1 and R2 would be connected through the foil strips. This would soon deplete battery B1. We mounted S1 in a separate box and connected it to the timer by a cable for easier opera-

Complete Build-It Plans for the Baseball Velocity Timer



If you have no experience wiring projects of this size, then follow pictorial diagram shown above very carefully. Note that transistor Q1 is wired directly to terminal strip. Be sure base (b) connects to C1 and D1, and emitter (e) connects to R3 and R6.

tion. Switch S2 is used when calibrating the timer. Switch S3 disconnects battery B2, which energizes the transistor circuitry of the high-impedance voltmeter.

Construction. With the exception of S1, all of the electronic components are mounted in a sloping-front meter case. The size of the case is determined by the size of the meter movement used. Remember, the larger the scale, the easier it will be to read. This is important for accurate measurements, since we are dealing with a relatively small voltage. An aluminum case is used to minimize magnetic effects on the meter and to make construction easier.

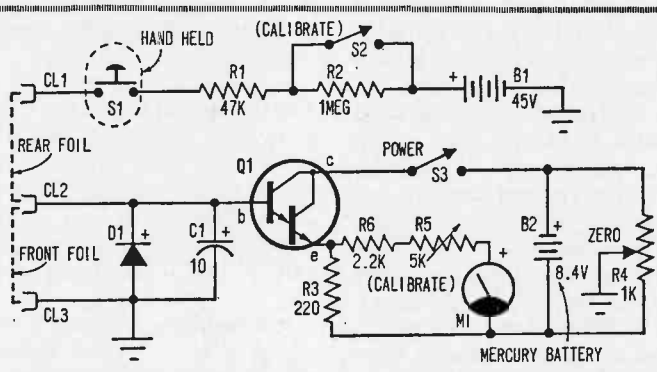
The 45-V battery B1, the meter M1, power switch S3, and zero-setting potentiometer R4 are mounted on the inside of the front half of the meter case. Battery B2, calibration resistor R5, calibration switch S2, the balance of components of the voltmeter, and capacitor C1, with its protecting diode D1, are mounted on terminal tie strips fastened to the rear half of the meter case.

Since the nominal useful life of B1 is well over 18 months it is not necessary to provide a holder and connector to facilitate quick exchange with a new one. We cemented B1 to the bottom of the meter case and soldered the leads directly to its terminals.

The 8.4-V mercury battery B2 is expended much more rapidly. Therefore, we used a standard battery holder and connector to facilitate its replacement. Battery B2 must be replaced whenever it is no longer possible to calibrate the instrument.

Make certain that you observe the correct polarity when connecting C1, D1, and M1. Diode D1 is necessary to limit the voltage rise across C1.

Mount the momentary pushbutton switch S1 in a mini-box and connect it to a length of 2-conductor, plastic-jacketed cable. The other end of this cable is, in turn, fed into the meter box through a protective grommet. One conductor is connected to R1 and the other to the termination of the #1 lead from the foil strips.



Timer's circuit is both simple and easy to understand. Make no modifications, however, until after you have unit working.

PARTS LIST FOR BASEBALL VELOCITY TIMER

B1—45-V battery (RCA VS055 or equiv.)
B2—8.4-V mercury battery (RCA VS 146 X or equiv.)
C1—10-uF, 100-VDC electrolytic capacitor
D1—Zener diode, 1 W, 12 V (Motorola 1N4742)
M1—0-1 mA DC panel meter (Allied 52E-7214 or equiv.)
Q1—2N5306 transistar (GE)
R1—47,000-ohm, ½-watt 5% resistar
R2—1,000,000-ohm, ½-watt 5% resistor
R3—220-ahm, ½-watt 5% resistar
R4—1000-ahm, linear-taper potentiometer
R5—5000-ohm, linear-taper patentiometer
R6—2200-ahm, ½-watt 5% resistar
S1—Spst pushbuttan switch (Switchcraft 211S or equiv.)
S2, S3—Spst toggle switch (Allied 56E4527 ar equiv.)
1—4¼ x 6 x 4-in. meter case (Bud CM1936 or equiv.)
1—2¾ x 2⅛ x 1⅝-in. minibox (Bud CU 2100A or equiv.)
3—Alligator clips (Allied 47E5081 or equiv.)
4—#3 spring clips (see text)
1—Battery holder far B2 (Keystone 140 ar equiv.)

Misc.—Tie strips, hardware, knabs, hook-up wire, 2- and 3-canductar plastic-jacketed cable, 1 x 2-ft. piece of ¾-in. plywaod, 6 ft. af 2 x 4-in. seasaned pine, nails, screws, paint, etc.

BASEBALL VELOCITY TIMER

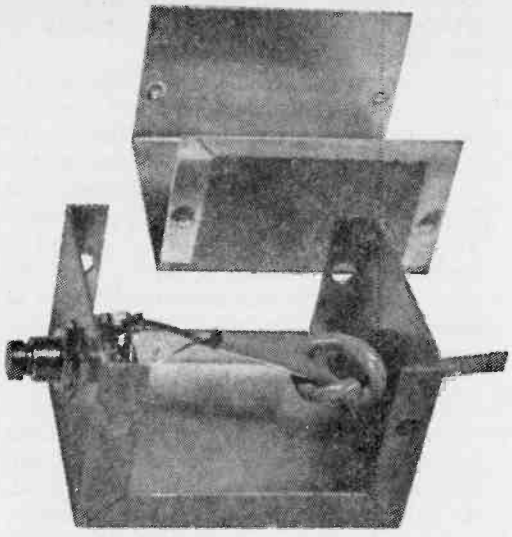
The wood frame that supports the foil strips is easily constructed. The base is a 1 x 2 ft. piece of ¾-in. plywood; the vertical supports and horizontal arms are made from seasoned pine 2 x 4s. The vertical supports are approximately 20-in. high and the horizontal arms are 12-in. long.

Fasten a vertical securely to each corner of one of the 2-ft. sides of the base so that it will be flush with the corner. The horizontal supports are each fastened to the top of one of the verticals, parallel to the 1-ft. sides of the base.

Next, mount #3 spring clips, one on each side of the base board, and one on each of the free ends of the horizontal arms so that the aluminum foil can be stretched tautly between an upper and lower clamp and held in place by these two clamps on each end of the assembly. Then mount three 1¼ to 1½-in. long, 8-32 flat head machine screws on the base board. Solder hook-up wire leads long enough to terminate at the three machine screws to each of the #3 clamps.

Finally, staple the leads neatly to the wood framework. Connect the bottom clamp leads separately, one to each of the outer terminal screws, then connect the two top leads to the center terminal screw you mounted on the base board.

A three-conductor, plastic-jacketed cable is used to connect the foil strips to the meter. It should be of sufficient length to permit moving the meter case a safe distance from the framework supporting the foil strips, to assure that wild pitches will not strike the meter. Connect each of the conductors to an alligator clip and mark them 1, 2, and 3.

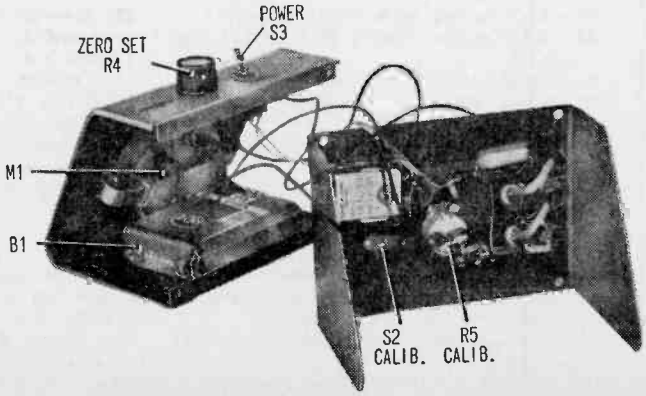


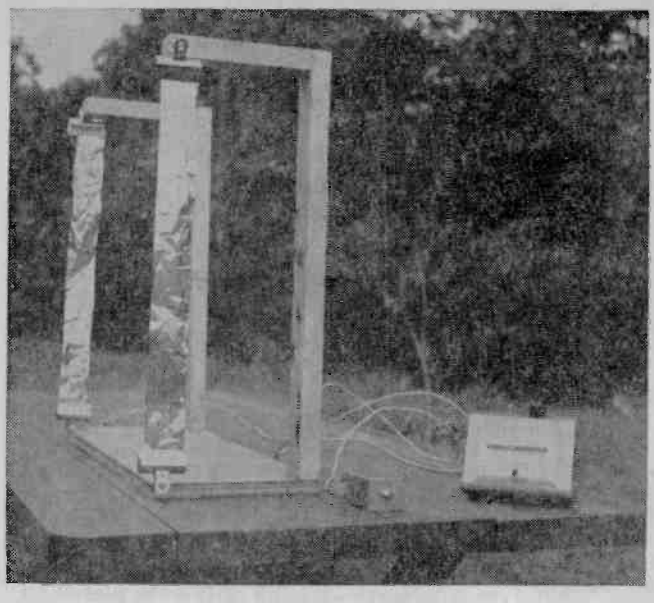
This is how author made his remote switch housing. To avoid this extra work, you can purchase a Switchcraft 921-K remote control switch complete with housing. It costs only $3.00 from Allied Radio—stock No. 56F5800.

The free end of this cable is brought through a grommet in the rear half of the meter case and knotted to relieve strain, leaving enough length to make connections to the components. Connect the #1 lead to one side of S1, #2 lead to the plus side of capacitor C1, and #3 lead to the minus side of this capacitor.

Calibration. Before connecting the alligator clips to the foil strips, clip all three of them together. Turn power switch S3 *on*, set calibration switch S2 to *calibrate* position, and adjust zero-setting potentiometer R4 for a zero meter reading. Note that as

If you've followed pictorial diagram carefully, your Baseball Velocity Timer should look like author's at right. Before you press button, take time to examine your wiring job very carefully. Be sure to check polarities of batteries, capacitor, diode, and meter. One goof here and you'll be back in the parts store, spending your hard-earned cash. Also, check and double-check transistor's connection to terminal strip—do it now!



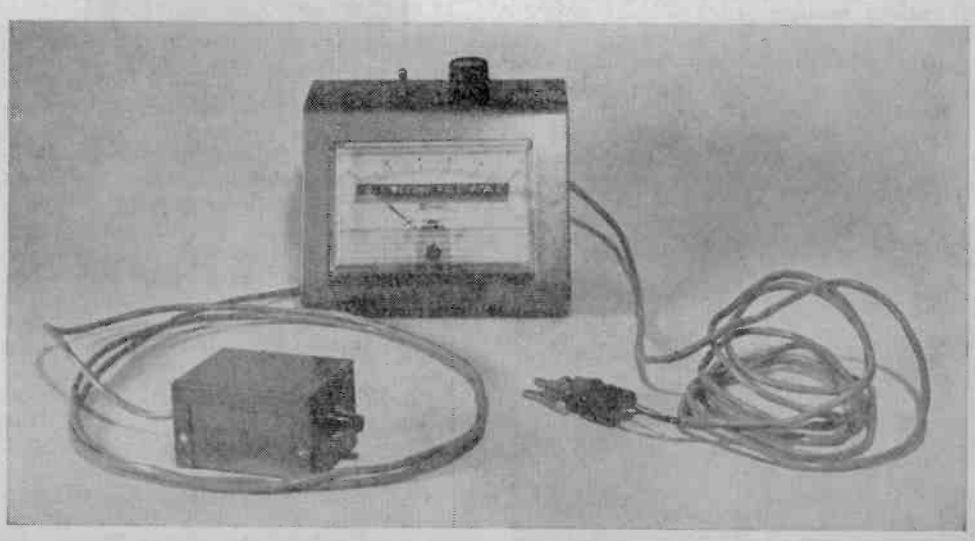


Stand used by author was simple wood structure that is easy to duplicate without detailed instructions. Only critical dimension is distance between two metal foil strips that will be broken by passing baseball. You can fabricate any stand that's feasible and economical to construct. Be sure metal foils are exactly 24 in. apart. When checking pitcher's throwing arm, have ball thrown into wind—anything else is cheating.

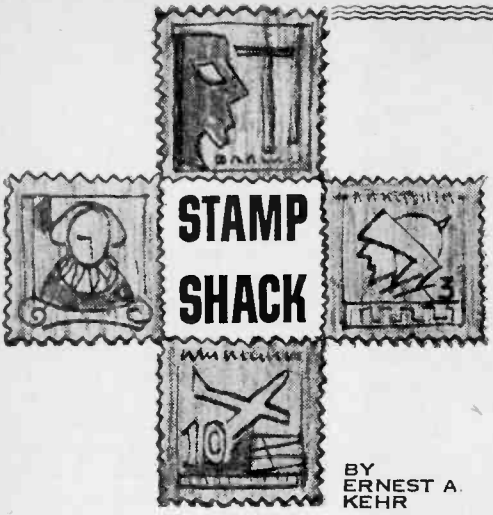
the knob is rotated in one direction the meter reading will increase until the pointer is off scale. Reversing the rotation of R4 will cause the pointer of the meter to drop until it reaches zero. Further rotation in this direction will not drive the pointer below zero. The correct setting is when the pointer just reaches zero.

Next, disconnect the #3 alligator clip, leaving #1 and #2 connected together. Then, using a stopwatch or sweep-second hand, depress pushbutton switch S1 for exactly one second. Immediately after releasing S1, quickly adjust calibration potentiometer R5 till the meter reads full scale. Since the meter pointer will begin dropping immediately after the release of S1, it will be necessary to repeat this adjustment several times.

Reset S2 to its *normal* position and connect the three alligator clips to the foil strips. Connect #1 clip to the first ribbon struck by the tossed ball, #2 clip to the center or common terminal, and #3 clip to the terminal connected to the second ribbon hit by the ball. *(Continued on page 106)*



All wired and calibrated, Baseball Velocity Timer is ready to take on the sandlot Mud Cats.



BY ERNEST A. KEHR

● ● Most of the world's nations used "Madonna," "Nativity" and kindred designs with a religious motif for stamps issued to carry Christmas mails. Guyana made a notable exception: its pair of Yuletide adhesives (6 and 20 cent denominations printed in multi-color) feature the tropospheric scatter system which is being introduced to improve communications between the South American nation with insular Trinidad, some 350 miles to the northwest.

● The first depicts two 60-foot diameter dish aerials at Thomas Lands, with a message, "Guyana sends Christmas greetings to the world," placed between zigzags to suggest the system's radio rays. The other has the same message superimposed on a map showing the route of the new communications medium.

● Intended to replace the present high frequency telephone service, the tropospheric scatter system will provide Guyana with high quality telephone and telex service to the United States, Britain, the British Commonwealth and Europe via existing communications links in Trinidad. Initially, it is to be equipped with 32 voice circuits, with provisions for expansion at a later date.

Guyana 1968 Christmas Issue

● Most important core of the system is a pair of immense dish aerials—one to send; the other to receive messages. The Guyana twins were erected on sites at Thomas Lands, near Georgetown, that have been elevated thirty feet to clear the shore-side highway. The other two are at Morne Blend, Trinidad.

● Briefly, the system involves the sender's words being fed into a transmitter which is connected with the feed horn. This sprays the message in a frequency modulated carrier to the antenna. The antenna's concave surface concentrates the sound waves into a narrow radio beam which passes up to the atmosphere. Most of the beam is dissipated into space, but a minute portion of it bounces back to earth—enough of it to be picked up by the receiving antenna at the other end with sufficient energy to be detected and amplified then relayed to its destination by Trinidad's existing facilities.

● Just how this happens is anybody's guess; no one seems to know for sure whether it's reflection, refraction or what. We prefer to think of it as "bounce."

Israel Eltascope/Pacemaker Issue

● ● A year ago, when new air-mail stamps were authorized, the Israeli Ministry of Posts decided to use their designs as miniature posters to advertise the country's major products for export to raise needed foreign exchange to meet its military budget. The latest addition to this series, released in December, is an 80-agorot denomination which publicizes its electronic devices. Featured is a basic bedside sub-unit of an Eltascope, set against a background of the instrument's impulses when in operation. One of the country's airliners, such as the ones shot up at the Athens and Geneva Airports, is in the lower corner of the yellow and brown stamp.

● The Eltascope, which is a domestic version of "pacemaker" and monitoring devices developed in the United States and

(Continued on page 106)

putting your CB Club on the map

DO's and DON'Ts on how to publicize your CB Club

by Don Jensen

Congratulations. You've just been named Publicity Chairman of the MyTee Five Watters—your dubious reward for stepping out to the bar for a quick one while the president was appointing club committees.

But there's no need to panic. Yes, even you can do a praiseworthy job of helping your CB club achieve some well deserved public recognition. And who knows? If you're on your toes, you may even be reappointed next year!

For openers, though, forget you ever heard the word publicity. You'll be dealing mostly with your local newspaper, so remember its business is news. The editor couldn't care less about giving your CB club publicity. If your group is doing something newsworthy, then offer it to the paper as such. And, it's not a bad idea to chuck the Publicity Chairman title and call yourself the MyTee Five Watters' Information Officer, News Service Editor, or some such.

Fear you need not have. Contrary to public opinion, newsmen don't eat publicity chairmen for breakfast. Some have even been known to smile benevolently when approached in the right way at the right time.

What's News? When you come right down to it, there are really only two types of stories that have much chance of ending

your CB Club on the map

up in print—those about club-sponsored events of community-wide interest, and those hard news stories which have a CB angle.

Your annual CB jamboree is a good example of the former. Any event that can draw a couple of thousand persons is bound to catch the fancy of an editor. But don't pester him with notices of regular monthly meetings of your own members.

Even better bets for news coverage are the solid news stories. Aiding a distressed CB motorist from Muncie, stalled out on Route 463, is *not* news. But a raging snowstorm or a race with the stork, and you've got something.

Thing to bear in mind is that news is as perishable as a carton of tutti frutti on an August afternoon. If it happened yesterday, OK. Last week? Forget it! If you're publicizing a coming event, give the story to the paper as soon as all details are complete. Then don't forget a follow-up the morning after. *(Continued on page 108)*

DO'S AND DON'TS OF WRITING A PRESS RELEASE

DON'TS

Dear Editor,

I am the new publicity chairman of the MyTee Five Watters CB Club. We want some publicity for our upcoming "coffee break" at the Silver Spoon Diner.

Please put the following in your paper as soon as possible....

A large number of CB'ers was called out one night last week to help search for a two-year-old tyke who wandered away from home and got lost.

KBP9328, "Bunky" Jones got a call from a neighbor lady who said her child was lost and he quickly got on channel 9 and gave out a 10-33.

Soon, local CB'ers of the MyTee Five Watters were cruising mobile looking for the boy....

The regular meeting of the MyTee Five Watters CB Club will be held Friday evening in the basement of the Knights of the Prairie Lodge. There will be a swappers' hour and members are reminded to bring along spare electronic gear from their junk boxes.

Coffee and donuts will be served afterward by members of the refreshment committee....

The MyTee Five Watters recently elected officers for the coming year.

In a close 17 to 15 vote, Erv Splatter, KBN4733, won the presidency, nosing out Herkimer Heterodyne, KEB1148, the incumbent.

After the election, members congratulated Erv and gave a vote of thanks to Herkimer for a job well done last year.

Erv then appointed a number of members to club committees, including, Refreshments, Mabel Kaffeklatch; Sunshine, Butterfly Schultz....

DO'S

NEWS RELEASE

TO: Pottsville Picayune-Intelligence

FROM: P. J. Flack
Information Officer
MyTee Five Watters CB Club
Bigelow 5-4322

SUBJECT: CB radio operator relays message, saves farmer's life.

Two-year-old Ricky Carter, who wandered all night through the swamps bordering the Ohfoggee River, is back home this morning, safe and sound, thanks to 15 local citizen band operators, members of the MyTee Five Watters CB Club.

Ricky, son of Mr. and Mrs. J. C. Carter, 423 Elm, wandered off into the swamp while following a stray dog.

Mrs. Carter said that when she first realized her son was gone, she called her neighbor, Charles Jones, 425 Elm, a member of the radio group's emergency team....

Citizen band radio operators from the entire state will pack Firemen's Park, Sunday afternoon, June 12, for the fourth annual MyTee Five Watters CB Jamboree.

Elmer Ratchet, jamboree chairman of the local organization of citizen band radio enthusiasts, said at least 2,500 visitors are expected.

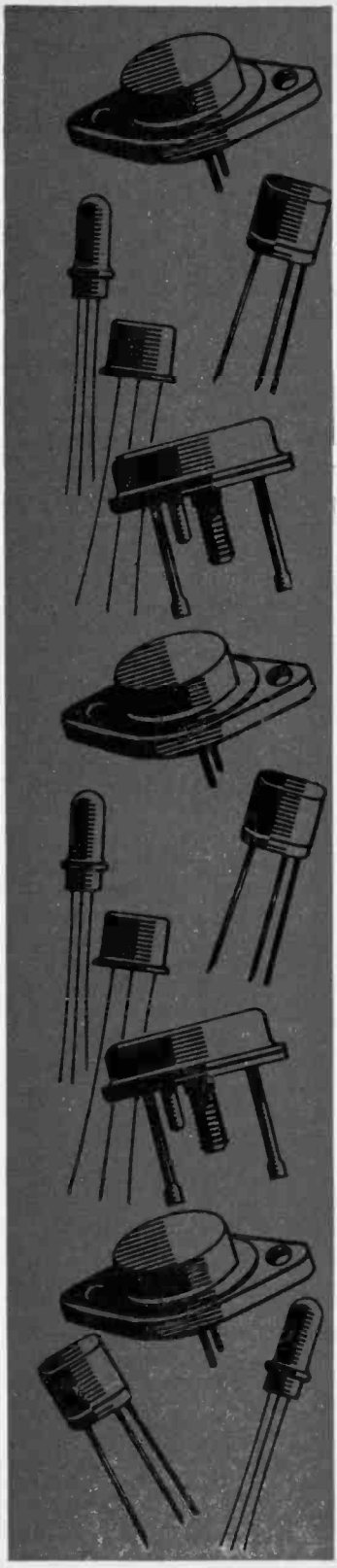
Highlighting the event will be a special demonstration of....

A Pottsville businessman has been elected president of the MyTee Five Watters CB Club for the coming year.

Ervin T. Splatter, 1973 Fourth Ave., manager of Erv's TV Sales, was chosen to head the local radio organization.

The MyTee Five Watters' members are government licensed two-way radio operators, not "hams." The members all have CB transmitter-receivers at their homes or businesses, or in their autos.

"The club will continue its program of offering assistance to Pottsville police and civic groups," Splatter said today....



HOW TO DESIGN SOLID-STATE CIRCUITS ...the easy way!

All it takes are a few simple facts and two equations that are a cinch to apply!

by Herb Cohn

How many times have you vowed to crack that transistor manual, plow through all the biasing mathematics, and finally design your own one-transistor audio preamp?

Inevitably it will happen. After three quadratic equations you come upon one formula that breaks every rule of high-school algebra that you once knew cold! At this point you abandon the scientific approach and go back to building someone else's circuits.

What you don't know, since nobody has ever told you, is that you can design that preamp, and far more complex circuitry. All you'll need are *two* simple formulas (and we do mean simple) and a few facts about transistors.

First the Facts. The base/emitter junction of any transistor is a diode, and as a diode the base/emitter junction can pass large change of current (from 100 microamps to 100 milliamps) with only a small change in voltage. This means that the base/emitter voltage is pretty *constant* for any value of base current.

This holds true for *pnp* or *npn*, silicon or germanium types (Fig. 1). The difference between a germanium and silicon base/emitter junction is the base/emitter voltage: for germanium transistors it's 0.2 V; for silicon, it's 0.6 V.

Next the Formulas. Now let's look at those two simple formulas we hinted at earlier. The first one is *Ohm's Law:*

$$E = IR$$

Now that is simple—we're sure you'll agree.

The second one is the formula for the current gain of a transistor:

$$H_{FE} = \frac{I_C}{I_B}$$

As you can see, H_{FE}, or current gain, equals the base current (I_B) divided into the collector current (I_C).

(Continued overleaf)

HOW TO DESIGN...

From these two simple formulas we can derive any other formulas needed for designing the biasing networks used in amplifiers.

What Are We Talking About? Before we jump into circuitry let's look at Fig. 2—a table of transistor definitions. Fig. 2 lists all the voltages and currents and their symbols you need to know to design a transistor circuit. From here on in we will use the symbols, so if there's any confusion, just flip back to Fig. 2 for the definitions.

Back to Circuitry. Let's see if we can determine the values for R1, R2, and Vcc (the collector battery voltage) for the circuit in Fig. 3 on page 70.

First! We must select a transistor for the circuit. The circuit shows a *pnp*, so we'll choose a fairly common transistor—a germanium type 2N404. The breakdown voltage of a 2N404 is about 20 volts. This voltage is the maximum collector battery voltage, Vcc (Fig. 2) that can be applied across a transistor without destroying it. Therefore, the Vcc should be well below this value. A 9-volt transistor radio battery will do nicely as the power source. Once we've selected the battery voltage we have automatically limited the maximum output swing. The collector voltage can swing from zero to nine volts. If we bias the collector to half the battery voltage (Vcc), we have a 4.5-volt swing—positive and negative. This is the maximum unclipped output. A 9-volt peak-to-peak swing gives you about 3 volts of undistorted and usable AC.

Second. For the next step we select a value of collector current (Ic). When we do this we lock in the value of R2. Let's have a closer look at this. If the collector-to-emitter voltage is 4.5 volts, or half the Vcc, the other half must fall across R2. Once we select a value of Ic which also flows through R2, we have:

$$R2 = \frac{V_{R2}}{Ic} = \frac{4.5 \text{ volts}}{Ic}$$

where VR2 is the voltage drop across resistor R2. Our notation VR2 is not in Fig. 2 but is easy to figure out. It's the voltage (V) across the load resistor R2. Not only have we determined the value for R2, but we have now restricted the range of load that the amplifier can drive. If R2 comes to 1 megohm, we couldn't expect it to drive a low-impedance speaker. It would be like putting a Volkswagen engine in a Mack truck.

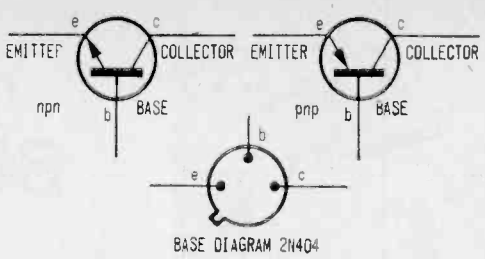


Fig. 1. Arrowhead in transistor symbol tells you whether unit is pnp or npn.

Suppose we want to drive a tube amplifier with a 50,000-ohm input impedance. Resistor R2 would have to be much smaller than 50,000 ohms in order that the 50,000-ohm input circuit does not load down our preamp circuit, causing distortion. Let's take a value of R2 that's approximately 10% of 50,000 ohms (like 4500 ohms) and work backwards to find Ic. We can try Ohm's Law on this one:

$$Ic = \frac{E}{R} = \frac{4.5}{4500} = 1 \text{ mA}$$

Now you can see why we picked a value of 4500 ohms for R2 instead of 5000 or 4000 ohms—it gives us an Ic which is a round number (1.0 mA) and easy to work with. This takes care of the output circuit values.

Third. Our next problem is to find a value of R1. Before we can determine R1 we must know the base current, IB. Let's go back to the transistor gain formula given earlier and solve for IB.

If:
$$H_{FE} = \frac{Ic}{I_B}$$

then:
$$I_B = \frac{Ic}{H_{FE}}$$

We know Ic = 1 mA. Assuming an HFE of 100 (see Fig. 3):

$$I_B = \frac{Ic}{H_{FE}}$$

$$I_B = \frac{1 \text{ mA}}{100} = .01 \text{ mA or } 10 \text{ microamperes}$$

The current that flows through R1 is 10 microamperes. If we can figure out the voltage across R1 and divide it by 10 microamperes, we're in business.

$$R1 = \frac{\text{battery voltage} - \text{base-to-emitter voltage}}{10 \text{ mA}}$$

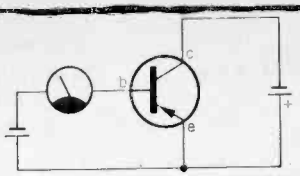
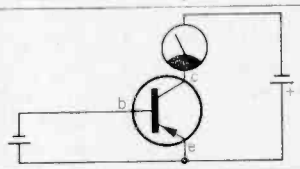
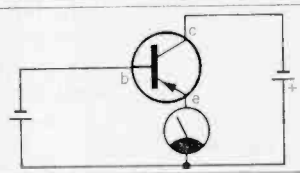
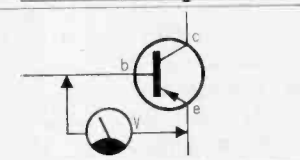
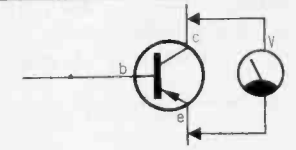
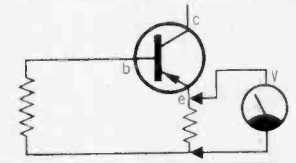
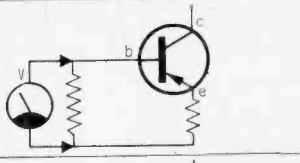
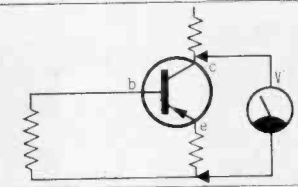
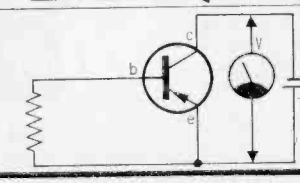
Base Current		I_B
Collector Current		I_C
Emitter Current		I_E
Base-to-Emitter Voltage		V_{BE}
Collector-to-Emitter Voltage		V_{CE}
Emitter Voltage		V_E
Base Voltage		V_B
Collector Voltage		V_C
Collector Battery Voltage		V_{CC}

Fig. 2. Glossary chart highlights transistor terminology and symbols used in this story. Simplified schematic diagrams illustrate how various currents and voltages are measured.

HOW TO DESIGN ...

or $$R1 = \frac{V_{CC} - V_B}{10\ u_A}$$

The base-to-emitter voltage (V_B) of a germanium transistor is 0.2 volt, which is only about 2% of the 9 volts of the battery (V_{CC}). Since V_B is so small, we can drop it from the equation without introducing any significant error. This leaves us:

$$R1 = \frac{V_{CC}}{I_B}$$

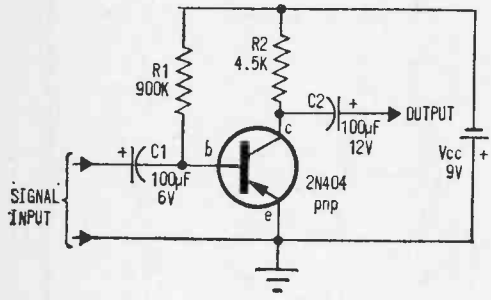
$$R1 = \frac{9\ volts}{10\ microamperes} = 900k\ ohms$$

Now It Gets Hot. Although this circuit's values are easy to calculate, the circuit is very unstable. For one thing, the collector current (I_C) is totally dependent on the value of H_{FE}, and H_{FE} can change quite a bit with small temperature changes.

When you build this circuit, put a voltmeter across the collector and the emitter, then put your finger on the case of the transistor. The heat of your finger will change the voltage readings slightly. Imagine what a 40°F change in temperature can do.

A second reason for this circuit's instability is a characteristic of transistors called I_{CO}, or collector-to-base leakage current. The leakage path looks like a resistor connected between collector and base which may pass as much as 3 or 4 microamperes into the base. Add this leakage to the 10 microamperes passing through R1 and this total is amplified by the H_{FE} of the transistor. Couple this with the fact that this leakage (I_{CO}) increases with temperature, and you've got the *engineering blues.*

The Ups and Downs of It. In Fig. 4 we have an improvement in circuitry over that in Fig. 3. Resistor R1, instead of going to the negative side of the battery, connects to the collector of the transistor. To see how this circuit improvement works, let us assume that a rise in temperature has increased Ic. This means that the voltage drop across R2 (Fig. 4) has increased, while the voltage from collector to emitter (V_{CE}) has decreased. *(Continued on page 107)*



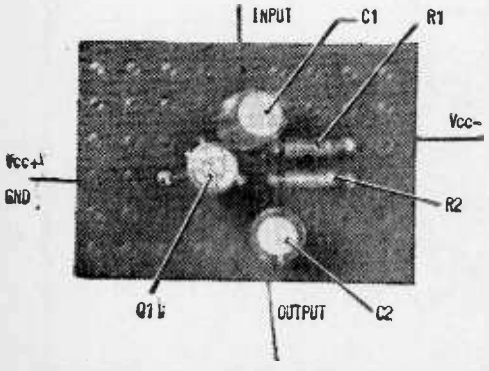
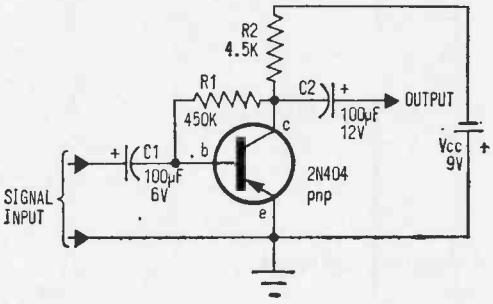


Fig. 3. Check the math used to compute values shown in diagram above, then assemble circuit on a perf-board (see below).



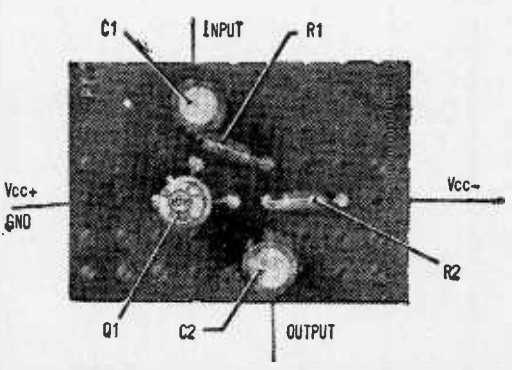


Fig. 4. What a difference a connection makes! In this case resistor R1 connects directly to transistor Q1's collector for biasing.

Did you know that any body, even our own earth, has capacitance even when it is apart from all other objects in the universe!

The Use of Ground in High-Frequency Circuits

by George W. Lagus

Radio receivers often have a ground terminal in addition to an external antenna terminal. But, curiously enough, when only a single wire is available, much better reception is obtained by connecting it to the antenna terminal. Obviously, most receivers need an antenna more than they need a ground. This is because most receivers have a chassis of sufficient size that it functions as an artificial ground by virtue of its single-terminal capacitance.

It may come as a surprise to many that there are two types of capacitance (unipolar, or single terminal; and bipolar, or two terminal). According to electrostatic theory, every individual conducting body can serve as a charge reservoir. This property may be called single-terminal capacitance, and it is best typified by an insulated metallic sphere (see Fig. 1 on next page) capable of holding a static charge of a single polarity. Such a sphere has a capacitance of 10/9 *uu*F per centimeter of radius.

Antenna And Ground Capacitance. The larger a capacitance, the less voltage is needed to cause a specific high frequency current to flow into it. Every antenna element therefore has to have some capacitance as a charge reservoir. A dipole antenna system as in Fig. 2A needs no ground. A loop antenna also works well without ground. However, when a dipole antenna is deprived of one element, optimum RF current may be obtained by providing a single-terminal capacitance (a ground) to substitute for the charge reservoir characteristic of the missing antenna element (Fig. 2B).

If we figure the radius of the earth as 637 million centimeters, we obtain approximately 707 *u*F as the static capacitance of ground. Less than a millionth of this amount is more than enough to complement a typical radio receiving antenna. Therefore, the capacitance of the receiver chassis is usually sufficient as an antenna balance.

Since single-terminal capacitances affect the tuning of resonant circuits, the equivalent circuit diagrams of Fig. 3 may be useful in visualizing the effects of two unipolar (single-terminal) capacitances in terms of an equivalent bipolar capacitor.

Chassis capacitance may also be used as a potential stabilizer. This application is best illustrated by considering the "cooling" effect of the chassis on one end of the high-voltage supply in a typical TV receiver. Though the chassis is connected to one end of a 20,000-volt high frequency transformer, it is quite safe to touch the metal.

Both Needed. It should be clear from the foregoing example that in open circuit operations a two-terminal capacitor may be of little use, while on the other hand, single-terminal capacitors are grossly inefficient as replacements for two-terminal capacitors.

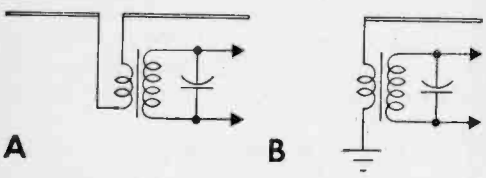
Modern technology can produce a pocket-size electrolytic capacitor of the same magnitude of capacitance as that possessed by the entire earth, namely 707 *u*F. From the international definition of the Farad in terms of the charge/voltage ratio of a capacitor, it is easy to deduce the following: if a mad basement inventor somewhere in the world managed to pump 707 Ampere-seconds DC unilaterally into the ground, the entire earth would become charged to one million volts of electrostatic potential. That's enough to literally make everyone's hair stand on end. Fortunately, no one can obtain that much unipolar electricity apart from its opposite kind. But the scheme would become practical if one could use the planet Venus, via a space cable, to balance the open circuit. If a

The Use of Ground in High-Frequency Circuits

ground wire and a Venus cable were each plugged into the opposite terminal of a 110 VDC power outlet, the stored energy would barely be sufficient to light a two-watt bulb for one second.

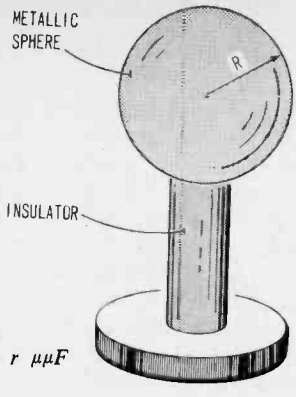
Big Charge. But since the energy stored in a capacitance is proportional to the square of the voltage, it would take about 197 kW hours to charge earth and Venus to an opposite potential of 1,000,000 volts.

Some old-timers among our radio buffs



may remember that the late genius Nikola Tesla (1857-1943) gave several demonstrations of the feasibility of electrifying large areas of land by ground propagation of high frequency currents. He was ridiculed as a mad inventor when he proposed the scheme of electrifying the entire earth by taking advantage of its natural AC resonance.

Fig. 1. Computing the capacitance of a sphere where the entire surface is a conducting metal is given in the equation below. "r" is the radius of the sphere in centimeters.

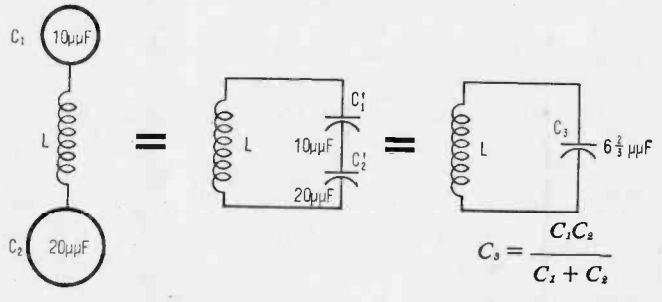


$$C = \frac{10}{9} r \ \mu\mu F$$

Fig. 2. The dipole antenna (A) needs no ground terminal to function normally. Each leg (pole) of the antenna serves as a single-terminal capacitor. Remove one leg (B) and you have an antenna which uses ground as a single-terminal capacitor.

Of course, ground is being used as part of low frequency two-conductor systems, as for instance in telegraphy, telephony and AC power transmission. But ground has too much HF power loss to be used efficiently as a one-conductor transmission line. Its main use in HF work is that of an auxiliary capacitance, or charge reservoir. ■

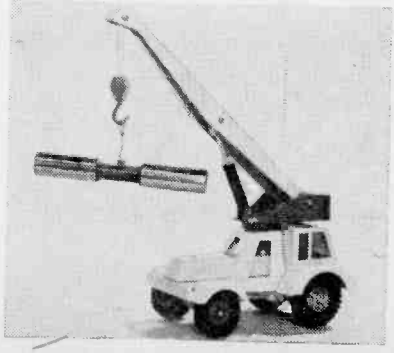
Fig. 3. Equivalent circuits showing the qualitative effect of single-terminal capacitances. Note that the smaller capacitance is the limiting factor of the combination. If C_2 were increased to infinity, the equivalent capacitance of the combination would approach 10 uuF as a limit.



$$C_3 = \frac{C_1 C_2}{C_1 + C_2}$$

Good Samarium Makes Magnets

Magnets in microwave tubes are very costly when made from the usual platinum-cobalt alloy. To lower costs, Raytheon has come up with a new magnet made from material based on cobalt and the rare-earth element *samarium*. The new magnet material is four times as strong as most alnicos and twice as strong as platinum-cobalt magnets. Magnets made from the new material perform well in microwave tubes at 265 degrees centigrade, a temperature at which platinum-cobalt degrades 50 per cent. The toy crane (right) symbolizes the samarium-cobalt magnet's ability to pick up 500 times its own weight. ■



OPERATION SAPPORO

a new use for a wind tunnel

by Joe Gronk

Facts and photos courtesy of National Research Council of Canada

■ Tests conducted in Ottawa by the National Research Council of Canada and the Canadian Amateur Ski Association may give Canada's National Ski Team a split-second edge over competitors at the next Winter Olympics at Sapporo, Japan, in 1972.

Objective of Tests. Important and sometimes startling results were achieved in the tests which were conducted in a six- by nine-foot horizontal wind tunnel operated by NRC's National Aeronautical Establishment. Three skiers from the Ottawa area took part in the initial tests which are expected to be performed periodically for several years.

The objective of the tests, dubbed "Operation Sapporo," is to find ways to reduce drag or wind resistance experienced by skiers competing in downhill races. Any decrease in drag could result in a corresponding increase in a skier's speed.

How Tests Staged. The tests were proposed by Jean-Pierre Picher of Toronto, Alpine Coach for the Southern Ontario Zone of the Canadian Amateur Ski Association. Others involved from the skiing world are Alan Raine of Nelson, B.C., Administrative Head Coach for Canada's National Ski Team; Dave Jacobs of Montreal, former Head Coach of the National Ski Team, and Normand Bureau of Pointe Gatineau, Que., of the Pointe Gatineau Ski Zone.

The tests were conducted on a weekend by a team of engineers from NAE's Low Speed Aerodynamics Laboratory, who donated their time to the project. They included R. J. Templin, Head of the Laboratory; H. H. Kelland, Wind Tunnels Superintendent, and G. A. Dobrodzicki, a member of the Laboratory with considerable skiing experience. The skiers involved in the tests were Betsy Clifford, Susan Graves, and Andy Dobrodzicki, son of G. A. Dobrodzicki.

OPERATION SAPPORO

Wind Tunnel Benefits. The wind tunnel simulated actual drag conditions experienced by skiers traveling up to 80 miles an hour in downhill races. Skiers who took part in the tests wore their own racing equipment and their skis were mounted on a board attached to the wind tunnel's system for measuring aerodynamic forces.

Simulated drag, experienced by the skiers as wind generated by the tunnel's fans whipped by them at various speeds, was recorded automatically by electronic equipment for later analysis. For the purposes of the tests, speeds of up to 111 miles an hour were simulated.

Body Drag. Drag was measured for some 14 body positions, including the "egg" position, a crouch which has proved the fastest riding position for high-speed skiers. Drag created by a skier's helmet, slacks, boots and the skis themselves also was measured.

Mr. Raine says he thinks these tests have produced a new racing position, a crouch he calls the "DJR" position—named after G. A. Dobrodzicki, Mr. Jacobs, and himself. He believes this position may shave as much as two seconds per minute from times achieved with the "egg" position.

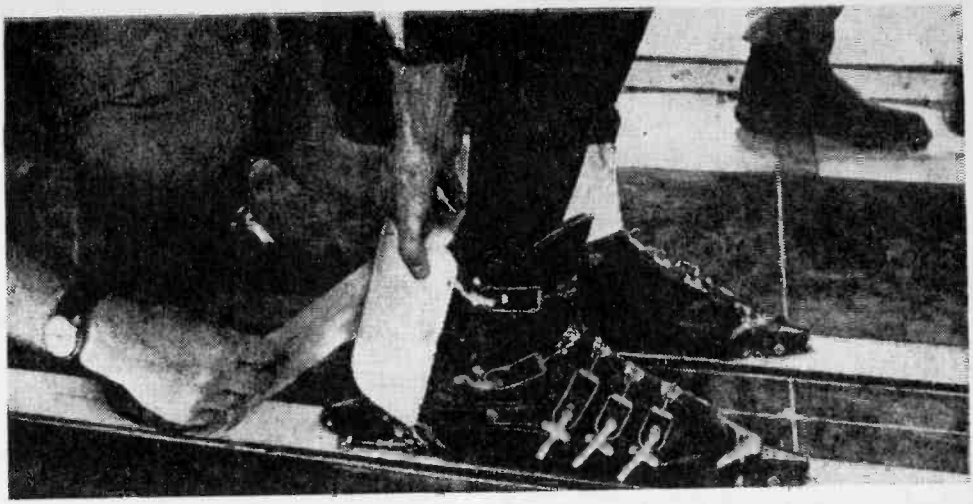
Since only 9/100ths of a second separated the Gold and Silver Medals during the 1968 Olympics, the "DJR" position could be an important asset to the Canadian Olympic team in 1972.

Position of Body and Limbs. Mr. Raine said one of the most important results of the tests was the effect of the position of a skier's hands on his speed. A hand flailing out for a second or so, perhaps to steady balance, can increase drag and reduce speed.

The tests showed that each skier also has his own body position. Before Canada's National Ski Team left for Europe in December for international competition, all members were tested in the wind tunnel to determine their best body positions for maximum speed on skis.

Clothing Redesign. Tests also were made with skiers wearing a streamlined helmet, fairings attached to the back of the leg and boot and with the buckles of the ski boot taped. These tests also indicated that changes

Practice may make perfect (photo at right), but only after considerable time has been spent in the laboratory. Skier Andy Dobrodzicki (photo at left) in a crouched position braces against the breeze in a wind tunnel. Data collected under test conditions may get Andy a Gold Medal.



The time separation of only a couple of hundreths of a second between first and second place in major amateur contests, makes what a skier wears very important. Here, fairing is attached to boot to reduce drag.

in the design of ski equipment and clothing can reduce drag.

Benefits from Tests. "The results of the tests will be made known only to the Canadian Amateur Ski Association," Mr. Templin said.

"We hope we can help members of the National Ski team improve their time in downhill races," Mr. Kelland said.

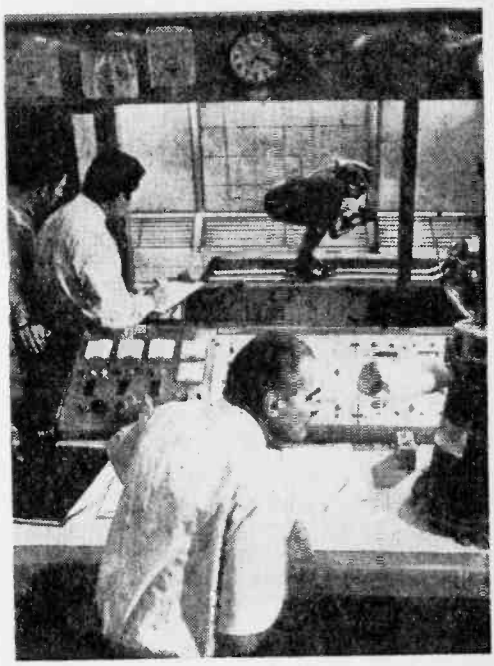
Mr. Picher said in this day and age Olympic medals are being won by hundredths of a second.

"For instance, even with timings that precise, there was a tie for second place in the women's giant slalom in 1964, and the spread to first place was only a couple of hundredths of a second."

Improving Timer Sensitivity. Efforts now were being made to develop devices to get timing down to thousandths of a second. Anything that could give the Canadian team an advantage of such fractions of a second was worth looking into.

All Sports Benefit from Research. World Olympic skiing champion Nancy Greene said she was delighted to see the National Ski Team and NRC cooperating in a program to modernize and streamline ski racing equipment.

"I hope there can be the same type of co-operation in other areas of sport so that Canada can be original and not do just what everybody else is doing," she said. "I would like to see such bodies as the National Research Council involved in the design of other sports equipment which could help improve Canada's competitive position in the sports world." ■



Wind tunnel engineer (foreground) and Ski Team officials record reduction in drag achieved with streamlined helmet during wind tests that exceeded 110 miles per hour.

HAM TRAFFIC

DE WZDQS

By MARSHALL LINCOLN

Paper People—Key Club Members

☐ The man who edits a ham club paper is probably one of the club's least appreciated members. Yet he is also one of the most valuable.

With him rests the power . . . and the responsibility . . . for creating and maintaining interest in the club month after month. Many times this fellow would rather be spending a Saturday night in his ham shack. Instead, he's plunking away at his typewriter or up to his elbows in sticky mimeograph ink.

Most good editors keep their jobs for several years . . . partly because they are aware that the club would have a hard time finding anyone else to take the job. They hang on, knowing that keeping the club paper alive is often the same as keeping the club itself alive.

This means the editor has his work cut out for him for a long period. Usually, the editor keeps his job for years . . . and keeps on doing his level best to alternately inspire, interest, humor, cajole, harangue, and spur on the club and its activities.

Clubs, if they are more than just social groups, can contribute lots to a fellow's interest in ham radio. They bring together, at least once a month and under one roof, a variety of talent and creative ideas. When pooled, such add appreciably to each individual's interest and understanding of our marvelous world of ham radio.

Of all the assignments that may be handed to the eager worker who joins a radio club, that of club paper editor can be the most rewarding. (I know—I've been one, and I believe I'm a better ham because of the experience.) Oh sure, there were times it was one big headache. But there were many more times when it was a great thrill, a lot of fun, and an inspiring, educational experience all rolled into one.

If you've worked on your club's paper, you know what I mean. If you haven't, then I hope you at least appreciate the amount of work the editor does with each issue to provide you with a newsy, interesting, and worthwhile publication.

There's a wide variety of club papers published across our land by clubs that vary from small-town groups of fewer than a dozen members to large metropolitan organizations of more than 100. Every one of these papers makes for fascinating reading.

One of the slickest I've seen is *Florida Skip*, edited by Andy Clark, W4IYT. This one is a real first-class job, resembling a professional news magazine. It has a whole stable of writers and correspondents, representing several clubs scattered over Florida. And it carries regular columns on such subjects as VHF, MARS, Nets, Quarter Century Wireless Association, and others. Naturally, it also has an advertising manager who busies himself bringing in some money to keep this ambitious project running.

Few ham groups have the time, the people, or the money to put out a professionally printed paper like *Florida Skip*, so most of them use the old reliable mimeograph machine. This doesn't necessarily mean they suffer, however, for such papers can still cover a wide range of interests in fine style.

One of the outstanding papers of this sort is the *FEARL News* (that first word stands for Far East Auxiliary Radio League). Bob Rhodes, KA2LL, edits this one, which is aimed at the ham group at military bases in the Far East. He grinds out about 20 pages monthly for this group, covering such subjects as DX activities, military and for-

eign equipment available for ham use, editorials and news items reprinted from other papers, technical and construction tips, and propagation forecasts.

A paper that specializes in giving helpful information to other club paper editors is the *Amateur Radio News Service Bulletin*, edited by Ralph Anderson, KØNL. The ARNS group prints information on many things of interest only to club paper editors, such as how to acquire or build inexpensive sorting and folding machines, or how to reproduce drawings on a low-cost paper, etc.

Perking up the club members to think about new ideas is pretty hard sometimes, but it can be done. Jerry Lucas, W9BS, editor of the *Ama-Chewer* published by the Indianapolis Radio Club, does it with technical puzzles. He's always searching for new puzzles related to electronics, which he uses to exercise the gray matter of his members.

Humor sometimes helps do this, too, as witness this example from the *Ham Monitor*, edited by Robert Lange, WØILB.

He wrote: "For a quick test of the quality of a storage battery, connect a wire from one battery terminal to the handle of your best pocket knife. Open a good blade and run it quickly across the other terminal of the battery. If the knife immediately becomes a saw, the battery is in good condition."

Don Miller, W9NTP, editor of the *Indiana Amateur TV and UHF Club News*, winds up his news letters with this line: "Hams should be seen as well as heard."

So you see there're as many ways to handle a club paper as there are to skin a cat. But there the comparison ends, for putting out a club paper never skinned anybody and always helped someone. You don't think so? Okay, then, the next time your club paper arrives in the mail, see how long you can lay it aside and keep from reading it. See what I mean?

What About Patches? The rumors are spreading: "Phone patches are legal." "No, phone patches are not legal." "Phone patches will be legal soon." And so they go, with variations on each of these.

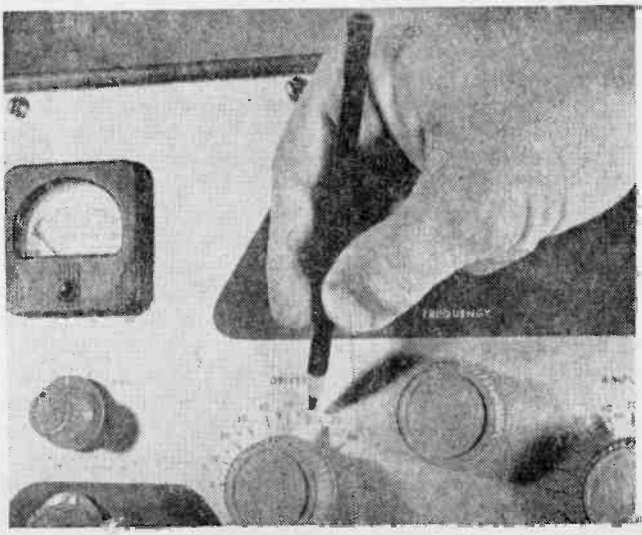
The fact is that things have been changing too fast for most of us to keep up with the latest developments. After all, any subject that involves a Federal agency and the mammoth Bell Telephone System is bound to be complicated. And this one will probably stay that way quite a while!

I'll try to summarize for you what it looks like now. But remember that the situation may change again before I get this paper out of my typewriter.

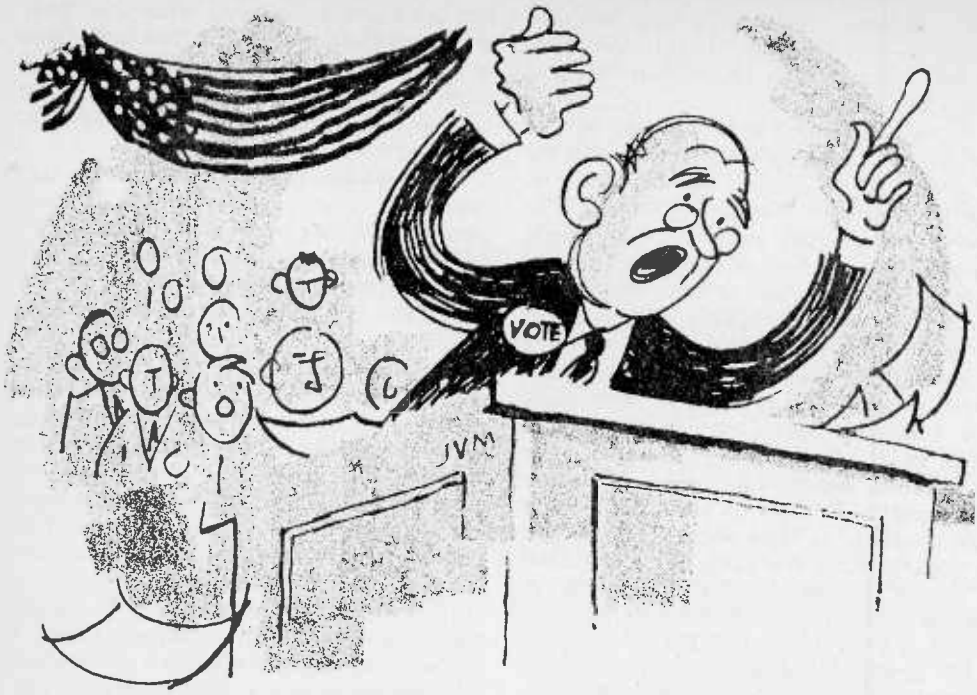
It all started with what is called the Carterphone Case, in which a company sought a decision allowing it to connect a commercial radio system into the regular telephone lines. This would permit the company's customers to turn on their mobile two-way radios and use them to make regular telephone calls.

Ma Bell objected, but lost the first round. It was decided that the telephone folks couldn't stop anyone from connecting a "foreign attachment" to the telephone as long as it didn't interfere with normal telephone service. This seemed to pave the way for ham phone patches, but Ma Bell cranked out an appeal to stop this business.

(Continued on page 110)



To save time in retuning your transmitter after you switch from one band to another, mark the correct driver and final amplifier knob positions with a felt marking pen. Use a different color for each band. A small spot marked on the panel for the correct position of each tuning knob will save time as well as eliminate long tune-up transmissions. Fine tuning adjustments should still be made using panel meter readings, but these can be very brief if you start with each knob in approximately the correct position before putting the rig on the air.



Ed was that kind of an engineer that always had his head in the clouds until he learned

The Value

Sweat beaded on Ed's forehead as he made the final connections. He had spent more than a year on the project already. Twelve times he had done this; twelve times he had failed. He threw the switch, put on the earphones and aimed the antenna at the street below. He carefully sighted the antenna at a man in a gray overcoat across the street and heard his thoughts.

◎ It had all started on a rainy weekend when Ed had been looking for a new electronics project. He worked at a small manufacturing plant in a heavily industrialized city in the Midwest. The company made small items of electronics gear for the larger plants in the city. Ed's job was wiring, and sometimes research, for Royal Electronics was not large enough to employ a full-time R&D staff.

Ed was single and lived in an old frame house near the center of town. The house was really too large, but he used the second floor for his workshop. Ed was a ham radio bug and spent most of his free time working on some small project. He was looking for such a project when he happened to hear a radio news commentator mention that Russian scientists had detected weak microwave radiations from the heads of patients.

Now Ed very seldom forgot anything concerning electronics. He might not remember to set his alarm clock, or remember a three item shopping list, but he could recall circuits he had only seen once, five years ago. He had seen a small article in a science and electronics magazine about a ham who had made a hearing aid for the deaf by applying modulated radio frequency signals directly to the heads of subjects. Even the congenitally deaf had been able to hear the modulation.

Ed read quite a bit of science-fiction, and had heard of the experiments at Duke University and elsewhere, and decided these two phenomena could certainly go a long way towards explaining telepathy. Ed decided to try a few simple experiments to test his theory.

◎ First, Ed wired up a small oscillator in the broadcast band, using AC on the plate to obtain self-modulation. He wound a carefully insulated loop around the tank coil and

# of a Hobby

by Larry Lisle

connected it to the plates of an old neutralizing condenser. Attaching these to his temples, he threw the switch, and to his amazement, heard the buzz of the AC current.*

Lacking anything better to do, Ed decided to try and determine if there was a specific resonant frequency to which he would be especially sensitive. He reasoned that the resonant frequency, if it existed, would be very high, since the lower portions of the radio spectrum had been saturated with all manner of signals for years with no noticeable effects. He started at 3,000 megahertz with a tunnel diode and cavity resonator. It turned out to be a larger task than Ed had dreamed.

◎ About once a week Ed set the project aside, discouraged. Finally, after about three months of work he succeeded. The signals peaked abruptly, as he had hoped they would, in the highest reaches of the spectrum, where the differences between radio and heat are minute. He built a receiver for the frequency and connected the input to his temples, and the output to an earphone.

The results astounded him. It was as though he was talking to himself and getting answers. He used a tape recorder to make sure he wasn't imagining things.

◎ What had started as an idle pastime had now become an obsession. Ed spent all of his free time on the project, trying to improve his receiver, and make it capable of working at a distance. The signal strengths were incredibly small, and the problems of obtaining sufficient amplification were almost insurmountable. He had only a small amount of money to put into the project, and as a result it took him nearly a year to build a receiver that covered the entire top of his workbench.

He made the final connections, aimed the antenna at the man across the street, and for the first time in history, understood exactly what another man was thinking. He followed the man with the antenna as far as he could, which was only to the corner, for the effective range was only a little more than a hundred yards.

For a moment, Ed just sat there, stunned. He focused on a well dressed lady, going to her car after an evening of shopping. She was thinking of how to explain to her husband that she had just purchased a four-hundred dollar fur jacket. It was odd, but she couldn't seem to keep her mind on just one subject, but jumped from the jacket to the dented car fender of a year ago, to her son's wife, back to the jacket, to their last vacation in Miami, and so on.

As time wore on, Ed found that this was a hard and fast rule rather than the exception. He never found anyone to keep his mind on one thing

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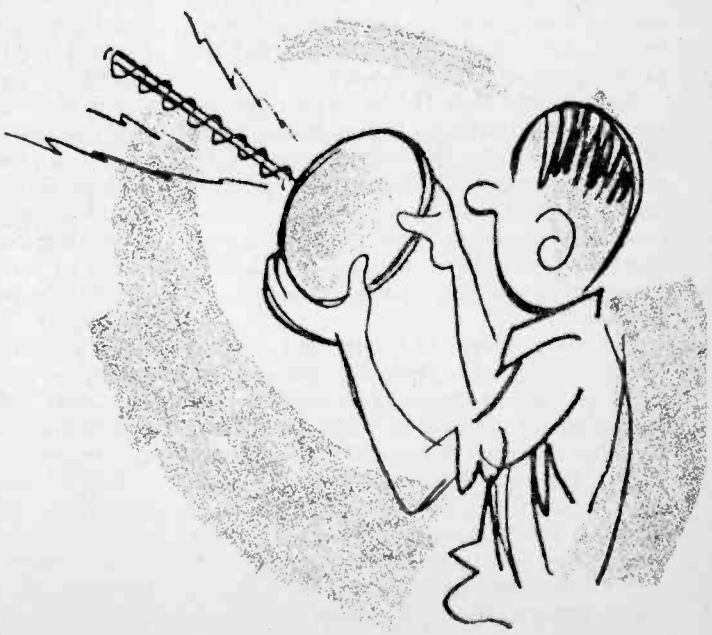


* If our readers try this, the only thing they may hear will be the voice of St. Peter—Editor.

TOMMY'S DYING VOICE

By Don Jensen

The British Forces Broadcasting Service is a falling star in the

☐ *"Ship me somewheres east of Suez, where the best is like the worst,"* penned Kipling, voicing the plaint of the typical British soldier, who for centuries has guarded the far-flung corners of the Empire.

Since World War II, the British government has tried, with its Forces Broadcasting Service, to combat the loneliness and isolation of its overseas troops. At its postwar peak, the BFBS, now known as the British Forces Broadcasting Service, operated medium and shortwave stations in nearly a score of countries, from Gibraltar to Singapore.

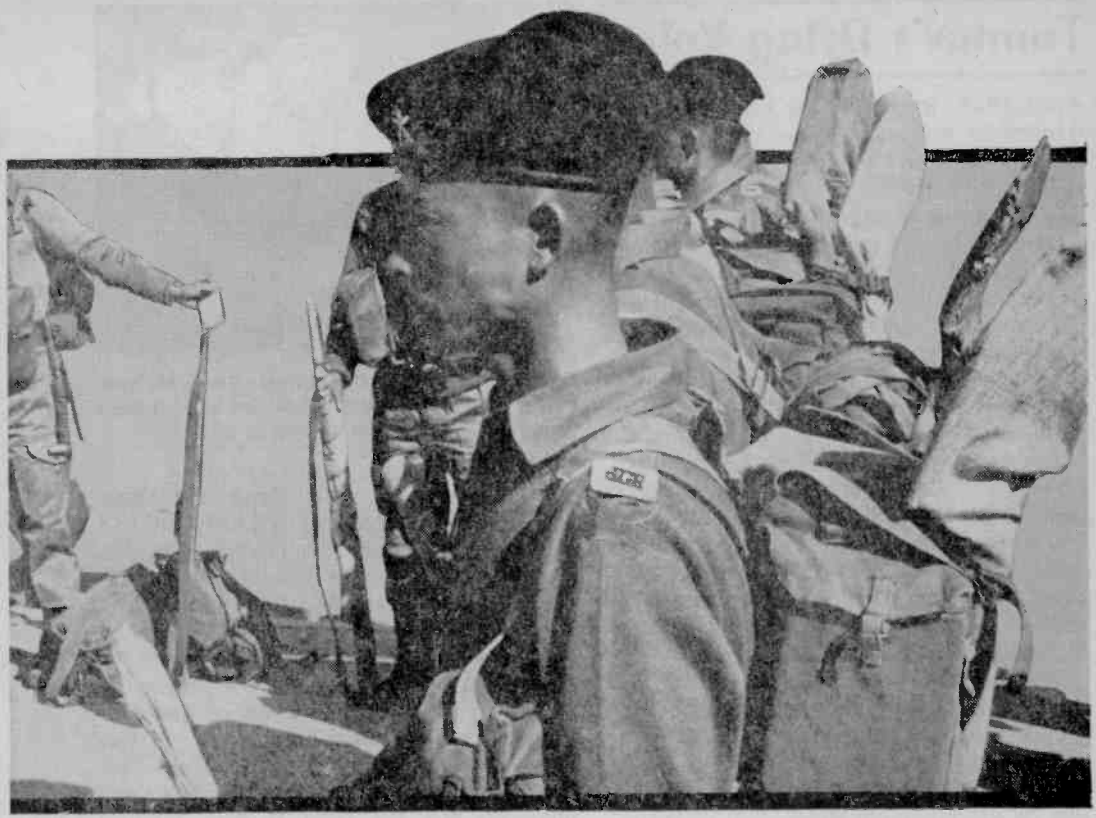
Operating much like our own Armed Forces Radio and Television Service, the BFBS provides a service of information and entertainment, as well as a link with home for Her Majesty's forces. Over the years, British Forces shortwave stations in Palestine, Malta, Trieste and elsewhere also have provided good DXing for SWLs around the world. But now those days are nearly over.

With the sun rapidly setting on Britain's global empire, her multi-million man wartime army has shrunk to just over 400,000. Plans have been announced for the withdrawal of 32,000 troops from the Far East. By 1971, the Union Jack will fly over a mere handful of garrisons east of Suez.

The need for a military broadcasting network lessened, the chain of BFBS stations already has been cut to a scattered few local medium wave and FM outlets and a single shortwave transmitter.

The Beginning of the End. Britain's last shortwave outpost is BFBS-Singapore, a 10,000-watt station broadcasting on 5010 and 6040 kMz, from the tiny, but important Asian nation. If you want to log this one, the last of the British battledress broadcasters, you'd better hurry. Before long, it too, will be gone, like the "thin red line" of military might.

British Forces Broadcasting Station—Singapore became a part of the network in the mid-1950's, when battalions of Commonwealth troops were battling the communist terrorists in Malaya. During the 1963-65 confrontation between Malaysia and Indo-



failing light that once never set on the British global empire!

nesia, British highlanders, patroling the jungles and waterways of Sarawak and Sabah, tuned the station's programs on transistorized portables.

The Singapore operation today is the stepchild of its powerful predecessor, R. SEAC, which broadcast from Ceylon during the immediate postwar years to the 1.3 million men in the South East Asian Command.

The Beginning. Though experimental programs date back to Christmas Day, 1932, when King George V broadcast his holiday message to the fleet in Malta, regular service was not established until 1943. Stations in the Middle East, North and East Africa brought radio enjoyment to members of the three armed services. Staffed by Army and Royal Air Force personnel, these transmitters presented special interest programs, musical requests and sports events outside the scope of the BBC's overseas service.

Planning for R. SEAC also began in 1943, though it did not go on the air until May 1946. The most ambitious Forces station in the world, its 100-kw transmitter, located in a palm grove 15 miles from its Colombo studios, pumped out six and a half hours of programming daily. Special "home folks" broadcasts were beamed to Great Britain each Sunday evening on 19 meters. But in

ABBREVIATIONS

BBC	British Broadcasting Company
BFBS	British Forces Broadcasting Service
DXers	radio listener interested in long distant reception
DXing	long distance, distant (contact or country)
FM	frequency modulation or frequency modulated
GMT	Greenwich Mean Time
kHz	kilohertz (kilocycles)
kW	kilowatt
MW	medium wave
QSL	decorated postal card or letter from station acknowledging reception report
R. SEAC	Radio Southeast Asia Comamnd
SW	shortwave
SWL	shortwave listener

Tommy's Dying Voice

April 1949, its operations ended and the transmitter was turned over to the Ceylon government.

During its three-year life, however, R. SEAC became a favorite with DXers. Many veteran SWLs still treasure their QSLs from this station.

The void left by its passing wasn't really felt for several years. When Commonwealth soldiers were rushed to Malaya in the '50's to stem the tide of terrorist activities, the government belatedly recognized the need. BFBS-Singapore filled the gap.

The End. Most of what remains of British power in Asia is concentrated on the 200-square-mile island nation at the tip of the Malay Peninsula, but some forces still remain in Malaysia, across the narrow Johore Strait. It is mainly for these servicemen, garrisoned in the Malaysian state of Malacca, that the station transmits its short wave programs.

Operations are directly controlled by the Far East Land Forces headquarters in Singapore, although overall supervision stems from the London offices in the Kings Buildings on Dean Stanley Street.

Its British-made Marconi transmitter and colinear dipole antenna are located in a hilly area near Jurong, a brand new industrial satellite town on the island's southwest coast, a few miles from the city of Singapore.

Though the schedule once listed programs in Kiswahili, Chinyanja, Fijian and Dyak languages, today only British and Gurkhali programs are aired. The latter serve the fierce Nepalese troops still in British uniform.

Parachute battalion commander briefs his men during the Indonesian-Malaysian dispute that brought Tommies east of Suez in 1965.

BFBS-Singapore is rare enough to be considered a good DX catch, but plenty of sharp listeners managed to log it during the past year. It does take a bit of patience, though, and a good ear helps, since interference sometimes masks the channel. The frequency is easy to locate, being just a short jump up the dial from WWV's familiar "ticks".

English programs are heard from 0630 to 1230 GMT, with a two-hour Gurkha program following. North American listeners can hear the station best after 1130 GMT,

(Continued on page 104)

BRITISH FORCES BROADCASTING CASUALTY LIST

Station	Location	Ceased SW Operations
FBS Middle East	Jerusalem, Palestine	1947
Radio SEAC	Colombo, Ceylon	1949
FBS No. 4	Lakatamia, Cyprus	About 1951
FBS Middle East	Malta Garrison, Malta	About 1951
FBS Experimental	Trieste	1954
FBS No. 5, North Africa	Benghazi, Libya	1957
FBS No. 2, East Africa	Nairobi, Kenya	About 1964
BFBS—Singapore	Singapore	?

Other British Forces Stations (MW and FM, Past and Present)—Cairo, Kabrit, Fayid, EGYPT; Tripoli, Tobruk, El Adem, LIBYA; Nicosia, Valetta, Limassol, Episkopi, Akrotiri, Dhekelia, CYPRUS; Gaza, Haifa, ISRAEL; Basra, IRAQ; Beirut, LEBANON; Mombassa, KENYA; Graz, Klagenfurt, Zeltweg, Vienna, AUSTRIA; Hamburg, Hannover, Langenberg, Herford, Berlin, Bonn, GERMANY; Rome, Naples, ITALY; Algiers, ALGERIA; Wellington Front, GIBRALTAR; OMAN; ADEN.

WHITE'S RADIO LOG

An up-to-date Directory of North American AM, FM, and TV Stations, including special sections on World-Wide Shortwave Stations and Emergency Stations for Selected Areas

WHITE'S RADIO LOG CONTENTS FOR 1969*

* If you save six consecutive issues of Radio-TV Experimenter and Science and Electronics, you will have a complete White's Radio Log. If you have missed an issue, you may be able to get a copy by writing directly to the publisher stating which issue you wish and enclosing $1.00 for each issue.

WHITE'S

RADIO LOG

U. S. AM Stations by Location

Listing indicates stations on the air up to February 14, 1969.

Location	C.L.	kHz
Abbeville, Ala.	WARI	1480
Abbeville, La.	KROF	960
Abbeville, S.C.	WABV	1590
Aberdeen, Md.	WAMO	970
Aberdeen, Miss.	WMPA	1240
Aberdeen, S.Dak.	KSDN	930
	KABR	1420
	KXRO	1320
Aberdeen, Wash.	KBKW	1450
Abilene, Tex.	KRBC	1470
	KCAD	1560
	KNIT	1280
	KWKC	1340
Abilene, Kansas	KABI	250
Abingdon, Va.	WBBI	1230
Ada, Okla.	KADA	1230
Adel, Ga.	WAAG	1470
Adrian, Mich.	WABJ	1490
Agana, Guam	KUAM	610
Aguadilla, P.R.	WABA	850
	WGRF	1340
Ahoskie, N.C.	WRCS	970
Aiken, S.C.	WAKN	990
	WLOW	1300
Ainsworth, Neb.	KBRB	1440
Aitkin, Minn.	KKIN	1000
Akron, Ohio	WAKR	1590
	WSLR	1350
	WCUE	1150
	WHLO	640
Alamogordo, N.M.	KALG	1230
	KINN	1270
Alamo Heights, Tex.	KDRY	1110
Alamosa, Colo.	KGIW	1450
Albany, Ga.	WALG	1590
	WFAZ	960
	WLYB	1250
	WGPC	1450
	WJAZ	960
Albany, Ky.	WANY	1390
Albany, Minn.	KASM	1150
Albany, N.Y.	WABY	1400
	WOKO	1460
	WPTR	1540
	WROW	590
Albany, Oreg.	KWIL	790
	KRKT	990
Albemarle, N.C.	WABZ	1010
	WZKY	1580
Albert Lea, Minn.	KATE	1450
Albertville, Ala.	WAVU	630
Albion, Mich.	WALM	1260
Albuquerque, N.M.	KABQ	1350
	KDEF	1150
	KGGM	610
	KHIP	1520
	KOB	770
	KPAR	1190
	KQEO	920
	KRZY	1450
	KVOD	730
	KZIA	1580
Alcoa, Tenn.	WEAG	1470
Alexander City, Ala.	KRZY	1450
	WRFS	1050
Alexandria, La.	KALB	580
	KDBS	1410
	KSYL	970
Alexandria, Minn.	KXRA	1490
Alexandria, Va.	WPIK	790
Algona, Iowa	KLGA	1600
Alice, Tex.	KOPY	1070
Alisal, Cal.	KRSA	1570
Allendale, S.C.	WDOG	1300
Allentown, Pa.	WHOL	1600
	WAEB	790
	WKAP	1320
	WSAN	1470
Alliance, Nebr.	KCOW	1400
Alliance, Ohio	WFAH	1310
Alisal, Calif.	KRSA	1570
Alma, Ga.	WULF	1400
Alma, Mich.	WFYC	1280
Alpena Township, Mich.	WATZ	1450
Alpine, Tex.	KVLF	1240
Altavista, Va.	WKDE	1000
Alton, Ill.	WOKZ	1570
Altona, Man.	CFAM	1290
Altoona, Pa.	WFBG	1290
	WRTA	1240
	WVAM	1430
Alturas, Calif.	KCNO	570
Altus, Okla.	KWHW	1450
Alva, Okla.	KALV	1430
Amarillo, Tex.	KDJW	1010
	KPUR	1440
	KGNC	710
	KIXZ	940
	KRAY	1360
	KZIP	1310
Ambridge, Pa.	WMBA	1460
Americus, Ga.	WDEC	1290
	WISK	1390
Ames, Iowa	KASI	1430
	WOI	640
Amherst, Mass.	WTTT	1430
Amherst, N.S.	CKDH	1400
Amherst, N.Y.	WUFO	1080
Amite, La.	WABL	1570
Amory, Miss.	WAMY	1580
Amsterdam, N.Y.	WKOL	1570
	WCSS	1490
Anaconda, Mont.	KANA	580
Anacortes, Wash.	KAGT	1340
Anaheim, Calif.	KEZY	1190
Anchorage, Alaska	KBYR	1270
	KFQD	750
	KENI	550
	KYAK	630
Andalusia, Ala.	WCTA	920
	WAAO	1530
Anderson, Cal.	KMRE	1580
Anderson, Ind.	WHUT	1470
	WHBU	1240
Anderson, S.C.	WAIM	1230
	WANS	1280
Andrews, Tex.	KACT	1360
Annapolis, Md.	WANN	1190
	WYRE	810
	WNAV	1430
Ann Arbor, Mich.	WAAM	1600
	WPAG	1050
Anna, Ill.	WRAJ	1440
Anniston, Ala.	WANA	1490
	WDNG	1450
	WHMA	1390
Annville-Cleona, Pa.	WAHT	1510
Anoka, Minn.	KANO	1470
Ansonia, Conn.	WAOS	690
Antigo, Wis.	WATK	900
Apollo, Pa.	WAVL	910
Apopka, Fla.	WTLN	1520
Apple Valley, Cal.	KAVR	960
Appleton, Wis.	WAPL	1570
	WHBY	1230
Aquadilla, P. R.	WUNA	1340
Arab, Ala.	WRAB	1380
Arcadia, Fla.	WAPG	1480
Arcata, Calif.	KENL	1340
	KATA	1340
Ardmore, Okla.	KVSO	1240
Ardmore, Tenn.	WSLV	1520
Arecibo, P.R.	WCMN	1280
	WMIA	1070
	WNIK	1230
Argentia, Nfld.	VOUS	1480
Arkadelphia, Ark.	KVRC	1240
Arkan. City, Kans.	KSOK	1280
Arlington, Fla.	WDGJ	1220
Arlington, Va.	WAVA	780
	WEAM	1390
Arroyo Grande, Calif.	KOAG	1280
Artesia, N.M.	KSVP	990
Arvada, Colo.	KQXI	1550
Ashburn, Ga.	WMES	1570
Asbury Park, N.J.	WJLK	1310
Asbury Park-Eatontown, N. J.	WHTG	1410
Asheboro, N.C.	WGWR	1260
Asheville, N.C.	WISE	1310
	WLOS	1380
	WSKY	1230
	WWNC	570
Ashland, Ky.	WCMI	1340
	WTCR	1420
Ashland, Ohio	WNCD	1340
Ashland, Oreg.	KWIN	1400
	KRVC	1350
Ashland, Va.	WIVE	1430
Ashland, Wis.	WATW	1400
Ashtabula, Ohio	WAQI	1600
	WREO	970
Aspen, Colo.	KSNO	1260
Astoria, Oreg.	KAST	1370
	KVAS	1230
Atchison, Kans.	KARE	1470
Athens, Ala.	WKAC	1080
Athens, Ga.	WGAU	1340
	WDOL	1470
	WKAC	1080
	WRFC	960
	KQXI	790
Athens, Ohio	WATH	970
	WOUB	1340
Athens, Tenn.	WLAR	1450
	WYXI	1390
Athens, Tex.	KBUD	1410
Atlanta, Ga.	WPLO	590
	WIGO	1340
	WAOK	1380
	WERD	790
	WGKA	1190
	WGST	920
	WGUN	1010
	WIIN	970
	WQXI	790
	WSB	750
	WYZE	1480
Atlanta-Decatur, Ga.	WGUN	1010
Atlanta, Tex.	KALT	900
Atlantic, Iowa	KJAN	1220
Atlantic Beach, Fla.	WKTX	1600
Atlantic City, N.J.	WFPG	1450
	WLDB	1490
	WMID	1340
Atmore, Ala.	WATM	1590
Atoka, Okla.	KEOR	1110
Attleboro, Mass.	WARA	1320
Auburn, Ala.	WAUD	1230
Auburn, Calif.	KAHI	950
Auburn, Ind.	WIFF	1150
Auburn, Me.	WPNO	1530
Auburn, N.Y.	WMBO	1340
	WAUB	1590
Auburn, Wash.	KASY	1220
Auburndale, Fla.	WTWB	1570
Auburndale, Wis.	WLBL	930
Augusta, Ark.	KMCW	1190
Augusta, Ga.	WAUG	1050
	WBBQ	1340
	WBIA	1230
	WGAC	580
	WROW	1480
	WTHB	1550
Augusta, Maine	WRDO	1400
	WFAU	1340
Aurora, Colo.	KOSI	1430
Aurora, Ill.	WMRO	1280
	WKKD	1580
Aurora, Mo.	KSWM	940
Austell, Ga.	WACX	1600
Austin, Minn.	KAUS	1480
	KQAQ	970
Austin, Tex.	KNOW	1490
	KHFI	970
	KTBC	590
	KOKE	1370
	KVET	1300
Ava, Mo.	KSOA	1430
Avalon, Cal.	KBIG	740
Avondale Estates, Ga.	WAVO	1420
Aztec, N. Mex.	KHAP	1340
Babylon, N.Y.	WBAB	1440
	WGLI	1290
Bad Axe, Mich.	WLEW	1340
Bainbridge, Ga.	WMGR	930
	WAZA	1360
Baker, Mont.	KFLN	960
Baker, Oreg.	KBKR	1490
Bakersfield, Calif.	KAFY	550
	KBIS	970
	KERN	1410
	KGEE	1230
	KUZZ	800
	KLYD	1350
	KWAC	1490
	KPMC	1560
Bellingham, Wash.	KPUG	1170
Baldwinsville, N.Y.	WSEN	1050
Ballinger, Tex.	KRUN	1400
Baltimore, Md.	WBAL	1090
	WAYE	860
	WBMD	750
	WCAO	600
	WCBM	680
	WEBB	1360
	WFBR	1300
	WITH	1230
	WSID	1010
	WWIN	1400
Bamberg-Denmark, S.C.	WWBD	790
Bangor, Maine	WABI	910
	WGUY	1250
	WLBZ	620
Banning, Calif.	KPAS	1490
Baraboo, Wis.	WBDO	740
Bardstown, Ky.	WBRT	1320
Barbourville, Ky.	WYWY	950
Barnesboro, Pa.	WNCC	950
Barnesville, Ga.	WBAF	1090
Barnwell, S.C.	WBAW	740
Barre, Vt.	WSNO	1450
Barstow, Calif.	KWTC	1230
	KIOT	1310
Bartlesville, Okla.	KWON	1400
Bartow, Fla.	WBAR	1460
Bassett, Va.	WODY	900
Bastrop, La.	KTRY	730
	KVOB	1340
Batavia, N.Y.	WBTA	1490
Batesburg, S.C.	WBLR	1430
Batesville, Ark.	KBTA	1340
Batesville, Miss.	WBLE	1290
Bath, Maine	WJTO	730
Bath, N.Y.	WFSR	1580
Baton Rouge, La.	WAIL	1260
	WLUX	1550
	WYNK	1380
	WIBR	1300
	WJBO	1150
	WLCS	910
	WXOK	1460
Battle Creek, Mich.	WBCK	930
	WKFR	1400
	WVOC	1500
Baxley, Ga.	WUFE	1260
Bayard, N.M.	KNFT	950
Bay City, Mich.	WBCM	1440
	WXOX	1250
Bay City, Tex.	KIOX	1270
Bay Minette, Ala.	WBCA	1150
Bayamon, P.R.	WLUZ	1600
	WRSJ	1560
Baytown, Tex.	KWBA	1360
Beacon, N.Y.	WBNR	1260
Beardstown, Ill.	WRMS	790
Beatrice, Nebr.	KWBE	1450
Beaufort, N.C.	WBMA	1400
Beaufort, S.C.	WBEU	960
	WSIB	1490
Beaumont, Tex.	KLVI	560
	KPYC	1450
	KTRM	990
Beaver Dam, Wis.	WBEV	1430
Beaver Falls, Pa.	WBVP	1230
Beckley, W. Va.	WJLS	560
	WCIR	1060
	WWNR	620
Bedford, Ind.	WBIW	1340
Bedford, Pa.	WBFD	1310
Bedford, Va.	WBLT	1350
Beeville, Tex.	KIBL	1490
Bel Air, Md.	WVOB	1520
Belen, N.Mex.	KARS	860
Belfast, Me.	WBME	1230
Belgrade, Mont.	KGVW	630
Bellaire, Ohio	WOMP	1290
Bellefontaine, O.	WTOO	1390
Bellefonte, Pa.	WBLF	1330
Bell Fourche, S.Dak.	KBFS	1450
Belle Glade, Fla.	WSWN	900
Belleville, Ont.	CJBQ	800
Belleville, Ill.	WIBV	1260
Bellevue, Wash.	KBVU	1540
	KFKF	1540
Bellingham, Wash.	KPUG	1170
	KGMI	790
	KOQT	1550
	KBFW	930
Belmont, N.C.	WCGC	1270
Beloit, Wis.	WGEZ	1490
	WBEL	1380
Belton, S.C.	WHPB	1390
Belton, Tex.	KTDN	940
Belzoni, Miss.	WELZ	1460
Bemidji, Minn.	KBUN	1450
Bend, Oreg.	KBND	1110
	KGRL	940
Bennetsville, S.C.	WBSC	1550
Bennington, Vt.	WBTN	1370
Benson, Minn.	KBMO	1290
Benson, N.C.	WPYB	1130
Benton, Ark.	KBBA	690
	KGKO	850
Benton, Ky.	WCBL	1290
Benton Harbor-St. Joseph, Mich.	WHFB	1060
Berkeley, Calif.	KPAT	1400
Berkeley Springs, W.Va.	WCST	1010
Berlin, N.H.	WMOU	1230
	WBRL	1400
Berlin, Wis.	WISS	1090
Berry Hill, Tenn.	WVOL	1470
Berryville, Ark.	KTHS	1480
Berwick, Pa.	WBRX	1280
Bessemer, Ala.	WYAM	1450
Bethesda, Md.	WGMS	570
Bethlehem, Pa.	WGPA	1100
Beverly, Mass.	WMLO	1570
Biddeford, Maine	WIDE	1400
Big Bear Lake, Cal.	KTOT	1050
Big Delta, Alaska	WXLL	980
Big Lake, Tex.	KBLT	1290
Big Rapids, Mich.	WBRN	1460
Big Sprg., Tex.	KBST	1490
	KHEM	1270
	KBYG	1400
Big Stone Gap, Va.	WLSD	1220
Biloxi, Miss.	WLOX	1490
	WVMI	570
Billings, Mont.	KBMY	1240
	KGHL	790
	KOOK	970
	KOYN	910
	KURL	730
Binghamton, N.Y.	WINR	680
	WKOP	1360
	WNBF	1290
Birmingham, Ala.	WAPI	1070
	WBRC	960
	WCRT	1260
	WAQY	1220

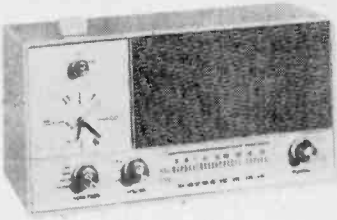
Location	C.L.	kHz
	WENN	1320
	WATV	900
	WSGN	610
	WYDE	850
	WVOK	690
Bisbee, Ariz.	KSUN	1230
Bishop, Calif.	KIBS	1230
Bishopville, S.C.	WAGS	1380
Bismarck, N.Dak.	KFYR	550
	KBMR	1350
Bismarck-Mandan, N.Dak.	KBOM	1270
Black Mountain, N.C.	WBMS	1350
	WFGW	1010
Black River Falls, Wis.	WWIS	1260
Blackfoot, Idaho	KBLI	690
Blacksburg, Va	WKEX	1430
Blackshear, Ga.	WBSG	1350
Blackstone, Va.	WKLV	1440
Blackwell, Okla.	KLTR	1580
Blaine, Wash.	KARI	550
Blakely, Ga.	WBBK	1260
Blanding, Utah	KUTA	790
Bloomington, Ill.	WJBC	1230
Bloomington, Ind.	WTTS	1370
Bloomsburg, Pa.	WCNR	930
	WHLM	550
Blountstown, Fla.	WKMK	1000
Blue Earth, Minn.	KBEW	1560
Bluefield, W.Va.	WHIS	1440
	WKOY	1240
Blythe, Calif.	KYOR	1450
Blytheville, Ark.	KLCN	910
Boaz, Ala.	WBSA	1300
Boca Raton, Fla.	WSBR	740
Bogalusa, La.	WJKC	1490
	WBOX	920
Boise, Ida.	KATN	950
	KBOI	670
	KEST	790
	KGEM	1140
	KIDO	630
	KYME	740
Bolivar, Mo.	KBLR	1130
Bolivar, Tenn.	WBOL	1560
Bonham, Tex.	KFYN	1420
Boone, Iowa	KFGQ	1260
	KWBG	1590
Boone, N.C.	WATA	1450
Boonville, Ind.	WBNL	1540
Boonville, Mo.	KWRT	1370
Booneville, Miss.	WBIP	1400
Boonville, N.Y.	WBRV	900
Borger, Tex.	KHUZ	1490
	KBBB	1600
Boston, Mass.	WBZ	1030
	WCOP	1150
	WILD	1090
	WEZE	1260
	WEEI	590
	WHDH	850
	WMEX	1510
	WRKO	680
	WRYT	950
Boulder, Colo.	KBOL	1490
Bowie, Tex.	KBAN	1410
Bowling Green, Ky.	WKCT	930
	WBGN	1340
	WLBJ	1410
Bowling Green, Mo.	KPCR	1530
Bowl. Green, Ohio	WMGS	730
Bozeman, Mont.	KXXL	1450
	KBMN	1230
Bradbury Hgts., Md.	WPGC	1580
Braddock, Pa.	WLOA	1550
Braddocks Heights, Md.	WMHI	1370
Bradenton, Fla.	WTRL	1490
	WBRD	1420
Bradford, Pa.	WESB	1490
Brady, Tex.	KNEL	1490
Brainerd, Minn.	KLIZ	1380
	KVBR	1340
Brandon, Miss.	WRKN	970
Branson, Mo.	KBHM	1220
Brantford, Ont.	CKPC	1380
Brattleboro, Vt.	WTSA	1450
	WKVT	1490
Brawley, Calif.	KROP	1300
Brazil, Ind.	WWCM	1380
Breckenridge, Minn.	KBMW	1450
Breckenridge, Tex.	KSTB	1430
Bremen, Ga.	WWCC	1440
Bremerton, Wash.	KBRO	1490
Brenham, Tex.	KWHI	1280
Brevard, N.C.	WPNF	1240
Brewster, N.Y.	WPUT	1510
Brewton, Ala.	WEBJ	1240
Bridgeport, Ala.	WBTS	1480
Bridgeport, Conn.	WICC	600
	WOJZ	1530
	WNAB	1450
Bridgeton, N.J.	WSNJ	1240
Brigham City, Utah	KBUH	800
Brighton, Colo.	KBRN	800
Brinkley, Ark.	KBRI	1570
Bristol, Conn.	WBIS	1440
Bristol, Tenn.	WOPI	1490
	WKYE	1550
Bristol, Va.	WCYB	690
	WFHG	980

Location	C.L.	kHz
Brockton, Mass.	WBET	1460
	WOKW	1410
Brockville, Ont.	CFJR	1450
Broken Bow, Nebr.	KCNI	1280
Bronson, Mo.	KBHM	1220
Brookfield, Conn.	WINE	940
Brookfield, Mo.	KGHM	1470
Brookhaven, Miss.	WCHJ	1470
	WJMB	1340
Brookings, Oreg.	KURY	910
Brookings, S.Dak.	KBRK	1430
Brookline, Mass.	WBOS	1600
Brookneal, Va.	WODI	1230
Brooksville, Fla.	WWJB	1450
Brownfield, Tex.	KKUB	1300
Brownsville, Pa.	WASP	1130
Brownsville, Tenn.	WBHT	1520
Brownsville, Tex.	KBOR	1600
Brownwood, Tex.	KBWD	1380
	KEAN	1240
Brunswick, Ga.	WGIG	1440
	WMOG	1490
	WYNR	790
Brunswick, Maine	WCME	900
Brunswick, Md.	WTRI	1520
Bryan, Ohio	WBNO	1520
Bryan, Tex.	KORA	1240
	WTAW	1150
Bryson City, N.C.	WBHN	1590
Bucknannon, W.Va.	WBUC	1460
Bucyrus, Ohio	WBCO	1540
Buffalo, N.Y.	WBEN	930
	WYSL	1400
	WEBR	970
	WGR	550
	WKBW	1520
	WWOL	1120
Buffalo, Wyo.	KBBS	1450
Buford, Ga.	WDYZ	1460
Burbank, Cal.	KBBQ	1500
Burien, Wash.	KJWE	800
Burley, Idaho	KBAR	1230
Burlington, Colo.	KNAB	1140
Burlington, Iowa	KBUR	1490
	KYND	1150
Burlington, N.C.	WBBB	920
	WBAG	1150
Burlington, Vt.	WDOT	1400
	WJOY	1230
	WVMT	620
Burnett, Tex.	KTSL	1340
Burnettown, S.C.	WVAP	1510
Burney, Cal.	KAVA	1450
Burns, Oreg.	KRNS	1230
Burnsville, N.C.	WKYK	1540
Butler, Ala.	WPRN	1240
Butler, Mo.	KMAM	1530
Butler, Pa.	WBUT	1050
	WISR	680
Butte, Mont.	KBOW	550
	KXLF	1370
Cadillac, Mich.	WATT	1240
	WWAM	1370
Cadiz, Ky.	WKDZ	1110
Caguas, P.R.	WNEL	1430
	WVJP	1110
Cairo, Ga.	WGRA	790
Cairo, Ill.	WKRO	1490
Calais, Maine	WQDY	1230
Caldwell, Idaho	KCID	1490
	KBGN	910
Calera, Ala.	WBYT	1370
Calexico, Calif.	KICO	1490
Calhoun, Ga.	WCGA	900
	WEBS	1110
Calhoun City, Miss.	WURL	1530
Camas, Wash.	KVAN	1480
Cambridge, Md.	WCEM	1240
Cambridge, Mass.	WCAS	740
Cambridge, Ohio	WILE	1270
Camden, Ala.	WCOX	1540
Camden, Ark.	KAMD	910
	KJWH	1450
Camden, N.J.	WCAM	1310
	WTMR	800
Camden, S. C.	WACA	1590
Camden, Tenn.	WFWL	1220
Cameron, Tex.	KMIL	1330
Camilla, Ga.	WCLB	1220
Campbell, Ohio	WHOT	1330
Campbellsville, Ky.	WTCO	1450
Canandaigua, N.Y.	WCGR	1550
Cannon City, Colo.	KRLN	1400
Canonsburg, Pa.	WARO	540
Canton, Ga.	WCHK	1290
Canton, Ill.	WBYS	1560
Canton, Miss.	WMGO	1370
Canton, N.C.	WWIT	970
Canton, O.	WHBC	1480
	WOIO	1060
	WINW	1520
	WNYN	900
Canyon, Tex.	KCAN	1550
Cape Girardeau, Mo.	KFVS	960
	KZYM	1220
	KGMO	1550
Carbondale, Ill.	WCIL	1020
Carbondale, Pa.	WCDL	1440
Caribou, Maine	WFST	600
Carlisle, Pa.	WHYL	960
	WIOO	1000
Carlsbad, N.Mex.	KAVE	1240
	KBAD	740

Location	C.L.	kHz
	KCCC	930
Carmel, Calif.	KRML	1410
Carmi, Ill.	WROY	1460
Carnegie, Pa.	WZUM	1590
Caro, Mich.	WKYO	1360
Carolina, P. R.	WVOZ	1400
Carrington, N.Dak.	KDAK	1600
Carrizo Springs, Tex.	KBEN	1450
Carroll, Iowa	KCIM	1380
Carrollton, Ala.	WRAG	590
Carrollton, Ga.	WLBB	1100
Carrollton, Mo.	KAOL	1430
Carson City, Nev.	KRWL	1300
Cartersville, Ga.	WBHF	1450
	WKRW	1270
Carthage, Ill.	WCAZ	990
Carthage, Mo.	KDMO	1490
Carthage, Miss.	WECP	1490
Carthage, Tenn.	WRKM	1350
Carthage, Tex.	KGAS	590
Caruthersville, Mo.	KCRV	1370
Casa Grande, Ariz.	KPIN	1260
Casey, Ill.	WKZI	800
Casper, Wyo.	KTWO	1030
	KATI	1400
Cathedral City, Calif.	KVOC	1230
	KWXY	1340
Cayce, S.C.	WCAY	620
Cayey, P.R.	WLEY	1080
Cedar City, Utah	KSUB	590
Cedar Falls, Iowa	KCFI	1250
Cedar Rapids, Iowa	KCRG	1600
	KLWW	1450
	WMT	600
	KHAK	1360
Cedartown, Ga.	WGAA	1340
Celina, Ohio	WCSM	1350
Center, Ala.	WEIS	990
	WAGC	1550
Center, Tex.	KDET	930
Centerville, Ala.	WBIB	1590
Centerville, Iowa	KCOG	1400
Centerville, Ind.	WHON	930
Centreville, Miss.	WLBS	1580
Centerville, Tenn.	WHLP	1570
Centerville, Utah	KBBC	1600
Central City, Ky.	WNES	1050
	WMTA	1380
Centralia, Ill.	WILY	1210
Centralia & Chehalis, Wash.	KELA	1470
Central Point, Ore.	KPTN	1400
Centreville, Ala.	WBIB	1110
Ceres, Calif.	KLOC	920
Chadburn, N.C.	WVOE	1590
Chadron, Nebr.	KCSR	610
Chambersburg, Pa.	WCHA	800
	WCBG	1590
Champaign, Ill.	WOWS	1400
Chanute, Kans.	KCRB	1460
Chapel Hill, N.C.	WCNL	1360
Chardon, O.	WBKC	1560
Charlerol, Pa.	WESA	940
Charles City, Iowa	KCHA	1580
Charleston, Ill.	WEIC	1270
Charleston, Mo.	KCHR	1350
Charleston, S.C.	WCSC	1390
	WOKE	1340
	WPAL	730
	WQSN	1450
	WTMA	1250
Charleston, W.Va.	WCAW	680
	WCHS	580
	WGKV	1490
	WKAZ	950
	WTIP	1240
	WXVA	1550
Charlotte, Mich.	WCER	1390
Charlotte, N.C.	WBT	1100
	WAYS	610
	WGIV	1600
	WKTC	1310
	WSOC	930
	WIST	1240
	WWOK	1480
	WRPL	1540
Charlotte Amalie, V.I.	WBNB	1000
	WSTA	1340
	WBNB	1000
Charlottesville, Va.	WCHV	1260
	WELK	1010
	WINA	1070
Chase City, Va.	WMEK	980
Chatham, Va.	WKBY	1080
Chattahoochee, Fla.	WSBP	1580
Chattanooga, Tenn.	WMOC	1450
	WDEF	1370
	WDOD	1310
	WOXB	1490
	WGOW	1150
	WNOO	1260
Cheboygan, Mich.	WCBY	1240
Cheektowaga, N.Y.	WNIA	1230
Chehalis-Centralia, Wash.	KITI	1420
Chelan, Wash.	KOZI	1220
Cheraw, S.C.	WCRE	1420
Cherryville, N. C.	WCSL	1590
Cherokee, Iowa	KCHE	1440

Location	C.L.	kHz
Chesapeake, Va.	WCPK	1600
Chester, Ill.	KSGM	980
Chester, Pa.	WEEZ	1590
	WVCH	740
Chester, S.C.	WGCD	1490
Chester, Va.	WIKI	1410
Chestertown, Md.	WCTR	1530
Cheyenne, Wyo.	KFBC	1240
	KCGO	1590
	KRAE	1480
	KVWO	1370
Chicago, Ill.	WAIT	820
	WBBM	780
	WCFL	1000
	WCRW	1240
	WEDC	1240
	WGN	720
	WGRP	950
	WIND	560
	WJJD	1160
	WLS	890
	WMAQ	670
	WMBI	1110
	WNUS	1390
	WSBC	1240
Chicago Hgts., Ill.	WMPP	1470
	WCGO	1600
Chickasha, Okla.	KWCO	1560
Chico, Calif.	KHSL	1290
	KPAY	1060
Chicopee, Mass.	WACE	730
Chiefland, Fla.	WKQH	940
Childress, Tex.	KCTX	1510
Chillicothe, Mo.	KCHI	1010
Chillicothe, Ohio	WBEX	1490
	WCHI	1350
Chipley, Fla.	WBGC	1240
Chippewa Falls, Wis.	WAXX	1150
Christiansburg, Va.	WJJJ	1260
Christiansted, V.I.	WSTX	970
Church Hill, Tenn.	WMCH	1260
Cicero, Ill.	WVON	1450
Cincinnati, Ohio	WCKY	1530
	WCIN	1480
	WKRC	550
	WLW	700
	WSAI	1360
	WUBE	1230
	WZIP	1050
Clanton, Ala.	WKLF	980
Clare, Mich.	WCRM	990
Claremont, N.H.	WTSV	1230
Claremore, Okla.	KWPR	1270
Clarion, Pa.	WWCH	1300
Clarksburg, W.Va.	WBOY	1400
	WHAR	1340
	WPDX	750
Clarksdale, Miss.	WROX	1450
	WKDL	1600
Clarksville, Ark.	KLYR	1360
Clarksville, Tenn.	WJZM	1400
	WDXN	540
Clarksville, Tex.	KCAR	1350
Claxton, Ga.	WCLA	1470
Clayton, Ga.	WGHC	1570
Clayton, Mo.	KXLW	1320
	KFUO	850
Clayton, N.Mex.	KLMX	1450
Clearfield, Pa.	WCPA	900
Clearwater, Fla.	WTAN	1340
	WAZE	860
Cleburne, Tex.	KCLE	1120
Clermont, Fla.	WSLC	1340
Cleveland, Ga.	WRWH	1350
Cleveland, Miss.	WCLD	1490
	WOSK	1410
Cleveland, Ohio	WKYC	1100
	WIXY	1260
	WERE	1300
	WGAR	1220
	WHK	1420
	WABQ	1540
	WJW	850
Cleveland, Tenn.	WBAC	1340
	WCLE	1570
Cleveland, Tex.	KVLB	1410
Cleve. Hgts., Ohio	WJMO	1490
Clewiston, Fla.	WOWY	1590
Clifton, Ariz.	KCLF	1400
Clifton Forge, Va.	WCFV	1230
Clincho, Va.	WOIC	1430
Clinton, Ill.	WHOW	1520
Clinton, Iowa	KCLN	1390
	KROS	1340
Clinton, Mo.	KDKO	1280
Clinton, N.C.	WRRZ	880
Clinton, Okla.	KWOE	1320
Clinton, S.C.	WPCC	1410
Clinton, Tenn.	WYSH	1380
Cloquet, Minn.	WKLK	1230
Clovis, N.Mex.	KCLV	1240
	KICA	980
Coachella, Calif.	KCHV	970
Coalinga, Cal.	KOLI	1470
Coamo, P.R.	WCPR	1450
Coatesville, Pa.	WCOJ	1420
Cochran, Ga.	WVMG	1440
Cocoa, Fla.	WKKO	860
	WEZY	1350
	WWBC	1510
Cocoa Beach, Fla.	WRKT	1300
Cody, Wyo.	KODI	1400
Coeur d'Alene, Ida.	KVNI	1240

New Kits For Home And Hobby...



NEW
Kit GR-58
$47.95*

Heathkit GR-58 Solid-State AM/FM Clock Radio

An easy way to get up . . . choose news & weather on AM or the bright sound of FM music. AFC for easy FM tuning. Use "Auto" position for only radio, or the "Alarm" setting for alarm & radio. The clock-controlled accessory AC socket will even perk coffee for you in the morning. The "Snooze" button turns off the alarm for 10 minute periods until you move the function switch . . . lets you wake up gradually. Easy circuit board construction. For an easy way to get up, order yours now. 8 lbs.

NEW
Kit GR-48
$39.95*

Heathkit GR-48 Solid-State AM/FM Table Radio

An ideal table radio for any room in the house. All solid-state circuitry delivers the same excellent sound as the GR-58 above, but without the clock and alarm functions. An Automatic Frequency Control position on the mode switch locks that FM station in and makes tuning easy. Designer-styled avocado green cabinet with matching grille cloth. Fast, simple circuit board construction. 5 lbs.

NEW
Kit IG-28
$79.95*

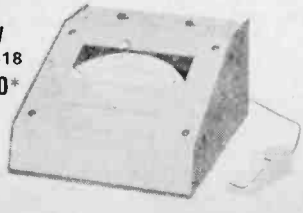
Heathkit IG-28 Solid-State Color-Bar—Dot Generator

The new Heathkit IG-28 is the most advanced instrument of its type available . . . at any price. Computer-type integrated circuitry eliminates divider chain adjustments and instability — no flutter, jitter or bounce . . . ever. Delivers 12 patterns — standard 9x9 dots, cross-hatch, vertical & horizontal lines, color bars & shading bars . . . plus the exclusive Heath "3 x 3" display of all patterns . . . plus a clear raster so necessary for purity adjustments. Also features variable front panel tuning for channels 2 through 6, front panel sync output, two front panel convenience outlets, variable positive or negative video output, built-in gun shorting circuits and grid jacks and vectorscope display capability. 8 lbs.

NEW
kit SB-500
$179.95*

Heathkit SB-500 2-Meter Transverter

The new SB-500 allows owners of Heathkit models SB-101, SB-110A, HW-100 and the SB-301/401 combination to operate on 2-meters without having to buy a complete new rig. It gives complete, reliable SSB & CW facilities from 144 to 148 MHz and features a husky 50 watts output, fast, easy tuning and a 0.2 uV receiver sensitivity. A built-in meter monitors final plate current or relative power. Internal relays eliminate cable changing when switching from LB gear to the SB-500. Step up to "2" now, with the SB-500. 19 lbs.



NEW
Kit PM-18
$62.00*

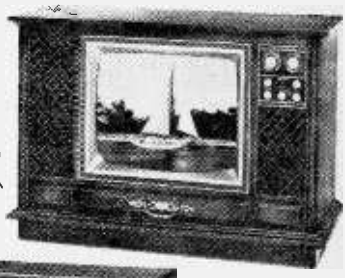
Heathkit PM-18 Fotoval® II Darkroom Computer

A new, low cost way to consistently produce beautiful B & W prints . . . without time, money and paper-wasting test strips. Once programmed, Fotoval II Darkroom Computer eliminates guesswork by accurately determining correct paper grade and exposure time — instantly. Put your negative in enlarger, make two quick readings with the built-in Exposure Probe, adjust enlarging diaphragm, expose for indicated time, and develop. The result is a beautiful print. Quick, easy conversion to color work too, with the accessory Color Probe Kit. 7 lbs.

From The Leader

HEATHKIT®

Now There are 4 Heathkit Color TV's... All With 2-Year Picture Tube Warranty



Kit GR-681
$499.95*
(less cabinet)

NEW Deluxe "681" Color TV With Automatic Fine Tuning

The new Heathkit "681" is the most advanced color TV on the market. Compare the GR-681 against any other set available, at any price . . . there isn't one that has all of these advanced features . . . Factory assembled Automatic Fine Tuning on all 83 channels that locks in the best color picture in the industry . . . Push-button Power Channel selection on VHF . . . Built-in cable-type remote control for turning set on and off and changing VHF channels . . . Provision for adding Wireless Remote Control at any time . . . Bridge-type low voltage power supply for superior regulation . . . plus the self-servicing features standard on all Heathkit color TV's . . . plus all the features of the GR-295 below. Compare the "681" against the rest . . . and be convinced. 135 lbs.

GRA-295-4, Mediterranean cabinet shown.....**$119.50***
Other cabinets from $62.95*

Kit GR-295
$449.95*
(less cabinet)

Deluxe "295" Color TV... Model GR-295

The GR-295 is packed with performance . . . a top quality American brand 295 sq. in. color tube with improved phosphors and a boosted B + supply deliver brighter, livlier color . . . Automatic degaussing . . . Exclusive Heath Magna-Shield . . . Automatic Color Control & AGC for pure, flutter-free pictures under all conditions . . . preassembled 3-stage IF . . . Deluxe VHF tuner with "memory" fine tuning . . . hi-fi sound output . . . 300 & 75 ohm VHF antenna inputs . . . plus exclusive Heath self-servicing features that can save you hundreds of dollars. 131 lbs.

GRA-295-1, Walnut cabinet shown.....**$62.95***
Other cabinets from $99.95*

Kit GR-227
$399.95*
(less cabinet)

Deluxe "227" Color TV... Model GR-227

Has same high performance & built-in self-servicing features as "295", except for 227 sq. in. screen. And, like the "295", it can be installed three ways — in one of the beautiful Heath factory assembled cabinets, your own custom cabinet or in a wall. 114 lbs.

GRA-227-1, Walnut cabinet shown.....**$59.95***
Other cabinets from $36.95*

Kit GR-180
$349.95*
(less cabinet)

Deluxe "180" Color TV... Model GR-180

The "180" features the same remarkable performance and built-in self-servicing facilities as the "295" except for 180 sq. in. viewing area. Feature for feature, the "180" is easily your best buy in color TV. 102 lbs.

GRS-180-5, table model cabinet and cart.....**$39.95***
Other cabinets from $24.95*

Now, Wireless Remote Control For Heathkit Color TV's

New Wireless Remote Control turns your Heathkit color TV on & off, changes VHF channels, adjusts volume, color and tint — all by sonic control. Installs on any rectangular tube Heathkit Color TV, even if you built it years ago. Circuit board/wiring harness construction.

Kit GRA-681-6, 7 lbs., for Heathkit GR-681 Color TV's.....**$59.95***
Kit GRA-295-6, 9 lbs., for Heathkit GR-295 & GR-25 TV's.....**$69.95***
Kit GRA-227-6, 9 lbs., for Heathkit GR-227 & GR-180 TV's.....**$69.95***

New Wireless
TV Remote Control
For GR-295, GR-227
& GR-180
$69.95

New Wireless
TV Remote Control
For GR-681
$59.95

NEW
FREE 1969 CATALOG!
Now with more kits, more color. Fully describes these along with over 300 kits for stereo/hi-fi, color TV, electronic organs, electric guitar & amplifier, amateur radio, marine, educational, CB, home & hobby. Mail coupon or write Heath Company, Benton Harbor, Michigan 49022.

HEATHKIT®

HEATH COMPANY, Dept. 19-6
Benton Harbor, Michigan 49022

☐ Enclosed is $_____ plus shipping.
Please send model (s)_____
☐ Please send FREE Heathkit Catalog.
☐ Please send Credit Application.

Name_____

Address_____

City_____ State_____ Zip_____

*Mail order prices; F.O.B. factory. Prices & specifications subject to change without notice. CL 355

WHITE'S

RADIO LOG

Location	C.L.	kHz
Coffeyville, Kans.	KGGF	690
Colby, Kans.	KXXX	790
Coldwater, Mich.	WTVB	1590
Coleman, Tex.	KSTA	1000
Colfax, Wash.	KCLX	1450
College Park, Ga.	WBAD	1570
Collierville, Tenn.	WPIP	1590
Colonial Heights, Va.	WPVA	1290
Colorado City, Tex.	KVMC	1320
Colo. Sprgs., Colo.	KRDO	1240
	KPIK	1580
	KVOR	1300
	KSSS	740
	KYSN	1460
	KRYT	1530
Columbia, Ky.	WAIN	1270
Columbia, La.	KCTO	1540
Columbia, Miss.	WCJU	1450
Columbia, Mo.	KFRU	1400
	KTGR	1580
Columbia, Pa.	WCOY	1580
Columbia, S.C.	WCOS	1400
	WIS	560
	WDIC	1320
	WNDK	1230
	WQXL	1470
Columbia, Tenn.	WMCP	1280
	WKRM	1340
Columbus, Ga.	WDAK	540
	WRBL	1420
	WHYD	1270
	WCLS	1580
	WOKS	1340
Columbus, Ind.	WCSI	1010
Columbus, Miss.	WACR	1050
	WCBI	550
	WMBO	1400
Columbus, Nebr.	KJSK	900
	KTTT	1510
Columbus, Ohio	WBNS	1460
	WCOL	1230
	WMNI	920
	WOSU	820
	WTVN	610
	WVKO	1580
Colville, Wash.	KCVL	1270
Comanche, Tex.	KCOM	1550
Commerce, Ga.	WJJC	1270
Concord, Calif.	KWUN	1480
Concord, N.H.	WKXL	1450
Concord, N.C.	WEGO	1410
Concordia, Kans.	KNCK	1390
Conneaut, Ohio	WWOW	1360
Connellsville, Pa.	WCVI	1340
Connersville, Ind.	WCNB	1580
Conroe, Tex.	KMCO	900
Conway, Ark.	KCON	1230
	KVEE	1330
Conway, N.H.	WBNC	1050
Conway, S.C.	WLAT	1330
Cookeville, Tenn.	WHUB	1400
	WPTN	1550
Coolidge, Ariz.	KCKY	1150
Coos Bay, Oreg.	KDOS	1250
	KYNG	1420
Copper Hill, Tenn.	WLSB	1400
Coquille, Oreg.	KWRO	630
Coral Gables, Fla.	WRIZ	1550
	WVCG	1080
Corbin, Ky.	WCTT	680
	WYGO	1330
Cordele, Ga.	WMJM	1490
Cordova, Alaska	KLAM	1450
Corinth, Miss.	WCMA	1230
	WKCU	1350
Cornelia, Ga.	WCON	1450
Corning, Ark.	KCCB	1260
Corning, N.Y.	WCBA	1350
	WCLI	1450
Cornwall, N.Y.	WWLE	1170
Corona, Cal.	KREL	1370
Corpus Christi, Tex.	KCTA	1030
	KCCT	1150
	KEYS	1440
	KRYS	1360
	KSIX	1230
	KUNO	1400
Corry, Pa.	WDTR	1370
Corsicana, Tex.	KAND	1340
Cortez, Colo.	KVFC	740
Cortland, N.Y.	WKRT	920
Corvallis, Ore.	KLOO	1340
	KFLY	1240
	KOAC	550
Corydon, Ind.	WPDF	1550
Coshocton, Ohio	WTNS	1560
Cottage Grove, Ore.	KNND	1400
Cottonwood, Ariz.	KVRD	1240
	KVIO	1600
Coudersport, Pa.	WFRM	600
Council Bluffs, Iowa	KRCB	1560
Courtenay, B.C.	CFCP	1440
Covington, Ga.	WGFS	1430
Covington, Ky.	WCLU	1320
Covington, La.	WARB	730
Covington, Tenn.	WKBL	1250
Covington, Va.	WKEY	1340
Cowan, Tenn.	WZYX	1440
Cozad, Neb.	KAMI	1580
Craig, Colo.	KRAI	550
Crane, Tex.	KCRR	1380
	KBSN	970
Crawfordsville, Ind.	WCVL	1550
Crescent City, Calif.	KPLY	1240
	KPOD	1310
Creston, Iowa	KSIB	1520
Crestview, Fla.	WCNU	1010
	WJSB	1050
Crewe, Va.	WSVS	800
Crockett, Tex.	KIVY	1290
Crookston, Minn.	KRDX	1260
Crossett, Ark.	KAGH	800
Crossville, Tenn.	WAEW	1330
	WCSV	1520
Crowley, La.	KSIG	1450
Crozet, Va.	WPED	810
Crystal Lake, Ill.	WCLR	850
Cuero, Tex.	KCFH	1600
Cullman, Ala.	WFMH	1460
	WKUL	1340
Culpeper, Va.	WCVA	1490
Cumberland, Ky.	WCPM	1280
Cumberland, Md.	WCUM	1230
	WUOK	1270
	WTBD	1450
Cummings, Ga.	WSNE	1410
Cushing, Okla.	KUSH	1600
Cuyahoga Falls, Ohio	WCUE	1150
Cypress Gardens, Fla.	WGTO	540
Cynthiana, Ky.	WCYN	1400
Dade City, Fla.	WDCF	1350
Dadeville, Ala.	WDVC	910
Daingerfield, Tex.	KEGG	1560
Dalhart, Tex.	KXIT	1410
Dallas, N.C.	WAAK	960
Dallas, Oreg.	KRDW	1460
Dallas, Tex.	KRLD	1060
	KIXL	1040
	KSKY	660
	KLIF	1190
	WFAA	570
	WFAA	820
	KBOX	1480
	WRR	1310
Dalton, Ga.	WBLJ	1230
	WRCD	1430
	WTTI	1530
Danbury, Conn.	WLAD	800
Danville, Ill.	WDAN	1490
	WITY	980
Danville, Ky.	WHIR	1230
Danville, Pa.	WPGM	1570
Danville, Va.	WBTM	1330
	WYPR	970
	WDVA	1250
	WILA	1580
Dardanelle, Ark.	KCAB	980
Darlington, S.C.	WDAR	1350
Davenport, Iowa	WOC	1420
	KWNT	1580
	KSTT	1170
Dawson, Ga.	WDWD	990
Dayton, Ohio	WHIO	1290
	WING	1410
	WONE	980
	WAVI	1210
Dayton, Tenn.	WDNT	1280
Daytona Beach, Fla.	WNDB	1150
	WMFJ	1450
	WROD	1340
Deadwood, S.Dak.	KDSJ	980
Dearborn, Mich	WKNR	1310
Decatur, Ala.	WHDS	800
	WAJF	1490
	WMSL	1400
Decatur-Atlanta, Ga.	KGUN	1010
	WOMN	1310
Decatur, Ill.	WDZ	1050
	WSDY	1340
Decatur, Ind.	WADM	1540
Decorah, Iowa	KDEC	1240
	KWLC	1240
Deer Lodge, Mont.	KDRG	1400
Deerfield, Va.	WABH	1150
Defiance, Ohio	WDNW	1280
De Funiak Springs, Fla.	WDSP	1280
	WZEP	1460
De Kalb, Ill.	WLBK	1360
De Land, Fla.	WJBS	1490
	WOOO	1310
Delano, Calif.	KCHJ	1010
Delaware, Ohio	WDLE	1550
Delray, Bch., Fla.	WDBF	1420
Del Rio, Tex.	KDLK	1230
	KWDR	810
	KWMC	1490
Delta, Colo.	KDTA	1400
Deming, N.Mex.	KOTS	1230
Demopolis, Ala.	WXAL	1400
Denham Sprgs., La.	WLBI	1220
Denison, Ia.	KDSN	1530
Denison-Sherman, Tex.	KDSX	950
Denmark-Bamberg, S.C.	WWBD	790
Denton, Tex.	KDNT	1440
Denver, Colo.	KDEN	1340
	KFML	1390
	KHOW	630
	KIMN	950
	KLIR	990
	KLZ	560
	KBTR	710
	KOA	850
	KPOF	910
	KFSC	1220
	KTLN	1280
Denver City, Tex.	KKAL	1580
De Queen, Ark.	KDQN	1390
DeRidder, La.	KDLA	1010
DeSoto, Mo.	KHAD	1190
Des Moines, Iowa	KCBC	1390
	KIOA	940
	KRNT	1350
	KSO	1460
	KWKY	1150
	WHO	1040
Detroit, Mich.	WCAR	1130
	WJBK	1500
	WJLB	1400
	WJR	760
	WWJ	950
	WXYZ	1270
Detroit Lakes, Minn.	KDLM	1340
Devils Lake, N.Dak.	KDLR	1240
DeWitt, Ark.	KDEW	1470
Dexter, Mo.	KDEX	1590
Diboll, Tex.	KSPL	1260
Dickinson, N.Dak.	KDIX	1230
Dickson, Tenn.	WDKN	1260
Dillon, Mont.	KDBM	1490
Dillon, S.C.	WDSC	800
Dimmitt, Tex.	KDHN	1470
Dinuba, Calif.	KRDU	1130
Dixon, Ill.	WIXN	1460
Dodge City, Kans.	KGNO	1370
	KEDD	1550
Dodgeville, Wis.	WDMP	810
Donaldsonville, Ga.	WSEM	1500
Donaldsonville, La.	WDLV	1090
Donaldsonville, La.	WSLG	1090
Doneison, Tenn.	WAMB	1190
Doniphan, Mo.	KDFN	1500
Dothan, Ala.	WAGF	1320
	WDIG	1450
	WDOF	560
Douglas, Ariz.	KAWT	1450
	KAPR	930
Douglas, Ga.	WDMG	860
	WDKA	1310
Douglas, Wyo.	KWIV	1050
Douglasville, Ga.	WDGL	1520
Dover, Del.	WDOV	1410
	WKEN	1600
Dover-Foxcraft, Me.	WDME	1340
Dover, N.J.	WRAN	1510
Dover, N.H.	WTSN	1270
Dover, Ohio	WJER	1450
Dowagiac, Mich.	WDOW	1440
Doylestown, Pa.	WBUX	1570
Dublin, Ga.	WMLT	1330
	WXLI	1230
Du Bois, Pa.	WCED	1420
Dubuque, Iowa	KDTH	1370
	WDBQ	1490
Duluth, Minn.	KDAL	610
	WEBC	560
	KAOH	1390
Dumas, Ark.	KDDA	1560
Dumas, Tex.	KDDD	800
Duncan, Okla.	KRHD	1350
Dundee, N.Y.	WFLR	1570
Dunkirk, N.Y.	WDOE	1410
Dunn, N.C.	WCKB	780
Du Quoin, Ill.	WDQN	1580
Durand, Wis.	WRDN	1430
Durango, Colo.	KIUP	930
	KDGO	1240
Durant, Okla.	KSFO	750
Durham, N.C.	WDNC	620
	WSRC	1410
	WSSB	1490
	WTIK	1310
Dyersburg, Tenn.	WDSG	1450
	WTRO	1330
Eagle Pass, Tex.	KEPS	1270
Eagle River, Wis.	WERL	950
Easley, S.C.	WELP	1360
E. Grand Forks, Minn.	KRAD	1590
Eastland, Tex.	KERC	1590
E. Lansing, Mich.	WKAR	870
	WVIC	730
E. Liverpool, Ohio	WOHI	1490
East Longmeadow, Mass.	WTYM	1600
Eastman, Ga.	WUFF	710
E. Moline, Ill.	WDLM	960
E. Point, Ga.	WTJH	1260
East Prairie, Mo.	KGCL	1080
E. Syracuse, N.Y.	WPAW	1540
Easton, Md.	WEMD	1460
Easton, Pa.	WEEX	1230
	WEST	1400
Eatonton, Ga.	WXPQ	1520
Eatontown, N.J.	WHTG	1410
Eau Claire, Wis.	WEAQ	790
	WBIZ	1400
	WECL	1050
Eau Gallie, Fla.	WMEG	920
	WTAI	1360
Ebensburg, Pa.	WEND	1580
Edenton, N.C.	WCDJ	1260
Edinburg, Tex.	KURV	710
Edmonds, Wash.	KGDN	630
Effingham, Ill.	WCRA	1090
Elba, Ala.	WELB	1350
Elberton, Ga.	WSGC	1400
El Cajon, Calif.	KDEO	910
El Campo, Tex.	KULP	1390
El Centro, Calif.	KXO	1230
	KAMP	1430
El Dorado, Ark.	KDMS	1290
	KELD	1400
Eldorado, Kans.	KBTO	1360
Eldorado Springs, Mo.	KESM	1580
Eleele, Kanai, Hawaii	KUAI	720
Elgin, Ill.	WRMN	1410
Elizabeth, N.J.	WELA	1530
Elizabeth City, N. C.	WCNC	1240
	WGAI	860
Elizabethton, Tenn.	WBEJ	1240
	WIDD	1520
Elizabethtown, Ky.	WIEL	1400
Elizabethtown, N.C.	WBLA	1440
Elizabethtown, Pa.	WHRY	1600
Elk City, Okla.	KBEK	1240
Elkhart, Ind.	WTRC	1340
	WCMR	1270
Elkins, N.C.	WIFM	1540
Elkins, W.Va.	WDNE	1240
Elko, Nev.	KELK	1240
Elkton, Md.	WSER	1350
Ellensburg, Wash.	KXLE	1240
Ellenville, N.Y.	WELV	1370
Ellsworth, Me.	WDEA	1370
Elmira, N.Y.	WELM	1410
	WENY	1230
Elmira Heights-Horseheads, N.Y.	WEHH	1590
El Paso, Tex.	KROD	600
	KELP	920
	KHEY	690
	KINT	1590
	KIZZ	1150
	KSET	1340
	KTSM	1380
El Reno, Okla.	KELR	1460
Ely, Minn.	WELY	1450
Ely, Nev.	KELY	1280
Elyria, Ohio	WEOL	930
Eminence, Ky.	WSTL	1600
Emporia, Kans.	KVOE	1400
Emporia, Va.	WEVA	860
Emporium, Pa.	WLEM	1250
Endicott, N.Y.	WENE	1480
Englewood, Colo.	KGMC	1150
Englewood, Fla.	WENG	1530
Englewood, Tenn.	WENR	1090
Enid, Okla.	KCRC	1390
	KGWA	960
Enterprise, Ala.	WIRB	600
Enterprise, Oreg.	KWVR	1340
Ephrata, Pa.	WGSA	1310
Ephrata, Wash.	KULF	730
Erie, Pa.	WWYN	1260
	WJET	1400
	WRIE	1330
	WWGD	1450
Erwin, Tenn.	WEMB	1420
Escanaba, Mich.	WDBC	680
	WLST	800
Escondido, Calif.	KOWN	1450
Espanola, N. M.	KDCE	970
Estes Park, Colo.	KKEP	1470
Estherville, Ia.	KILR	1070
Etowah, Tenn.	WCPH	1220
Eufaula, Ala.	WULA	1240
Eugene, Ore.	KEED	1450
	KASH	1600
	KATR	1320
	KORE	1050
	KERG	1280
	KPNW	1120
	KUGN	590
	KZEL	1540
Eunice, La.	KEUN	1490
Eureka, Calif.	KINS	980
	KRED	1480
Eustis, Fla.	WLCO	1240
Evanston, Ill.	WEAW	1330
	WNMP	1590

Location	C.L.	kHz
Evanston, Wyo.	KEVA	1240
Evansville, Ind.	WROZ	1400
	WGBF	1280
	WIKY	820
	WJPS	1330
Eveleth, Minn.	WEVE	1340
Everett, Pa.	WSKE	1050
Everett, Wash.	KRKO	1380
	KWYZ	1230
Evergreen, Ala.	WBLD	1470
Excelsior Springs, Mo.	KEXS	1090
Exeter, N.H.	WKXR	1540
Fairbanks, Alaska	KFAR	660
	KFRB	900
Fairbault, Minn.	KDHL	920
Fair Bluff, N.C.	WWKO	1480
Fairbury, Nebr.	KGMT	1310
Fairfax, Va.	WEEL	1310
Fairfield, Ill.	WFIW	1390
Fairfield, Iowa	KRCD	1570
Fairfield, O.	WCNW	1560
Fairhope, Ala.	WABF	1220
Fairmont, Minn.	KSUM	1370
Fairmont, N.C.	WFMO	860
Fairmont, W.Va.	WMMN	920
	WTCS	1490
Fairway, Kan.	KUDL	1380
Fajardo, P.R.	WMDD	1480
Falfurrias, Tex.	KPSO	1260
Fallon, Nev.	KVLV	980
Fall River, Mass.	WALE	1400
	WSAR	1480
Falls Church, Va.	WFAX	1220
Falls City, Nebr.	KTNC	1230
Fargo, N.Dak.	WDAY	970
	KFGO	790
	KFNW	900
	KQWB	1550
Faribault, Minn.	KDHL	920
Farmersville, La.	KTOL	1470
Farmington, Me.	WKTJ	1380
Farmington, Mo.	KREI	800
Farmington, N.M.	KENN	1390
	KWYK	960
	KRZE	1280
Farmville, N.C.	WFAG	1250
Farmville, Va.	WFLO	870
Farrell, Pa.	WFAR	1470
Farwell, Tex.	KZOL	1570
Fayette, Ala.	WWWF	990
Fayetteville, Ark.	KHOG	1440
	KFAY	1250
Fayetteville, N.C.	WFAI	1230
	WFNC	940
	WFLB	1490
	WIDU	1600
Fayetteville, Tenn.	WEKR	1240
Fergus Falls, Minn.	KBRF	1250
Fernandina Beach, Fla.	WFBF	1570
Ferriday, La.	KFNV	1600
Festus, Mo.	KJCF	1400
Festus-St. Louis, Mo.	KXEN	1010
Findlay, Ohio	WFIN	1330
Fisher, W.Va.	WELD	690
Fitchburg, Mass.	WEIM	1280
	WFGL	960
Fitzgerald, Ga.	WBHB	1240
Flagstaff, Ariz.	KCLS	600
	KAFF	930
	KEOS	690
Flat River, Mo.	KFMO	1240
Flint, Mich.	WFDF	910
	WTRX	1330
	WAMM	1420
	WMRP	1570
	WKMF	1470
	WTAC	600
Flomaton, Ala.	WTCB	990
Florence, Ala.	WJOI	1340
	WDWL	1240
Florence, S.C.	WJMX	970
	WOLS	1230
	WYNN	540
Floydada, Tex.	KFLD	900
Foley, Ala.	WHEP	1310
Fond du Lac, Wis.	KFIZ	1450
Fordyce, Ark.	KBJT	1570
Forest, Miss.	WMAG	860
Forest City, N.C.	WBBO	780
	WAGY	1320
Forks, Wash.	KVAC	1490
Forrest City, Ark.	KXJK	950
Ft. Atkinson, Wis.	WFAW	940
Ft. Bragg, Calif.	KDAC	1230
Ft. Campbell, Ky.	WABD	1370
Ft. Collins, Colo.	KCOL	1410
	KZIX	600
Ft. Dodge, Iowa	KVFD	1400
	KWMT	540
Ft. Knox, Ky.	WSAC	1470
Ft. Lauderdale, Fla.	WFTL	1400
	WSRF	1580
Ft. Madison, Iowa	KXGI	1360
Ft. Morgan, Colo.	KFTM	1400
Ft. Myers, Fla.	WINK	1240
	WMYR	1410
	WCAI	1350
Ft. Payne, Ala.	WFPA	1400

Location	C.L.	kHz
	WZOB	1250
Ft. Pierce, Fla.	WARN	1330
	WIRA	1400
Ft. Scott, Kans.	KMDD	1600
Ft. Smith, Ark.	KFPW	1230
	KFSA	950
	KTCS	1410
	KWHN	1320
Ft. Stockton, Tex.	KFST	860
Ft. Valley, Ga.	WFPM	1150
Ft. Walton Beach, Fla.	WNUE	1400
	WFTW	1260
Ft. Wayne, Ind.	WGL	1250
	WFWR	1090
	WOWO	1190
	WLYV	1450
	WKJG	1380
Ft. Worth, Tex.	KJIM	870
	KBUY	1540
	KFJZ	1270
	KNOK	970
	WBAP	570
	KBAP	820
	KXOL	1360
Fortuna, Cal.	KIXF	1280
Fosston, Minn.	KEHG	1480
Fostoria, Ohio	WFOB	1430
Fountain City, Tenn.	WROL	1490
Fountain Inn, S.C.	WFIS	1600
Fowler, Calif.	KLIP	1220
Framingham, Mass.	WKOX	1190
Frankfort, Ind.	WILO	1570
Frankfort, Ky.	WFKY	1490
Franklin, Ky.	WFKN	1220
Franklin, La.	KFRA	1390
	WFCG	1110
Franklin, N.C.	WFSC	1050
Franklin, N.H.	WFTN	1240
Franklin, Pa.	WFRA	1450
Franklin, Tenn.	WAGG	950
	WIZO	1380
Franklin, Va.	WYSR	1250
Franklinton, La.	WFCG	1110
Frederick, Md.	WFMD	930
Frederick, Okla.	KTAT	1570
Fredericksburg, Tex.	KNAF	910
Fredericksburg, Va.	WFVA	1230
	WFLS	1350
Fredericktown, Mo.	KFTW	1450
Fredonia, N.Y.	WBUZ	1570
Freeport, Ill.	WELL	1570
Freeport, N.Y.	WGBB	1240
Freeport, Tex.	KBRZ	1460
Fremont, Mich.	WBFC	1490
	WSHN	1550
Fremont, Nebr.	KHUB	1340
Fremont, Ohio	WFRO	900
Fresno, Calif.	KARM	1430
	KBIF	900
	KIRV	1510
	KEAP	980
	KXEX	1550
	KFRE	940
	KGST	1600
	KMAK	1340
	KMJ	580
	KYNO	1300
Friona, Tex.	KNNN	1070
Front Royal, Va	WFTR	1450
Frostburg, Md.	WFRB	560
Fulton, Ky.	WFUL	1270
Fulton, Miss.	WFTO	1330
Fulton, Mo.	KFAL	900
Fulton, N.Y.	WOSC	1300
Fuquay Sprgs., N.C.	WAKS	1460
Gadsden, Ala.	WGAD	1350
	WETD	980
	WAAX	570
	WEAC	1500
Gaffney, S.C.	WFGN	1570
Gainesville, Fla.	WOVH	980
	WGGG	1230
	WRUF	850
	WUWU	1390
Gainesville, Ga.	WGGA	550
	WDUN	1240
	WNRJ	1580
Gainesville, Tex.	KGAF	1580
Gaithersburg, Md.	WHMC	1150
Galax, Va.	WBOB	1360
Galesburg, Ill.	WGIL	1400
	WAIK	1590
Gallatin, Tenn	WHIN	1010
	WAMG	1130
Gallipolis, Ohio	WJEH	990
Gallup, N. Mex.	KGAK	1330
	KYVA	1230
Galveston, Tex.	KILE	1400
	KGBC	1540
Gander, Nfld.	CBG	1450
Garden City, Ga.	WNMT	1520
Garden City, Kan.	KUIL	1240
	KUPK	1050
Garden City, Mich.	WTAK	1090
Gardiner, Me.	WABK	1280
Gardner, Mass.	WGAW	1340
Garner, N.C.	WKBQ	1000

Location	C.L.	kHz
Gary, Ind.	WWCA	1270
	WLTH	1370
Gastonia, N.C.	WGNC	1450
	WLTC	1370
Gate City, Va.	WGAT	1050
Gaylord, Mich.	WATC	900
Geneseo, Ill.	WGEN	1500
Geneva, Ala.	WGEA	1150
Geneva, Ill.	WGSB	1480
Geneva, N.Y.	WGVA	1240
Georgetown, Del.	WJWL	900
Georgetown, Ky.	WAXU	1580
Georgetown, S.C.	WGTN	1400
	WINH	1470
Georgetown, Tex.	KGTN	1530
Gettysburg, Pa.	WGET	1320
Gillette, Wyo.	KIML	1270
Gilroy, Cal.	KAZA	1290
Gladewater, Tex.	KEES	1430
Glasgow, Ky.	WKAY	1490
	WCDS	1440
Glasgow, Mont.	KLTZ	1240
Glen Burnie, Md.	WISZ	1590
Glendale, Ariz.	KRUX	1360
Glendale, Calif.	KIEV	870
Glendive, Mont.	KXGN	1400
	KGLE	590
Glennallen, Alaska	KCAM	790
Glens Falls, N.Y.	WBZA	1410
	WWSC	1450
Glenville, Ga.	WKIG	1580
Glenwood Sprgs., Colo.	KGLN	980
Globe, Ariz.	KZOW	1240
Gloucester, Va.	WDDY	1420
Gloversville-Johnston, N.Y.	WENT	1340
Gold Beach, Oreg.	KBLY	1220
Golden, Colo.	KICM	1250
Golden Meadow, La.	KLEB	1600
Golden Valley, Minn.	KQRS	1440
	KUXL	1570
Goldsboro, N.C.	WFMC	730
	WGBR	1150
	WGOL	1300
Gonzales, Tex.	KCTI	1450
Goodland, Kans.	KLOE	730
Gordon, Ga.	WCIK	1560
Goshen, Ind.	WKAM	1460
Gouvernour, N.Y.	WIGS	1230
Grafton, N.D.	KGPC	1340
Grafton, W.Va.	WVVW	1260
Graham, N.C.	WSML	1190
Graham, Tex.	KSWA	1330
Grand Coulee, Wash.	KFDR	1360
Grand Forks, N.D.	KFJM	1370
	KILO	1440
	KNOX	1310
Grand Haven, Mich.	WGHN	1370
Grand Island, Nebr.	KMMJ	750
	KRGI	1430
Grand Junction, Colo.	KREX	1100
	KEXO	1230
	KSTR	620
	KWSL	1340
Grand Prairie, Tex.	KKDA	730
Grand Rapids, Mich.	WAFT	1480
	WJEF	1230
	WFUR	1570
	WGRD	1410
	WLAV	1340
	WOOD	1300
Grand Rapids, Minn.	KOZY	1490
Grangeville, Idaho	KORT	1230
Granite City, Ill.	WGNU	920
Granite Falls, N. C.	WKJK	900
Grants, N.Mex.	KMIN	980
Grants Pass, Oreg.	KAGI	930
	KAJO	1270
Grayson, Ky.	WGOH	1370
Gt. Barrington, Mass.	WSBS	860
Gt. Bend, Kans.	KVGB	1590
Gt. Falls, Mont.	KFBB	1310
	KUDI	1450
	KMON	560
	KARR	1400
Greeley, Colo.	KFKA	1310
	KYOU	1450
Green Bay, Wis.	WBAY	1360
	WDUZ	1400
	WNFL	1440
Greeneville, Tenn.	WGRV	1340
	WSMG	1450
Greenfield, Mass.	WHAI	1240
Greensboro, N.C.	WBIG	1470
	WCOG	1320
	WEAL	1510
	WKTB	1550
	WGBG	1400
	WPET	950
Greensburg, Ind.	WTRE	1330
Greensburg, Pa.	WHJB	620
Greenville, Ala.	WGYV	1380

Location	C.L.	kHz
Greenville, Mich.	WPLB	1380
Greenville, Miss.	WJPR	1330
	WDDT	900
	WGVM	1260
Greenville, N.C.	WNCT	1070
	WODW	1340
	WPXY	1550
Greenville, S.C.	WESC	660
	WFBC	1330
	WHYZ	1070
	WMRB	1490
	WMUU	1260
	WQOK	1440
Greenville, Tex.	KGVL	1400
Greenwich, Conn.	WGCH	1490
Greenwood, Miss.	WABG	960
	WGRM	1240
	WLEF	1540
Greenwood, S.C.	WCRS	1450
	WGSW	1350
Greer, S.C.	WEAB	800
	WCKI	1300
Grenada, Miss.	WNAG	1400
Gresham, Oreg.	KRDR	1230
Gretna, La.	KGLA	1540
Gretna, Va.	WMNA	730
Griffin, Ga.	WKEU	1450
	WHIE	1320
	WGRI	1410
Grinnell, Iowa	KGRN	1410
Groton, Conn.	WSUB	980
Grove City, Pa.	WSAJ	1340
Grundy, Va.	WNRG	940
Guayama, P.R.	WXRF	1590
Gulfport, Miss.	WRDA	1380
	WGCM	1240
Gunnison, Colo.	KGUC	1490
Guntersville, Ala.	WGSV	1270
Guthrie, Okla.	KWRW	1490
Guymon, Okla.	KGYN	1210
Hackensack, N.J.	WJRZ	970
Hagerstown, Md.	WARK	1490
	WJEJ	1240
Haines City, Fla.	WHAN	930
Haleyville, Ala.	WJBB	1230
Halfway, Md.	WHAG	1410
Hamden, Conn.	WCDQ	1220
Hamilton, Ala.	WERH	970
Hamilton, Mont.	KYLQ	980
Hamilton, Ohio	WMOH	1450
Hamilton, Tex.	KCLW	900
Hamlet, N. C.	WKDX	1250
Hammond, Ind.	WJOB	1230
Hammond, La.	WFPR	1400
Hammonton, N.J.	WNJH	1580
Hampton, S.C.	WBHC	1270
Hampton, Va.	WVEC	1490
Hancock, Mich.	WMPL	920
Hanford, Calif.	KNGS	620
Hannibal, Mo.	KHMO	1070
Hanover, N.H.	WTSL	1400
	WDCR	1340
Hanover, Pa.	WHVR	1280
Hardin, Mont.	KHDN	1230
Hardinsburg, Ky.	WHIC	1520
Harlan, Ky.	WHLN	1410
Harlingen, Tex.	KGBT	1530
Harriman, Tenn.	WHBT	1600
Harrisburg, Ill.	WERQ	1240
Harrisburg, Pa.	WFEC	1400
	WCMB	1460
	WHP	580
	WKBO	1230
Harrison, Ark.	KHOZ	900
Harrisonburg, Va.	WHBG	1360
	WKCY	1300
	WSVA	550
Harrodsburg, Ky.	WHBN	1420
Hartford, Conn.	WDRC	1360
	WCCC	1290
	WPOP	1410
	WTIC	1080
Hartford, Ky.	WLLS	1600
Hartford, Wis.	WTKM	1540
Hartselle, Ala.	WHRT	860
Hartsville, S.C.	WHSC	1450
Hartsville, Tenn.	WJKM	1090
Hartwell, Ga.	WKLY	980
Harvard, Ill.	WMCW	1600
Harvey, Ill.	WBEE	1570
Hastings, Mich.	WBCH	1220
Hastings, Minn.	KDWA	1460
Hastings, Nebr.	KHAS	1230
	KICS	1550
Hattiesburg, Miss.	WBKH	950
	WFOR	1400
	WHSY	1230
	WORV	1580
	WXXX	1310
Havelock, N.C.	WUSM	1330
Haverhill, Mass.	WHAV	1490
Havre, Mont.	KOJM	610
Havre de Grace, Md.	WASA	1330
Hawkinsville, Ga.	WCEH	610
Hayhesville, La.	KLUV	1580
Hays, Kans.	KAYS	1400
Hayward, Wis.	WHSM	910
Hazard, Ky.	WKIC	1390
Hazelhurst, Ga.	WVOH	920
Hazlehurst, Miss.	WMDC	1220
Hazleton, Pa.	WAZL	1490

WHITE'S

RADIO LOG

Location	C.L.	kHz
Heber Springs, Ark.	KAWW	1370
Helena, Ark.	KFFA	1360
Helena, Mont.	KCAP	1340
	KBLL	1240
Hemet, Calif.	KHSJ	1320
Hemingway, S.C.	WKYB	1000
Hempstead, N.Y.	WHLI	1100
Henderson, Ky.	WSON	860
Henderson, Nev.	KBMI	1400
	KTOO	1280
Henderson, N.C.	WHNC	890
	WIZS	1450
Henderson, Tenn.	WHHM	1580
Henderson, Tex.	KGRI	1000
	KWRD	1470
Hendersonville, N.C.	WHKP	1450
	WHVL	1600
Henryetta, Okla.	KHEN	1590
Hereford, Tex.	KPAN	860
Herkimer, N.Y.	WALY	1420
Hermiston, Oreg.	KOHU	1570
Herendon, Va.	WHRN	1440
Herrin, Ill.	WJPF	1340
Hettinger, N.Dak.	KNDC	1490
Hibbing, Minn.	WMFG	1240
Hickory, N.C.	WHKY	1290
	WIRC	680
	WSPF	1000
Highland, Ill.	WINU	1510
Highland Park, Ill.	WEEF	1480
Highland Park, Tex.	KVIL	1150
Highland Springs, Va.	WENZ	1450
High Point, N.C.	WMFR	1230
	WNOS	1590
	WHPE	1070
Hillsboro, Ohio	WSRW	1590
Hillsboro, Oreg.	KUIK	1360
Hillsboro, Tex.	KHBR	1560
Hillsdale, Mich.	WCSR	1340
Hillsville, Va.	WHHV	1400
Hilo, Hawaii	KPUA	970
	KIPA	1110
	KIMO	850
Hinesville, Ga.	KGML	990
Hinton, W. Va.	WMTD	1380
Hobbs, N.Mex.	KWEW	1480
	KHOB	1390
Holbrook, Ariz.	KDJI	1270
Holdenville, Okla.	KVYL	1370
Holdredge, Nebr.	KUVR	1380
Holland, Mich.	WHTC	1450
	WJBL	1260
Hollister, Cal.	KMPG	1540
Hollywood, Fla.	WGMA	1320
Holly Springs, Miss.	WKRA	1110
Holyoke, Mass.	WREB	930
Homer, La.	KHAL	1320
Homestead, Fla.	WIII	1430
Homewood, Ala.	WJLD	1400
Hondo, Tex.	KRME	1460
Honolulu, Hawaii	KAIM	870
Honolulu, Hawaii	KCCN	1420
	KGMB	590
	KZOO	1210
	KHAI	1090
	KPOI	1380
	KIKI	830
	KGU	760
	KHVH	1040
	KKUA	690
	KNDI	1270
	KOHO	1170
	KORL	650
	KTRG	990
	KUMU	1500
Hood River, Oreg.	KIHR	1340
Hope, Ark.	KXAR	1490
Hopewell, Va.	WHAP	1340
Hopkinsville, Ky.	WHOP	1230
	WKOA	1480
Hoquiam, Wash.	KGHO	1560
Hornell, N.Y.	WHHO	1320
	WLEA	1480
Horseheads, N.Y.	WIQT	1000
Hot Springs, Ark.	KBHS	590
	KXOW	1420
	KZNG	1340
Hot Springs, S.Dak.	KOBH	580
Houghton, Mich.	WHDF	1400
Houghton Lake, Mich.	WHGR	1290
Houlton, Maine	WHOU	1340
Houma, La.	KJIN	1490
Houston, Miss.	WCPC	940
Houston, Mo.	KBTC	1250
Houston, Tex.	KCOH	1430
	KENR	1070
	KILT	610
	KNUZ	1230
	KODA	1010
	KPRC	950
	KTHT	790
	KTRH	740
	KXYZ	1320
	KYOK	1590
Howell, Mich.	WHMI	1350
Hudson, N.Y.	WHUC	1230
Hugo, Okla.	KIHN	1340
Humacao, P.R.	WALO	1240
Humboldt, Tenn.	WIBJ	740
Huntingdon, Pa.	WHUN	1150
Huntington, Ind.	WHLT	1300
Huntington, N.Y.	WGSM	740
Huntington, W.Va.	WKEE	800
	WSAZ	930
	WWHY	1470
Huntsville, Ala.	WBHP	1280
	WEUP	1600
	WFIX	1450
	WAAY	1550
	WVOV	1000
Huntsville, Tex.	KSAM	1490
Huron, S.Dak.	KIJV	1340
Hutchinson, Kans.	KWBW	1450
	KWHK	1260
Hutchinson, Minn.	KDUZ	1260
Hyde Park, N.Y.	WHVW	950
Idabel, Okla.	KBEL	1240
Idaho Falls, Idaho	KID	590
	KTEE	1260
Immokalee, Fla.	WCOF	1490
Independence, Ia.	KUPI	980
	KOUR	1220
Independence, Kans.	KIND	1010
Independence, Mo.	KCCX	1510
Indiana, Pa.	WDAD	1450
Indianapolis, Ind.	WATI	810
	WBRI	1500
	WFBM	1260
	WGEE	1590
	WIBC	1070
	WIFE	1310
	WIRE	1430
	WXLW	950
Indianola, Iowa	KBAB	1490
Indianola, Miss.	WNLA	1380
Indian Rocks Beach, Fla.	WGUP	1520
Indio, Calif.	KREO	1400
Inglewood, Calif.	KTYM	1460
Inkster, Mich.	WCHB	1440
International Falls, Minn.	KGHS	1230
Inverness, Fla.	WYSE	1560
Iola, Kansas	KALN	1370
Ionia, Mich.	WION	1430
Iowa City, Iowa	KXIC	800
	WSUI	910
Iowa Falls, Ia.	KIFG	1510
Irondale, Ala.	WLPH	1480
Iron Mtn., Mich.	WMIQ	1450
Iron River, Mich.	WIKB	1230
Ironton, Ohio	WIRO	1230
Ironwood, Mich.	WJMS	590
Irvine, Ky.	WIRV	1550
Isabella, P.R.	WISA	1390
Ishpeming, Mich.	WJPD	1240
	WCKD	970
Islip, N.Y.	WLIX	540
Ithaca, N.Y.	WHCU	870
	WTKO	1470
Iuka, Miss.	WVOM	1270
Jackson, Ala.	WHOD	1290
Jackson, Ga.	WJGA	1540
Jackson, Ky.	WEKG	810
Jackson, Mich.	WIBM	1450
	WKHM	970
	WJCO	1510
Jackson, Miss.	WJDX	620
	WJQS	1400
	WJXN	1450
	WOKJ	1550
	WWUN	1590
	WRBC	1300
	WSLI	980
Jackson, Ohio	WLMJ	1280
Jackson, Tenn.	WDXI	1310
	WJAK	1460
	WTJS	1390
Jackson, Wis.	WYLO	540
Jackson, Wyo.	KSGT	1340
Jacksonville, Ark.	KGMR	1500
Jacksonville, Fla.	WJAX	930
	WAPE	690
	WBOM	970
	WVOJ	1320
	WIVY	1050
	WMBR	1460
	WOBS	1360
	WPDQ	600
	WQIK	1090
	WRHC	1400
Jacksonville, Ill.	WJIL	1550
	WLDS	1180
Jacksonville, Miss.	WJQS	1400
Jacksonville, N.C.	WJNC	1240
	WBBS	1290
	WLAS	910
Jacksonville, Tex.	KEBE	1400
Jacksonville Bch., Fla.	WBIX	1010
Jamestown, Ky.	WJKY	1060
Jamestown, N.Dak.	KEYJ	1400
	KSJB	600
Jamestown, N.Y.	WJTN	1240
	WKSN	1340
Jamestown, Tenn.	WCLC	1260
	WDEB	1500
Janesville, Wis.	WCLO	1230
Jasper, Ala.	WWWB	1360
	WARF	1240
Jasper, Ind.	WITZ	990
Jasper, Tex.	KTXJ	1350
Jefferson City, Mo.	KLIK	950
	KWOS	1240
Jefferson City, Tenn.	WJFC	1480
Jeffersonville, Ind.	WXVW	1450
Jena, La.	KCKW	1480
Jennings, La.	KJEF	1290
Jerome, Idaho	KART	1400
Jerseyville, Ill.	WJBM	1480
Jesup, Ga.	WLOP	1370
John Day, Ore.	KJDY	1400
Johnson City, Tenn.	WJCW	910
	WETB	790
Johnston, S.C.	WJES	1570
Johnstown, N.Y.	WIZR	930
Johnstown, Pa.	WJAC	850
	WARD	1490
	WCRO	1230
Joliet, Ill.	WJOL	1340
	WJRC	1510
Joliette, Que.	CJLM	1350
Jonesboro, Ark.	KBTM	1230
	KNEA	970
Jonesboro, La.	KTOC	920
Jonesboro, Tenn.	WJSO	1590
Jonesville, La.	KANV	1480
Joplin, Mo.	WMBH	1450
	KQYX	1560
	KFSB	1310
	KODE	1230
Joshua Tree, Cal.	KJST	1420
Junction, Tex.	KMBL	1450
Junc. City, Kans.	KJCK	1420
Juneau, Alaska	KINY	800
	KJNO	630
Jupiter, Fla.	WJTS	1000
Kailua, Hawaii	KLEI	1180
Kalamazoo, Mich.	WKPR	1420
	WKZO	590
	WKMI	1360
	WYYY	1470
Kalispell, Mont.	KGEZ	600
	KOFI	1180
Kane, Pa.	WKZA	960
Kankakee, Ill.	WKAN	1320
Kannapolis, N.C.	WGTL	870
	WRKB	1460
Kans. City, Kans.	KCKN	1340
Kansas City, Mo.	KCMO	810
	KMBZ	980
	KPRS	1590
	WDAF	610
	WHB	710
Kaukauna, Wis.	WKAU	1050
Kenedy-Karnes City, Texas	KAML	990
Kealakekua, Hawaii	KONA	790
Kearney, Nebr.	KGFW	1340
	KRNY	1460
Keene, N.H.	WKNE	1290
	WKBK	1220
Kelso, Wash.	KLOG	1490
Kemmerer, Wyo.	KMER	950
Kendallville, Ind.	WAWK	1140
Kenedy, Tex.	KAML	990
Kennett, Mo.	KBOA	830
	KBXN	1540
Kennewick, Wash.	KSMK	1340
Kennewick-Pasco-Richland, Wash.	KEPR	610
Kenosha, Wis.	WLIP	1050
Kent, O.	WKNT	1520
Keokuk, Iowa	KOKX	1310
Kermit, Tex.	KERB	600
Kerrville, Tex.	KERV	1230
Kershaw, S.C.	WKSC	1300
Ketchikan, Alaska	KTKN	930
Kewanee, Ill.	WKEI	1450
Keyser, W.Va.	WKLP	1390
Key West, Fla.	WKWF	1600
	WKIZ	1500
Kilgore, Tex.	KOCA	1240
Killeen, Tex.	KLEN	1050
Kimball, Nebr.	KIMB	1260
King, N. C.	WKTE	1090
King City, Calif.	KRKC	1490
Kingman, Ariz.	KAAA	1230
Kings Mountain, N.C.	WKMT	1220
Kingsport, Tenn.	WKIN	1320
	WKPT	1550
	WGOC	1090
Kingston, N.Y.	WBAZ	1550
	WGHQ	920
	WKNY	1490
Kingstree, S.C.	WDKD	1310
	WKSP	1090
Kingsville, Tex.	KINE	1330
Kingwood, W.Va.	WFSP	1560
Kinston, N.C.	WELS	1010
	WFTC	960
	WISP	1230
Kirkland, Wash.	KYAC	1460
	KBLE	1050
Kirksville, Mo.	KIRX	1450
Kissimmee, Fla.	WFIV	1080
	WACY	1220
Kittanning, Pa.	WACB	1380
Klamath Falls, Oreg.	KAGO	1150
	KFLW	1450
	KLAD	960
Knoxville, Iowa	KNIA	1320
Knoxville, Tenn.	WBIR	1240
	WIVK	850
	WATE	620
	WJBE	1430
	WKGN	1340
	WKXV	900
	WNOX	990
	WROL	1490
	WSKT	1580
Kokomo, Ind.	WIOU	1350
Kosciusko, Miss.	WKOZ	1350
Laconia, N.H.	WLNH	1350
	WEMJ	1490
LaCrosse, Wis.	WKBH	1410
	WLCX	1490
	WKTY	580
Ladysmith, Wis.	WLDY	1340
Lafayette, Ga.	WLFA	1590
Lafayette, Ind.	WASK	1450
	WAZY	1410
	WBAA	920
Lafayette, La.	KPEL	1420
	KVOL	1330
	KXKW	1520
Lafayette, Tenn.	WEEN	1460
LaFollette, Tenn.	WLAF	1450
LaGrande, Oreg.	KLBM	1450
LaGrange, Ga.	WLAG	1240
	WTRP	620
LaGrange, Ill.	WTAQ	1300
LaGrange, Tex.	KVLG	1570
LaJunta, Colo.	KBZZ	1400
Lake Charles, La.	KLOU	1580
	KPLC	1470
	KAOK	1400
Lake City, Fla.	WDSR	1340
	WGRO	960
Lake City, S.C.	WJOT	1260
Lake Geneva, Wis.	WMIR	1550
Lakeland, Fla.	WLAK	1430
	WONN	1230
	WWAB	1330
Lake Placid, N.Y.	WIRD	920
Lakeport, Cal.	KBLC	1270
Lake Providence, La.	KLPL	1050
Lake Tahoe, Calif.	KOWL	1490
Lakeview, Oreg.	KQIK	1230
Lake Wales, Fla.	WIPC	1280
Lakewood, Colo.	KLAK	1600
Lakewood Center, Wash.	KOOD	1480
Lake Worth, Fla.	WLIZ	1380
Lamar, Colo.	KLMR	920
Lamesa, Tex.	KPET	690
Lampasas, Tex.	KCYL	1450
Lancaster, Calif.	KAVL	610
	KBVM	1380
Lancaster, Ky.	WIXI	1280
Lancaster, N.Y.	WMMJ	1300
Lancaster, Ohio	WHOK	1820
Lancaster, Pa.	WGAL	1490
	WLAN	1390
Lancaster, S.C.	WLCM	1360
	WAGL	1560
Lander, Wyo.	KOVE	1330
Lanett, Ala.	WRLD	1490
Langdon, N.D.	KNDK	1080
Lansdale, Pa.	WNPV	1440
Lansford, Pa.	WLSH	1410
Lansing, Mich.	WILS	1320
	WJIM	1240
	WITL	1010
Lapeer, Mich.	WMPC	1280
	WTHM	1530
LaPlata, Md.	WSMD	1560
LaPorte, Ind.	WLOI	1540
Laramie, Wyo.	KLME	1490
	KOWB	1290
Laredo, Tex.	KGNS	1300
	KVOZ	1490
Larned, Kans.	KANS	1510
LaSalle, Ill.	WLPO	1220
LasCruces, N.Mex.	KOBE	1450
	KGRT	570
Las Vegas, Nev.	KENO	1460
	KLAV	1230
	KRAM	920
	KLUC	1140
	KRAM	1340
	KVEG	970
Las Vegas, N.Mex.	KFUN	1280
Latrobe, Pa.	WPKV	1570
	WQTW	1570
	WTRA	1480
Laurel, Md.	WLMD	900

Location	C.L.	kHz
Laurel, Miss.	WAML	1340
	WLAU	1600
	WNSL	1260
Laurens, S.C.	WLBG	860
Laurinburg, N.C.	WEWO	1080
	WLNC	1300
Lawrence, Kans.	KFKU	1250
	KLWN	1320
Lawrence, Mass.	WCCM	800
Lawrenceburg, Tenn.		
	WDXE	1370
Lawrenceville, Ga.	WLAW	1360
Lawrenceville, Ill.	WAKO	910
Lawrenceville, Va.	WLES	580
Lawton, Okla.	KSWO	1380
	KCCO	1050
Leadville, Colo.	KBRR	1280
Leaksville, N.C.	WLOE	1490
Leavenworth, Kans.	KCLO	1410
Lebanon, Ky.	WLBN	1590
Lebanon, Mo.	KLWT	1280
Lebanon, Oreg.	KGAL	920
Lebanon, Pa.	WLBR	1270
Lebanon, Tenn.	WCOR	900
Leesburg, Fla.	WLBE	790
	WZST	1410
Leesburg, Va.	WAGE	1290
Leesville, La.	KLLA	1570
Lehigh Acres, Fla.	WLEH	1440
Lehighton, Pa.	WYNS	1150
Leitchfield, Ky.	WMTL	1580
Leland, Miss.	WESY	1580
LeMars, Iowa	KLEM	1410
Lemmon, S.D.	KBJM	1400
Lemoore, Calif.	KLAN	1320
	KOAD	1240
Lenoir, N.C.	WJRI	1340
	WKGX	1080
Lenoir, Tenn.	WLIL	730
Lenoir City, Tenn.	WBLC	1360
Leominster, Mass.	WLMS	1000
Leonardtown, Md.	WKIK	1370
Levelland, Tex.	KLVT	1230
Levittown, Pa.	WBCB	1490
Lewisburg, Pa.	WUDO	1010
Lewisburg, Tenn.	WJJM	1490
Lewiston, Idaho	KRLC	1350
	KOZE	1300
Lewiston, Maine	WCOU	1240
	WLAM	1470
Lewistown, Mont.	KXLO	1230
Lewistown, Pa.	WKVA	920
	WMRF	1490
Lexington, Ky.	WLAP	630
	WBLG	1300
	WVLK	590
Lexington, Miss.	WXTN	1000
Lexington, Mo.	KLEX	1570
Lexington, Neb.	KRVN	880
Lexington, N.C.	WBUY	1440
Lexington, Tenn.	WDXL	1490
Lexington, Va.	WREL	1450
Lexington Pk., Md.	WPTX	920
Libby, Mont.	KLCB	1230
Liberal, Kans.	KSCB	1270
	KLIB	1470
Liberty, Ky.	WKDO	1560
Liberty, Mo.	KBIL	1140
Liberty, N.Y.	WVOS	1240
Liberty, Tex.	KPXE	1050
Lihue, Hawaii	KTOH	1350
Lima, Ohio	WIMA	1150
	WCIT	940
Lincoln, Ill.	WPRC	1370
Lincoln, Me.	WLKN	1450
Lincoln, Nebr.	KFOR	1240
	KLIN	1400
	KLMS	1480
	KLOL	1530
Lincolnton, N.C.	WLON	1050
Lineville, Ala.	WANL	1540
Linton, Ind.	WBTO	1600
Litchfield, Ill.	WSMI	1540
Litchfield, Minn.	KLFD	1410
Little Falls, Minn.	KLTF	960
Little Falls, N.Y.	WLFH	1230
Littlefield, Tex.	KZZN	1490
Little Rock, Ark.	KARK	920
	KALO	1250
	KLRA	1010
	KOKY	1440
	KAAY	1090
	KVLC	1050
Littleton, Colo.	KDKO	1510
Littleton, N. H.	WLTN	1400
Live Oak, Fla.	WNER	1250
Livingston, Mont.	KPRK	1340
Livingston, Tenn.	WLIV	920
Livingston, Tex.	KETX	1440
Lockhart, Tex.	KHRB	1060
Lock Haven, Pa.	WBPZ	1230
Lockport, N.Y.	WUSJ	1340
Lodi, Calif.	KCVR	1570
Logan, O.	WLGN	1510
Logan, Utah	KBLW	1390
	KSTU	1300
	KVNU	610
Logan, W.Va.	WLOG	1230
	WVDW	1290
Logansport, Ind.	WSAL	1230
Lompoc, Calif.	KKOK	1410
	KLOM	1330

Location	C.L.	kHz
	KNEZ	960
London, Ky.	WFTG	1400
Long Beach, Calif.	KFOX	1280
	KGER	1390
Longmont, Colo.	KLMO	1060
Long Prairie, Minn.	KEYL	1400
Longview, Tex.	KFRO	1370
	KLUE	1280
Longview, Wash.	KEDO	1400
	KBAM	1270
Lookout Mtn., Tenn.	WFLI	1070
Loretto, Pa.	WWSF	1400
Loris, S.C.	WLSC	1570
Los Alamos, N.Mex.	KRSN	1490
Los Angeles, Calif.	KABC	790
	KFI	640
	KHJ	930
	KFWB	980
	KGFJ	1230
	KFAC	1330
	KLAC	570
	KMPC	710
	KNX	1070
	KPOL	1540
	KGBS	1020
	KRKD	1150
Los Banos, Calif.	KLBS	1330
Louisburg, N.C.	WYRN	1480
Louisville, Ga.	WPEH	1420
Louisville, Ky.	WAVE	970
	WAKY	790
	WHAS	840
	WKLO	1080
	WINN	1240
	WFIA	900
	WLOU	1350
	WTMT	620
Louisville, Miss.	WLSM	1270
Loveland, Colo.	KLOV	1570
Loves Park, Ill.	WLUV	1520
Lovington, N.Mex.	KLEA	630
Lowell, Mass.	WCAP	980
	WLLH	1400
Lubbock, Tex.	KCBD	1590
	KDAV	580
	KLBK	1340
	KLFB	1420
	KFYO	790
	KLLL	1460
	KSEL	950
Lucedale, Miss.	WRBE	1440
Ludington, Mich.	WKLA	1450
Lufkin, Tex.	KRBA	1340
	KTRE	1420
Lumberton, N.C.	WAGR	580
	WTSB	1340
Luray, Va.	WRAA	1330
Lynchburg, Va.	WLVA	590
	WLLL	930
	WLGM	1320
	WWOD	1390
	WBRG	1050
Lynn, Mass.	WLYN	1360
Lyons, Ga.	WBBT	1340
Machias, Me.	WMCS	1400
Macomb, Ill.	WKAI	1510
Macon, Ga.	WBML	1240
	WCRY	900
	WDEN	1500
	WIBB	1280
	WMAZ	940
	WNEX	1400
Macon, Mo.	KLTI	1560
Madawaska, Me.	WSJR	1230
Madera, Calif.	KHOT	1250
Madill, Okla.	KMAD	1550
Madison, Fla.	WMAF	1230
Madison, Ga.	WYTH	1250
Madison, Ind.	WORX	1270
Madison, S.D.	KJAM	1390
Madison, Tenn.	WENO	1430
Madison, Wis.	WHA	970
	WIBA	1310
	WISM	1480
	WKOW	1070
	WMAD	1550
Madisonville, Ky.	WFMW	730
	WTTL	1310
Madisonville, Tenn.	WKYZ	1250
Magee, Miss.	WSJC	810
Magnolia, Ark.	KVMA	630
Makawao, Hawaii	KNUI	1310
Malden, Mo.	KTCB	1470
Malone, N.Y.	WICY	1490
Malvern, Ark.	KBOK	1310
Manassas, Va.	WPRW	1460
Manati, P.R.	WMNT	1500
Manchester, Conn.	WINF	1230
Manchester, Ga.	WFDR	1370
Manchester, Ky.	WWXL	1450
Manchester, N.H.	WFEA	1370
	WGIR	610
	WKBR	1250
Manchester, Tenn.	WMSR	1320
Manhattan, Kans.	KSAC	580
	KMAN	1350
Manistee, Mich.	WMTE	1340
Manistique, Mich.	WTIQ	1490
Manitou Springs, Colo.		
	KCMS	1490
Manitowoc, Wis.	WCUB	980
	WOMT	1240

Location	C.L.	kHz
Mankato, Minn.	KYSM	1230
	KTOE	1420
Manning, S.C.	WYMB	1410
Mansfield, La.	KDXI	1360
Mansfield, Ohio	WMAN	1400
	WCLW	1570
Maplewood, Minn.	WJSW	1010
Maquoketa, Iowa	KMAQ	1320
Marathon, Fla.	WFFG	1300
Marianna, Ark.	KZOT	1460
Marianna, Fla.	WTYS	1340
	WTOT	980
Marietta, Ga.	WFOM	1230
	WBIE	1080
Marietta, Ohio	WMOA	1490
	WBRJ	910
Marine City, Mich.		
	WSMA	1590
Marionette, Wisc.	WMAM	570
Marion, Ala.	WJAM	1310
Marion, Ill.	WGGH	1150
Marion, Ind.	WBAT	1400
	WMRI	860
Marion, Ky.	WMJL	1010
Marion, N.C.	WBRM	1250
Marion, Ohio	WMRN	1490
Marion, S.C.	WATP	1430
Marion, Va.	WMEV	1010
	WOLD	133
Marked Tree, Ark.	KPCA	1580
Marksville, La.	KAPB	1370
Marlborough, Mass.	WSRO	1470
Marquette, Mich.	WDMJ	1320
Marshall, Minn.	KMHL	1400
Marshall, Mo.	KMMO	1300
Marshall, N.C.	WMMH	1460
Marshall, Tex.	KMHT	1450
	KDOX	1410
Marshalltown, Iowa	KFJB	1230
Marshfield, Wis.	WDLB	1450
Martin, Tenn.	WCMT	1410
Martinsville, Ind.	WCBK	1540
Martinsburg, Pa.	WJSM	1110
Martinsburg, W.Va.	WEPM	1340
Martinsville, Va	WHEE	1370
	WMVA	1450
Maryville, Mo.	KNIM	1580
Marysville, Calif	KMYC	1410
Marysville, Kans	KNDY	1570
Maryville, Tenn.	WGAP	1400
Mason, Mich.	WUNN	1110
Mason City, Iowa	KGLO	1300
	KRIB	1490
	KSMN	1010
Massena, N.Y.	WMSA	1340
	WYBG	1050
Massillon, Ohio	WTIG	990
Matawan, W.Va.	WHJC	1360
Mattoon, Ill.	WLBH	1170
Mauston, Wis.	WRJC	1270
Mayaguez, P.R.	WAEL	600
	WKJB	710
	WORA	760
	WPRA	990
	WTIL	1300
Mayfield, Ky.	WNGO	1320
Mayodan, N.C.	WMYN	1420
Mayville, N.D.	KMAV	1520
Maysville, Ky.	WFTM	1240
McAlester, Okla.	KTMC	1400
	KNED	1150
McAllen, Tex.	KRIO	910
McCall, Ida.	KMCC	1240
McComb, Miss.	WHNY	1250
	WAPF	980
McCook, Nebr.	KBRL	1300
	KICX	1360
McGehee, Ark.	KVSA	1220
McKeesport, Pa.	WEDO	810
	WMCK	1360
McKenzie, Tenn.	WHDM	1440
McKinney, Tex.	KYAL	1600
McLeansboro, Ill.	WMCL	1060
McMinnville, Oreg.	KMCM	1260
McMinnville, Tenn.	WBMC	960
	WAKI	1230
McPherson, Kans.	KNEX	1540
McRae, Ga.	WDAX	1410
Meadville, Pa.	WMGW	1490
Medford, Mass.	WHIL	1430
Medford, Oreg.	KMED	1440
	KSHA	860
	KDOV	1300
	KBOY	730
	KYJC	1230
Medford, Wis.	WIGM	1490
Media, Pa.	WXUR	690
Melbourne, Fla.	WMMB	1240
Memphis, Tenn.	WHBQ	560
	KBGH	1130
	WHER	1430
	WMC	790
	WDIA	1070
	WMPS	680
	WLOK	1340
	WMQM	1480
	WREC	600
	KWAM	990
Mena, Ark.	KENA	1450
Mendota, Ill.	WGLC	1090
Mendocino, Cal.	KMFB	1300
Menominee, Mich.	WAGN	1340
Menomonie, Wis.	WMNE	1360

Location	C.L.	kHz
Merced, Calif.	KYOS	1480
	KWIP	1580
Meriden, Conn.	WMMW	1470
Meridian, Miss.	WCOC	910
	WDAL	1330
	WMOX	1010
	WOKK	1450
	WQIC	1390
Merkle, Tex.	KWFA	1500
Merrill, Wis.	WXMT	730
Mesa, Ariz.	KBUZ	1310
	KALF	1510
Metropolis, Ill.	WMOK	920
Metter, Ga.	WMAC	1360
Mexia, Tex.	KBUS	1590
Mexico, Mo.	KXEO	1340
Mexico, Pa.	WJUN	1220
Miami, Ariz.	KIKO	1340
Miami, Fla.	WGBS	710
	WIOD	610
	WFAB	990
	WFUN	790
	WAME	1260
	WLTO	1220
	WQAM	560
	WQBA	1140
	WOCN	1450
	WINZ	940
Miami, Okla.	KGLC	910
Miami Beach, Fla.		
	WMBM	1490
	WKAT	1360
Michigan City, Ind.	WIMS	1420
Middlebury, Vt.	WFAD	1490
Middleport-Pomeroy, Ohio		
	WMPO	1390
Middlesboro, Ky.	WMIK	560
	WAFI	1560
Middletown, Conn.	WCNX	1150
Middletown, N.Y.	WALL	1340
Middletown, Ohio	WPFB	910
Midland, Mich.	WMDN	1490
Midland, Tex.	KCRS	550
	KJBC	1150
	KWEL	1440
	KABH	1510
Milan, Tenn.	WKBJ	1600
Miles City, Mont.	KATL	1340
Milford, Conn.	WFIF	1500
Milford, Del.	WTHD	930
Milford, Mass.	WMRC	1490
Milledgeville, Ga.	WMVG	1450
Millen, Ga.	WGSR	1570
Millington, Tenn.	WGMM	1380
Millinocket, Me.	WMKR	1240
Millville, N.J.	WMVB	1440
Milton, Fla.	WEBY	1330
	WSRA	1490
Milton, Pa.	WMLP	1380
	WARC	1380
Milwaukee, Wis.	WEMP	1250
	WRIT	1340
	WISN	1130
	WMIL	1290
	WNOV	860
	WOKY	920
	WTMJ	620
Minden, La.	KASO	1240
Mineola, N.Y.	WTHE	1520
Mineola, Tex.	KMOO	1510
Mineral Wells, Tex.	KORC	1140
Minneapolis, Minn.	WCCO	830
	WLOL	1330
	WMIN	1400
	WDGY	1130
	WWTC	1280
	KTCR	690
	KTIS	900
	KUOM	770
	KSTP	1500
Minot, N. Dak.	KLPM	1390
	KHRT	1320
	KCJB	910
	KTYN	1430
Mission, Kans.	KBEA	1480
Mission, Tex.	KIRT	1580
Missoula, Mont.	KGVO	1290
	KGMY	1450
	KYLT	1340
	KYSS	930
Mitchell, S.Dak.	KORN	1490
Moab, Utah	KURA	1450
Moberly, Mo.	KWIT	1230
Mobile, Ala.	WUNI	1410
	WABB	1480
	WGOK	900
	WMOO	1550
	WMOB	840
	WKRG	710
	WLIQ	1360
	WMOZ	960
Mobridge, S.Dak.	KOLY	1300
Mocksville, N.C.	WDSL	1520
Modesto, Calif.	KTRB	860
	KBEE	970
	KFIV	1360
Mojave, Calif.	KDOL	1340
Moline, Ill.	WQUA	1230
Monahans, Tex.	KVKM	1330
Moncks Corner, S. C.		
	WBER	950
Monett, Mo.	KRMO	990
Monette, Ark.	KBIB	1360

WHITE'S

RADIO LOG

Location	C.L.	kHz
Monmouth, Ill.	WRAM	1330
Monroe, Ga.	WMRE	1490
Monroe, La.	KMLB	1440
	KLIC	1230
	KNOE	540
Monroe, Mich.	WQTE	560
Monroe, N.C.	WIXE	1190
	WMAP	1060
Monroe, Wis.	WEKZ	1260
Monroeville, Ala.	WMFC	1360
Monterey, Calif.	KIDD	630
	KMBY	1240
Montevideo, Minn.	KDMA	1460
Monte Vista, Colo.	KSLV	1240
Montezuma, Ga.	WMNZ	1050
Montgomery, Ala.	WBAM	740
	WAPX	1600
	WCOV	1170
	WFMI	1000
	WHHY	1440
	WMGY	800
	WRMA	950
Montgomery, W.Va.	WMON	1340
Monticello, Ark.	KHBM	1430
Monticello, Fla.	WWSD	1090
Monticello, Ky.	WFLW	1360
Montpelier, Ida.	KVSI	1450
Montpelier-Barre, Vt.	WSKI	1240
Montrose, Colo.	KUBC	580
Montrose, Pa.	WPEL	1250
Mooresville, N.C.	WHIP	1350
Moorhead, Minn.	KVOX	1280
Morehead, Ky.	WMOR	1330
Morehead City, N.C.	WMBL	740
Morgan City, La.	KMRC	1430
Morganfield, Ky.	WMSK	1550
Morgantown, N.C.	WMNC	1430
Morgantown, W.Va.	WAJR	1440
	WCLG	1300
Morrilton, Ark.	KVOM	800
Morris, Ill.	WCSJ	1550
Morris, Minn.	KMRS	1230
Morristown, N.J.	WMTR	1250
Morristown, Tenn.	WCRK	1150
	WMTN	1300
Morton, Tex.	KRAN	1280
Moscow, Idaho	KRPL	1400
Moses Lake, Wash.	KSEM	1470
	KWIQ	1260
Moss Point, Miss.	WCIS	1460
Moulton, Ala.	WLCB	1530
Moultrie, Ga.	WMGA	1130
	WMTM	1300
Moundsville, W.Va.	WEIF	1370
Mountain City, Tenn.	WMCT	1390
Mountain Grove, Mo.	KLRS	1360
Mountain Home, Ark.	KTLO	1240
Mountain Home, Ida.	KFLI	1240
Mountainlake Terrace, Wash.	KURB	1510
Mt. Airy, N.C.	WPAQ	740
	WSYD	1300
Mt. Carmel, Ill.	WVMC	1360
Mt. Carmel, Pa.	WMIM	1590
Mt. Clemens, Mich.	WBRB	1430
Mt. Dora, Fla.	WVGT	1580
Mt. Holly, N.J.	WJJZ	1460
Mt. Jackson, Va.	WSIG	790
Mt. Kisco, N.Y.	WVIP	1310
Mt. Olive, N.C.	WDJS	1430
Mt. Pleasant, Mich.	WCEN	1150
Mt. Pleasant, Tex.	KIMP	960
Mt. Shasta, Calif.	KWSD	620
Mt. Sterling, Ky.	WMST	1150
Mt. Vernon, Ill.	WMIX	940
Mt. Vernon, Ind.	WPCO	1590
Mt. Vernon, Ky.	WRVK	1460
Mt. Vernon, Ohio	WMVO	1300
Mt. Vernon, Wash.	KAPS	1470
	KBRC	1430
Muleshoe, Tex.	KMUL	1380
Mullins, S.C.	WJAY	1280
Muncie, Ind.	WLBC	1340
	WERK	990
Munfordville, Ky.	WLOC	1150
Munising, Mich.	WGON	1400
Murfreesboro, N.C.	WWOR	1080
Murfreesboro, Tenn.	WGNS	1450
	WMTS	810
Murphy, N.C.	WCVP	600
	WKRK	1320
Murphysboro, Ill.	WINI	1420
Murray, Ky.	WNBS	1340
Murray, Utah	KMOR	1230
Muscatine, Iowa	KWPC	860
Muscle Shoals City, Ala.	WLAY	1450
Muskegon, Mich.	WKBZ	850
	WKJR	1520
	WTRU	1600
	WMUS	1090
Muskogee, Okla.	KBIX	1490
	KMUS	1380
Myrtle Beach, S.C.	WMYB	1450
	WTGR	1520
Nacogdoches, Tex.	KEEE	1230
	KSFA	860
Nampa, Idaho	KFXD	580
	KAIN	1340
Nanticoke, Pa.	WNAK	730
Napa, Calif.	KVON	1440
Naples, Fla.	WNOG	1270
Narrows-Pearlsburg, Va.	WNRV	990
Nashua, N.H.	WOTW	900
	WSMN	1590
Nashville, Ark.	KBHC	1260
Nashville, Ga.	WNGA	1600
Nashville, Tenn.	WKDA	1240
	WLAC	1510
	WMAK	1300
	WNAH	1360
	WSIX	980
	WSM	650
	WWGM	1560
Nassau, Bahamas	ZNS-2	1240
Natchez, Miss.	WMIS	1240
	WNAT	1450
Natchitoches, La.	KNOC	1450
Natick, Mass.	WGTR	1060
Naugatuck, Conn.	WOWW	1380
Navasota, Tex.	KWBC	1550
Nebraska City, Nebr.	KNCY	1600
Needles, Calif.	KSFE	1340
Neenah, Wis.	WNAM	1280
Nellisville, Wis.	WCCN	1370
Nelsonville, O.	WNAL	940
Neon, Ky.	WNKY	1480
Neosho, Mo.	KBTN	1420
Nevada, Mo.	KNEM	1240
New Albany, Ind.	WHEL	1570
	WREY	1290
New Albany, Miss.	WNAU	1470
Newark, Del.	WNRK	1260
Newark, N.J.	WVNJ	620
Newark, N.Y.	WACK	1420
Newark, Ohio	WCLT	1430
New Bedford, Mass.	WBSM	1420
	WNBH	1340
New Bern, N.C.	WHIT	1450
	WRNB	1490
Newberry, Mich.	WNBY	1450
Newberry, S.C.	WKDK	1240
	WKMG	1520
New Boston, Ohio	WIOI	1010
New Braunfels, Tex.	KGNB	1420
New Britain, Conn.	WRCH	910
	WRYM	840
New Brunswick, N.J.	WCTC	1450
Newburgh, N.Y.	WGNY	1220
Newburyport, Mass.	WNBP	1470
New Castle, Ind.	WCTW	1550
New Castle, Pa.	WBZY	1140
	WKST	1280
Newcastle, Wyo.	KASL	1240
New City, N.Y.	WRKL	910
New Haven, Conn.	WAVZ	1300
	WELI	960
	WNHC	1340
New Iberia, La.	KANE	1240
	KNIR	1360
New Kensington, Pa.	WKPA	1150
New London, Conn.	WNLC	1510
New Martinsville, W.Va.	WETZ	1330
Newnan, Ga.	WCOH	1400
	WNEA	1300
New Orleans, La.	WDSU	1280
	WJMR	990
	WBOK	800
	WNOE	1060
	WSMB	1350
	WNPS	1450
	WSHO	1230
	WTIX	690
	WWL	870
	WWOM	600
	WYLD	940
Newport, Ark.	KNBY	1280
Newport, Ky.	WNOP	740
Newport, N.H.	WCNL	1010
Newport, Oreg.	KNPT	1310
Newport, R.I.	WAOK	1540
Newport, Tenn.	WLIK	1270
Newport, Vt.	WIKE	1490
Newport News, Va.	WGH	1310
	WTID	1270
Newport Richey, Fla.	WGUL	1500
New Richmond, Wis.	WIXK	1590
New Roads, La.	KWRG	1500
New Rochelle, N.Y.	WVOX	1460
New Smyrna Beach, Fla.	WSBB	1230
	WOGO	1550
Newton, Iowa	KCOB	1280
Newton, Kans.	KJRG	950
Newton, Mass.	WNTN	1550
Newton, Miss.	WBKN	1410
Newton, N.J.	WNNJ	1360
Newton, N.C.	WNNC	1230
New Ulm, Minn.	KNUJ	860
New York, N.Y.	WABC	770
	WADO	1280
	WBNX	1380
	WCBS	880
	WEVD	1330
	WHN	1050
	WHOM	1480
	WINS	1010
	WLIB	1190
	WMCA	570
	WNBC	660
	WNEW	1130
	WNYC	830
	WOR	710
	WPOW	1330
	WQXR	1560
	WWRL	1600
Niagara Falls, N.Y.	WHLD	1270
	WJJL	1440
Nicholasville, Ky.	WNVL	1250
Niles, Mich.	WNIL	1290
Niles, Ohio	WNIO	1540
Nogales, Ariz.	KFBR	1340
Nome, Alaska	KICY	850
Norfolk, Nebr.	WJAG	780
Norfolk, Va.	WTAR	790
	WCMS	1050
	WNOR	1230
	WRAP	850
Normal, Ill.	WIOK	1440
Norman, Okla.	WNAD	640
	KNOR	1400
Norristown, Pa.	WNAR	1110
N. Adams, Mass.	WMNB	1230
N. Atlanta, Ga.	WRNG	680
N. Augusta, S.C.	WGUS	1380
	WFNL	1600
N. Bend, Ore.	KBBR	1340
North Charleston, S.C.	WNCG	910
Northampton, Mass.	WHMP	1400
North East, Pa.	WHYP	1530
Northfield, Minn.	WCAL	770
	KYMN	1080
N. Little Rock, Ark.	KOXE	1380
	KXLR	1150
North Platte, Nebr.	KJLT	970
	KNOP	1410
	KODY	1240
North Pole, Alaska	KJNP	1170
No. Syracuse, N.Y.	WSOQ	1220
N. Vernon, Ind.	WOCH	1460
No. Wilkesboro, N.C.	WKBC	810
Norton, Kans.	KNBI	1530
Norton, Va.	WNVA	1350
Norwalk, Conn.	WNLK	1350
Norwalk, O.	WLKR	1510
Norwich, Conn.	WICH	1310
Norwich, N.Y.	WCHN	970
Oakdale, La.	KREH	900
Oakes, N.Dak.	KEYD	1220
Oak Grove, La.	KWCL	1280
Oak Hill, W.Va.	WOAY	860
Oakland, Cal.	KNEW	910
	KABL	960
	KDIA	1310
Oakland, Md.	WMSG	1050
Oakland Park, Fla.	WIXX	1520
Oak Park, Ill.	WOPA	1490
Oak Ridge, Tenn.	WATO	1290
Ocala, Fla.	WMOP	900
	WTMC	1290
	WWKE	1370
Ocean City, Md.	WETT	1590
Ocean City, Somers Pt., N.J.	WSLT	1520
Oceanlake, Oreg.	KBCH	1380
Oceanside, Calif.	KUDE	1320
Oelila, Ga.	WSIZ	1380
Oconto, Wis.	WOCO	1260
Odessa, Tex.	WBZB	920
	KOZA	1230
	KOYL	1310
	KRIG	1410
Oelwein, Iowa	KOEL	950
Ogallala, Nebr.	KOGA	930
Ogden, Utah	KLO	1430
	KANN	1090
	KSVN	730
	KVOG	1490
Ogdensburg, N.Y	WSLB	1400
Oil City, Pa.	WKRZ	1340
Okeechobee, Fla.	WOKC	1570
Okla. City, Okla.	KBYE	890
	KLPR	1140
	KOCY	1340
	KOMA	1520
	KTOK	1000
	KJEM	800
	WKY	930
Okmulgee, Okla.	KOKL	1240
Old Saybrook, Conn.	WLIS	1420
Olean, N.Y.	WMNS	1360
	WHDL	1450
Olney, Ill.	WVLN	740
Olympia, Wash.	KGY	1240
	KITN	920
Omaha, Nebr.	KBON	1490
	KFAB	1110
	KOIL	1290
	KOOO	1420
	KOZN	660
	WOW	590
Omak, Wash.	KOMW	680
Oneida, N.Y.	WMCR	1600
Oneida, Tenn.	WBNT	1310
O'Neill, Nebr.	KBRX	1350
Oneonta, Ala.	WCRL	1570
Oneonta, N.Y.	WDOS	730
Ontario, Cal.	KSOM	1510
Ontario, Oreg.	KSRV	1380
Opelika, Ala.	WAOA	1520
	WPHO	1400
Opelousas, La.	KSLO	1230
Opp, Ala.	WAMI	860
Opportunity, Wash.	KZUN	650
Orange, Mass.	WCAT	1390
Orange, Tex.	KOGT	1600
Orange, Va.	WIMA	1340
Orangeburg, S.C.	WDIX	1150
	WORG	1580
	WTND	920
Orange Park, Fla.	WAYR	550
Ord, Neb.	KNLV	1060
Oregon City, Ore.	KYXI	1520
Orlando, Fla.	WDBO	580
	WHOO	990
	WORJ	1270
	WLOF	950
	WKIS	740
Ormond Bch., Fla.	WQXQ	1380
Orofino, Idaho	KLER	950
Oroville, Calif.	KAOR	1340
Ortonville, Minn.	KDIO	1350
Osage Bch., Mo.	KRMS	1150
Osceola, Ark.	KOSE	860
Oshkosh, Wis.	WAGO	690
	WOSH	1490
Oskaloosa, Iowa	KBOE	740
Oswego, N.Y.	WSGO	1440
Othello, Wash.	KRSC	1400
Otsego, Mich.	WAOP	980
Ottawa, Ill.	WCMY	1430
Ottawa, Kans.	KOFO	1220
Ottumwa, Iowa	KBIZ	1240
	KLEE	1480
Owatonna, Minn.	KRFO	1390
Owego, N.Y.	WEBO	1330
Owensboro, Ky.	WOMI	1490
	WVJS	1420
Owosso, Mich.	WOAP	1080
Oxford, Miss.	WSUH	1420
Oxford, N.C.	WOXF	1340
Oxnard, Calif.	KOXR	910
Ozark, Ala.	WOZK	900
	WAYD	1190
Ozark, Ark.	KZRK	1540
Paducah, Ky.	WDXR	1560
	WKYX	570
	WPAD	1450
Page, Ariz.	KPGE	1340
Painesville, Ohio	WPVL	1460
Paintsville, Ky.	WSIP	1490
Palatka, Fla.	WWPF	1260
	WSUZ	800
Palestine, Tex.	KNET	1450
Palm Bch., Fla.	WQXT	1340
Palm Sprgs., Calif.	KCMJ	1010
	KDES	920
	KPAL	1450
Palmdale, Calif.	KUTY	1470
Palm Desert, Cal.	KGOL	1270
Palo Alto, Calif.	KIBE	1220
Pamona, Cal.	KWOW	1600
Pampa, Tex.	KPDN	1340
	KGRO	1230
Panama Beach, Fla.	WGNE	1480
	WSCM	1290
Panama City, Fla.	WDLP	590
	WPCF	1430
Paoli, Ind.	WVAK	1560
Paradise, Cal.	KEWQ	930
Paragould, Ark.	KDRS	1490
Paris, Ark.	KCCL	1460
Paris, Ill.	WPRS	1440
Paris, Ky.	WPDE	1440
Paris, Tenn.	WTPR	710
Paris, Tex.	KPLT	1490
	KPRE	1250
Parkersburg, W.Va.	WCEF	1050
	WPAR	1450
	WTAP	1230
Park Falls, Wis.	WNBI	980
Park Rapids, Minn.	KPRM	1240
Parsons, Kans.	KLKC	1540
Pasadena, Cal.	KPPC	1240
	KRLA	1110
	KWKW	1300

Location	C.L.	kHz
Pasadena, Tex.	KLVL	1420
	KIKK	650
Pascagoula-Moss Point, Miss.	WPMP	1580
Pasco, Wash.	KORD	910
Paso Robles, Calif.	KPRL	1230
Pastillo, P.R.	WCGB	1050
Patchogue, L.I., N.Y.	WALK	1370
	WPAC	1580
Paterson, N.J.	WPAT	930
Pauls Valley, Okla.	KVLH	1470
Pawhuska, Okla.	KOSG	1500
Pawtucket, R.I.	WXTR	550
Payette, Ida.	KYET	1450
Pearsall, Tex.	KVWG	1280
Pecos, Tex.	KIUN	1400
Peekskill, N.Y.	WLNA	1420
Pekin, Ill.	WSIV	1140
Pell City, Ala.	WFHK	1430
Pendleton, Oreg.	KTIX	1240
	KUMA	1290
Pennington Gap, Va.	WSWV	1570
Pensacola, Fla.	WBOP	980
	WBSR	1540
	WMEL	610
	WNVY	1230
	WCOA	1370
	WPFA	790
Peoria, Ill.	WXCL	1350
	WMBD	1470
	WIRL	1290
	WPEO	1020
Perry, Fla.	WPRY	1400
	WGKR	1310
Perry, Ga.	WPGA	980
Perry, Iowa	KDLS	1310
Perryton, Tex.	KEYE	1400
Peru, Ind.	WARU	1600
Petaluma, Calif.	KTOB	1490
Peterborough, N.H.	WSCV	1050
Petersburg, Va.	WSSV	1240
Petoskey, Mich.	WMBN	1340
	WJML	1110
Phenix City, Ala.	WPNX	1460
Philadelphia, Miss.	WHOC	1490
Philadelphia, Pa.	KYW	1060
	WCAU	1210
	WDAS	1480
	WFIL	560
	WFLN	900
	WHAT	1340
	WHOC	1490
	WIBG	990
	WIP	610
	WPEN	950
	WRCP	1540
	WTEL	860
Philipsburg, Pa.	WPHB	1260
Phillipsburg, Kans.	KKAN	1490
Phoenix, Ariz.	KIFN	860
	KASA	1540
	KCAC	1010
	KHAT	1480
	KHEP	1280
	KMEO	740
	KOY	550
	KOOL	960
	KPHO	910
	KRIZ	1230
	KTAR	620
	KXIV	1400
Phoenix City, Ala.	WPNX	1460
Pickens, S.C.	WKKR	1540
Piedmont, Ala.	WPID	1280
Piedmont, Mo.	KPWB	1140
Pierre, S.D.	KGFX	1060
	KCCR	1240
Pikeville, Ky.	WLSI	900
	WPKE	1240
Pine Bluff, Ark.	KCLA	1400
	KADL	1270
	KOTN	1490
	KCAT	1530
	KPBA	1590
Pine City, Minn.	WCMP	1350
Pinellas Park, Fla.	WFSO	570
Pineville, Ky.	WANO	1230
Pineville, Ky.	WMLF	1280
Pineville, W.Va.	WWYO	970
Pipestone, Minn.	KLOH	1050
Piqua, Ohio	WPTW	1570
Pittsburg, Calif.	KKIS	990
Pittsburg, Kans.	KOAM	860
	KSEK	1340
Pittsburgh, Pa.	KDKA	1020
	KQV	1410
	WAMO	860
	WJAS	1320
	WPIT	730
	WTAE	1250
	WEEP	1080
	WWSW	970
Pittsfield, Ill.	WBBA	1580
Pittsfield, Mass.	WBEC	1420
	WBRK	1340
Pittston, Pa.	WPTS	1540
Plainfield, N.J.	WERA	1590
Plainview, Tex.	KVOP	1400
Plant City, Fla.	WPLA	910

Location	C.L.	kHz
Platteville, Wis.	WSWW	1590
Plattsburg, N.Y.	WEAV	960
	WIRY	1340
	WKDR	1070
Pleasanton, Tex.	KBOP	1380
Pleasantville, N.J.	WOND	1400
Plymouth, Ind.	WTCA	1050
Plymouth, Mass.	WPLM	1390
Plymouth, N.C.	WPNC	1470
Plymouth, N.H.	WPNH	1300
Plymouth, Wis.	WPLY	1420
Pocahontas, Ark.	KPOC	1420
Pocatello, Idaho	KSEI	930
	KWIK	1240
	KSNN	1290
Pocomoke City, Md.	WDMV	540
Pomona, Calif.	KWOW	1600
	KKAR	1220
Pompton Lakes, N.J.	WKER	1500
Pompano Beach, Fla.	WLOD	980
	WRBD	1470
Ponca City, Okla.	WBBZ	1230
Ponce, P.R.	WPRP	910
	WEUC	1420
	WPAB	550
	WLEO	1170
	WISO	1260
Pontiac, Ill.	WPOK	1080
Pontiac, Mich.	WPON	1460
Pontotoc, Miss.	WSEL	1440
Pooli, Ind.	WVAK	1560
Poplar Bluff, Mo.	KWOC	930
	KLID	1340
Poplarville, Miss.	WRPM	1530
Portage, Mich.	WTPS	1560
Portage, Pa.	WWML	1470
Portage, Wis.	WPDR	1350
Portageville, Mo.	KMIS	1050
Portales, N.Mex.	KENM	1450
Port Angeles, Wash.	KAPY	1000
	KONP	1450
Port Arthur, Tex.	KOLE	1340
	KPAC	1250
Porterville, Calif.	KTIP	1450
Port Hueneme, Calif.	KACY	1520
Port Huron, Mich.	WHLS	1450
	WPHM	1380
Port Jervis, N.Y.	WDLC	1490
Port Lavaca, Tex.	KGUL	1560
Portland, Ind.	WPGW	1440
Portland, Maine	WCSH	970
	WGAN	560
	WLOB	1310
	WPOR	1490
Portland, Oreg.	KBPS	1450
	KLIQ	1290
	KEX	1190
	KGW	620
	KOIN	970
	KPAM	1410
	KPDQ	800
	KPOJ	1330
	KWJJ	1080
	KXL	750
Port Neches, Tex.	KPNG	1150
Port St. Joe, Fla.	WJOE	1080
Portsmouth, N.H.	WBBX	1380
	WHEB	750
Portsmouth, Ohio	WPAY	1400
	WNXT	1260
Portsmouth, Va.	WHIH	1400
	WCVU	1350
	WPMH	1010
Port Sulphur, La.	KPBC	1510
Port Washington, Wis.	WGLB	1560
Post, Tex.	KPOS	1370
Poteau, Okla.	KLCO	1280
Potomac-Cabin John, Md.	WXLN	950
	KYRO	1280
Potosi, Mo.	WPDM	1470
Potsdam, N.Y.	WPAZ	1370
Pottstown, Pa.	WPAM	1450
Pottsville, Pa.	WPPA	1360
Poughkeepsie, N.Y.	WEOK	1390
	WKIP	1450
Powell, Wyo.	KPOW	1260
Poynette, Wis.	WIBU	1240
Prairie du Chien, Wis.	WPRE	980
Pratt, Kan.	KWNS	1290
Prattville, Ala.	WPXC	1410
Prentiss, Miss.	WKPO	1510
Prescott, Ariz.	KYCA	1490
	KENT	1340
	KNOT	1450
Prescott, Ark.	KTPA	1370
Presque Isle, Me.	WAGM	950
	WEGP	1390
Preston, Idaho	KPST	1340
Preston, Minn.	KFIL	1060
Prestonsburg, Ky.	WPRT	980
	WDOC	1310
Price, Utah	KOAL	1230
Prichard, Ala.	WZAM	1270
Prince Albert, Sask.	CKBI	900
Princeton, Ill.	WZOE	1490
Princeton, Ind	WRAY	1250
Princeton, Ky.	WPKY	1580
Princeton, Minn.	WKPM	1300

Location	C.L.	kHz
Princeton, N.J.	WHWH	1350
Princeton, W.Va.	WLOH	1490
Prineville, Oreg.	KRCO	690
Prosser, Wash.	KARY	1310
Providence, R.I.	WEAN	790
	WHIM	1110
	WICE	1290
	WJAR	920
	WLKW	990
	WPRO	630
	WRIB	1220
Provo, Utah	KIXX	1400
	KEYY	1450
	KOVO	960
Pryor, Okla.	KOLS	1570
Pueblo, Colo.	KDZA	1230
	KAPI	690
	KCSJ	590
	KFEL	970
Pueblo, Colo.	KKAM	1350
	KPUB	1480
Pulaski, Tenn.	WKSR	1420
Pulaski, Va.	WPUV	1580
Pullman, Wash.	KWSC	1250
	KPUL	1150
Punta Gorda, Fla.	WCCF	1580
Punxsutawney, Pa.	WPME	1540
Putnam, Conn.	WINY	1350
Puyallup, Wash.	KAYE	1450
Quanah, Tex.	KQLJ	1150
Quantico, Va.	WQVA	1590
Quincy, Cal.	KPCO	1370
Quincy, Fla.	WCNH	1230
Quincy, Ill.	WGEM	1440
	WTAD	930
Quincy, Mass.	WJDA	1300
Quincy, Wash.	KPOR	1370
Quitman, Ga.	WSFB	1490
Quitman, Miss.	WBFN	1500
Racine, Wis.	WRAC	1460
	WRJN	1400
Radford, Va.	WRAD	1460
Raeford, N.C.	WSHB	1400
Rainsville, Ala.	WVSM	1500
Raleigh, N.C.	WKIX	850
	WYNA	1550
	WPTF	680
	WLLE	570
	WRNC	1240
Ralls, Tex.	KCLR	1530
Rantoul, Ill.	WRTL	1460
Randolph, Vt.	WCVR	1230
Rapid City, S.Dak.	KOTA	1380
	KIMM	1150
	KRSD	1340
	KEZU	920
Raton, N.Mex.	KRTN	1490
Ravenswood, W.Va.	WMOV	1360
Rawlins, Wyo.	KRAL	1240
Raymond, Wash.	KAPA	1340
Raymondville, Tex.	KSOX	1240
Rayville, La.	KRIH	990
Reading, Pa.	WEEU	850
	WHUM	1240
	WRAW	1340
Red Bay, Ala.	WRMG	1430
Redding, Calif.	KRDG	1230
	KAHR	1330
	KQMS	1400
	KVCV	600
	KVIP	540
Red Bluff, Calif.	KBLF	1490
Redfield, S.Dak.	KFCB	1380
Redlands, Calif.	KCAL	1410
Red Lion, Pa.	WGCB	1440
Red Lodge, Mont.	KRBN	1450
Redmond, Oreg.	KPRB	1240
Red Oak, Ia.	KOAK	1080
Red Wing, Minn.	KCUE	1250
Redwood Falls, Minn.	KLGR	1490
Reedsburg, Wis.	WRDB	1400
Reedsport, Oreg.	KRAF	1470
Reidsville, N.C.	WFRC	1600
	WREV	1220
Remsen, N.Y.	WADR	1480
Reno, Nev.	KOH	630
	KBET	1340
	KOLO	920
	KONE	1450
	KCBN	1230
Rensselaer, Ind.	WRIN	1560
Rensselaer, N.Y.	WEEE	1300
Renton, Wash.	KREN	1420
Rexburg, Idaho	KRXK	1230
Rhinelander, Wis.	WOBT	1240
Rice Lake, Wis.	WJMC	1240
Richfield, Minn.	WPBC	980
Richfield, Utah	KSVC	980
Richland, Wash.	KALE	960
Richland, Wis.	WRCO	1450
Richlands, Va.	WRIC	540
Richmond, Ind.	WKBV	1490
Richmond, Ky.	WEKY	1340
Richmond, Va.	WANT	990
	WBBL	1480
	WRGM	1540
	WLEE	1480
	WEET	1320
	WGOE	1590
	WTVR	1380
	WRNL	910
	WRVA	1140

Location	C.L.	kHz
	WXGI	950
	WRGM	1540
Richwood, W.Va.	WVAR	600
Ridgecrest, Calif.	KRCK	1360
	KLOA	1240
Ridgeland, S.C.	WBUG	1430
Rifle, Colo.	KWSR	810
Rio Piedras, P.R.	WUNO	1320
Ripley, Miss.	WSCA	1260
Ripley, Tenn.	WTRB	1570
Ripon, Wis.	WCWC	1600
Riverhead, N.Y.	WRIV	1390
	WHRF	1570
Riverside, Calif.	KPRO	1440
	KACE	1570
Riverton, Wyo.	KVOW	1450
Riviera Beach, Fla.	WXVI	1600
Roanoke, Ala.	WELR	1360
Roanoke, Va.	WDBJ	960
	WRIS	1410
	WTOY	910
	WROV	1240
	WSLS	610
Roanoke Rapids, N.C.	WCBT	1290
Roaring Sprgs., Pa.	WKMC	1370
Roberval, Que.	CHRL	910
Robinson, Ill.	WTAY	1570
Robstown, Tex.	KROB	500
Rochelle, Ill.	WRHL	1060
Rochester, Minn.	KROC	1340
	KWEB	1270
	KOLM	1520
Rochester, N.H.	WWNH	930
Rochester, N.Y.	WBBF	950
	WHAM	1180
	WHEC	1460
	WNYR	680
	WSAY	1370
	WROC	1280
Rockford, Ill.	WROK	1440
	WYFE	1150
	WRRR	1330
Rockford, Mich.	WJPW	810
Rock Hill, S.C.	WRHI	1340
	WTYC	1150
Rockingham, N.C.	WAYN	900
Rock Island, Ill.	WHBF	1270
Rockland, Maine	WRKD	1450
Rockmart, Ga.	WPLK	1220
Rock Springs, Wyo.	KVRS	1360
Rockville, Conn.	WRKV	800
Rockville, Md.	WINX	1600
Rockwood, Tenn.	WRKH	580
Rocky Ford, Colo.	KAVI	1320
Rocky Mount, N.C.	WCEC	810
	WEED	1390
	WRMT	1490
	WKWS	1290
Rocky Mount, Va.	WYTI	1570
Rogers, Ark.	KAMO	1390
Rogers City, Mich.	WHAK	960
Rogersville, Tenn.	WRGS	1370
Rolla, Mo.	KCLU	1590
	KTTR	1490
Rome, Ga.	WLAQ	1410
	WIYN	1360
	WRGA	1470
	WROM	710
Rome, N.Y.	WKAL	1450
	WRNY	1350
Ronceverte, W.Va.	WRON	1400
Roseau, Minn.	KRWB	1410
Roseburg, Oreg.	KRNR	1490
	KQEN	1240
	KRXL	1250
	KYES	950
Rosenberg, Tex.	KFRD	980
Roservelt, N.M.	KRDD	1320
Roseville, Cal.	KPOP	1110
Rossville, Ga.	WRIP	1190
Roswell, N.Mex.	KRSY	1290
	KGFL	1430
	KBIM	910
	KRDD	1320
	KSWS	1020
Roxboro, N.C.	WRXO	1430
Royal Oak, Mich.	WEXL	1340
Rugby, N. Dak.	KGCA	1450
Ruidoso, N.Mex.	KRRR	1340
Rumford, Me.	WRUM	790
Rupert, Idaho	KAYT	970
Rushton, La.	KRUS	1490
Rusk, Texas	KTLU	1580
Russell, Kans.	KRSL	990
Russellville, Ala.	WWWR	920
Russellville, Ark.	KARV	1490
Russellville, Ky.	WRUS	610
Rutland, Vt.	WHWB	1000
	WSYB	1380
Rutherfordton, N.C.	WCAB	590
Sacramento, Calif.	KCRA	1320
	KFBK	1530
	KGMS	1380
	KJAY	1430
	KRAK	1140
	KROY	1240
	KXOA	1470
Safford, Ariz.	KGLU	1480
	KATO	1230
Sag Harbor, N.Y.	WLNG	1600

WHITE'S RADIO LOG

Location	C.L.	kHz
Saginaw, Mich.	WKNX	1210
	WSAM	1400
	WSGW	790
St. Albans, Vt.	WWSR	1420
St. Albans, W.Va.	WKLC	1300
St. Anthony, Ida.	KIGO	1400
St. Augustine, Fla.	WFOY	1240
	WETH	1420
St. Charles, Mo.	KIRL	1460
St. Cloud, Minn.	KFAM	1450
	WJON	1240
Ste. Genevieve, Mo.	KSGM	1340
St. George, S.C.	WQIZ	810
St. George, Utah	KDXU	1430
St. Helen, Mich.	WMIC	1590
St. Helens, Oreg.	KOHI	1600
St. Ignace, Mich.	WIDG	940
St. Johns, Mich.	WRBJ	1580
St. Johnsbury, Vt.	WTWN	1340
St. Joseph, Mich.	WSJM	1400
St. Joseph-Benton Harbor, Mich.	WHFB	1060
St. Joseph, Mo.	KFEQ	680
	KKJO	1550
	KUSN	1270
St. Louis, Mo.	KATZ	1600
	KMOX	1120
	KSD	550
	KSTL	690
	KWK	1380
	KXOK	630
	WEW	770
	WIL	1430
	KXEN	1010
St. Louis Park, Minn.	KRSI	950
St. Maries, Idaho	KOFE	1480
St. Mary's, Pa.	WKBI	1400
St. Paul, Minn.	KSTP	1500
	KDWB	630
	WMIN	1400
	WMKT	1370
	WCCO	830
St. Pauls, N.C.	WBYB	1060
St. Peter, Minn.	KRBI	1310
St. Petersburg, Fla.	WWBA	680
	WSUN	620
	WLCY	1380
St. Petersburg Beach, Fla.	WILZ	1590
Salamanca, N.Y.	WGGO	1590
Salem, Ill.	WJBD	1350
Salem, Ind.	WSLM	1220
Salem, Mass.	WESX	1230
Salem, Mo.	KSMO	1340
Salem, N. J.	WJIC	1510
Salem, O.	WSOM	600
Salem, Oreg.	KSLM	1390
	KAPT	1220
	KBZY	1490
	KGAY	1430
Salem, Va.	WBLU	1480
Salida, Colo.	KVRH	1340
Salina, Kans.	KSAL	1150
	KFRM	550
	KISI	910
Salinas, Calif.	KOON	1460
	KTOM	1380
Salinas, Calif.	KCTY	980-1000
Salinas, P.R.	WHOY	1210
Saline, Mich.	WOIB	1290
Salisbury, Md.	WBOC	960
	WICO	1320
	WJOY	1470
Salisbury, N.C.	WSTP	1490
	WSAT	1280
Sallisaw, Okla.	KRBB	1560
Salmon, Idaho	KSRA	960
Salt Lake City, Utah	KALL	910
	KCPX	1320
	KLUB	570
	KNAK	1280
	KRGO	1550
	KRSP	1060
	KSL	1160
	KSOP	1370
	KSXX	630
	KWHO	860
San Angelo, Tex.	KTEO	1340
	KGKL	960
	KPEP	1420
	KWFR	1260
San Antonio, Tex.	KAPE	1480
	KBAT	680
	KBER	1150
	KBUC	1310
	KCOR	1350
	KEDA	1540
	KITE	930
	KUKA	1250
	KMAC	630
	KONO	860
	KTSA	550
	WOAI	1200
San Bernardino, Calif.	KCKC	1350
	KFXM	590
	KRNO	1240
	KMEN	1290
Sandersville, Ga.	WSNT	1490
San Diego, Calif.	KCBQ	1170
	KFMB	760
	KOGO	600
	KGB	1360
	KSON	1240
	KSDO	1130
Sandpoint, Idaho	KSPT	1400
Sand Spring, Okla.	KTOW	1340
Sandusky, Mich.	WMIC	1560
Sandusky, Ohio	WLEC	1450
San Fernando, Calif.	KGIL	1260
Sanford, Fla.	WTRR	1400
	WSFR	1300
Sanford, Me.	WSME	1220
Sanford, N.C.	WEYE	1290
	WWGP	1050
San Francisco, Calif.	KFRC	610
	KCBS	740
	KFAX	1100
	KGO	810
	KNBR	680
	KKHI	1550
	KSAY	1010
	KSFO	560
	KSOL	1450
	KYA	1260
San Gabriel, Cal.	KAIL	1430
San German, P. R.	WRJS	1060
Sanitobia, Miss.	WSAO	1550
San Jose, Calif.	KLOK	1170
	KLIV	1590
	KEEN	1370
	KXRX	1500
San Juan, P.R.	WAPA	680
	WBMJ	1190
	WHOA	870
	WIAC	740
	WIPR	940
	WITA	1140
	WKAQ	580
	WKVM	810
	WQBS	650
	WRAI	1520
San Luis Obispo, Calif.	KATY	1340
	KSLY	1400
	KVEC	920
San Marcos, Tex.	KCNY	1470
San Mateo, Calif.	KOFY	1050
San Rafael, Calif.	KTIM	1510
San Saba, Tex.	KBAL	1410
San Sebastion, P.R.	WFBA	1460
Santa Ana, Calif.	KWIZ	1480
Santa Barbara, Cal.	KDB	1490
	KGUD	990
	KIST	1340
	KTMS	1250
	KACL	1290
Santa Clara, Calif.	KGNU	1430
Santa Cruz, Calif.	KSCU	1080
Santa Fe, N.Mex.	KTRC	1400
	KAFE	810
	KVSF	1260
Santa Maria, Cal.	KCOY	1400
	KSMA	1240
	KSEE	1480
	KZDN	1600
Santa Monica, Cal.	KDAY	1580
Santa Paula, Cal.	KQIQ	1400
Santa Rosa, Calif.	KSRO	1350
	KVRE	1460
	KJAX	1150
Santa Rosa, N.Mex.	KSYX	1420
Sapulpa, Okla.	KREK	1550
Saranac Lake, N.Y.	WNBZ	1240
Sarasota, Fla.	WKXY	930
	WSAF	1220
	WSPB	1450
	WYNO	1280
Saratoga, N.Y.	WSPN	900
Saratoga Springs, N.Y.	WKAJ	900
Sauk Rapids, Minn.	WVAL	800
Sault Ste. Marie, Mich.	WSOO	1230
Savannah, Ga.	WBYG	1450
	WEAS	900
	WSAV	630
	WSGA	1400
	WTOC	1290
	WSOK	1230
Savannah, Tenn.	WORM	1010
Sayre, Pa.	WATS	960
Scheffield, Ala.	WSHF	1290
Schenectady, N.Y.	WGY	810
	WSNY	1240
Scotland Neck, N.C.	WYAL	1280
Scott City, Kans.	KFLA	1310
Scottsbluff, Nebr.	KNEB	960
Scottsboro, Ala.	KOLT	1320
	WCRI	1050
	WROS	1330
Scottsdale, Ariz.	KDOT	1440
Scottsville, Ky.	WLCK	1250
Scranton, Pa.	WARM	590
	WEJL	630
	WGBI	910
	WICK	1400
	WSCR	1320
Seaford, Del.	WSUX	1280
Searcy, Ark.	KWCB	1300
Seaside, Ore.	KSWB	930
Seattle, Wash.	KAYO	1150
	KIXI	910
	KING	1090
	KIRO	710
	KJR	950
	KOL	1300
	KOMO	1000
	KSND	1590
	KTW	1250
	KVI	570
	KXA	770
	KBLE	1050
Sebring, Fla.	WJCM	960
	WSEB	1340
Sedalia, Mo.	KDRO	1340
	KSIS	1050
Seguin, Tex.	KWED	1580
Selinsgrove, Pa.	WSEW	1240
Selma, Ala.	WAMA	1340
	WHBB	1490
	WTQX	1570
Selma, N.C.	WBZB	1090
Selmer, Tenn.	WDTM	1130
Seminole, Tex.	KIKZ	1250
Senatobia, Miss.	WSAU	1550
Seneca Falls, N.Y.	WSFW	1110
Seneca Township, S.C.	WSNW	1150
Sevierville, Tenn.	WSEV	930
Seward, Alaska	KIBH	950
Seymour, Ind.	WJCD	1390
Seymour, Tex.	KSEY	1230
Shakopee, Minn.	KSMM	1530
Shallotte, N.C.	WVCB	1410
Shamokin, Pa.	WISL	1480
Shamrock, Tex.	KBYP	1580
Sharon, Pa.	WPIC	790
Shawano, Wis.	WTCH	960
Shawnee, Okla.	KGFF	1450
Sheboygan, Wis.	WHBL	1330
	WKTS	950
Sheffield, Ala.	WSHF	1290
Shelby, Mont.	KSEN	1150
Shelby, N.C.	WOHS	730
	WADA	1390
Shelbyville, Ind.	WSVL	1520
Shelbyville, Ky.	WCND	940
Shelbyville, Tenn.	WHAL	1400
	WLIJ	1580
Sheldon, Iowa	KIWA	1550
Shell Lake, Wis.	WCSW	940
Shelton, Wash.	KMAS	1280
Shenandoah, Iowa	KMA	960
Shenandoah, Pa.	WMBT	1530
Sheridan, Wyo.	KWYO	1410
	KROE	930
Sherman, Tex.	KRRV	910
	KTXO	1500
Shippensburg, Pa.	WSHP	1480
Show Low, Ariz.	KVSL	1590
	KVWM	970
Shreveport, La.	KBCL	1220
	KEEL	710
	KDKA	1550
	KJOE	1480
	KCIJ	980
	KRMD	1340
	KWKH	1130
Sidney, Mont.	KGOX	1480
Sidney, Nebr.	KSID	1340
Sidney, O.	WMVR	1080
Sierra Vista, Ariz.	KHFH	1420
Sikeston, Mo.	KSIM	1400
	KMPL	1520
Siler City, N.C.	WNCA	1570
Siloam Sprgs., Ark.	KUOA	1290
Silsbee, Tex.	KKAS	1300
Silver City, N.Mex.	KSIL	1340
Silver Sprgs., Md.	WQMR	1050
Simcoe, Ont.	CFRS	1560
Sinton, Tex.	KTOD	1590
Sioux City, Iowa	KSCJ	1360
	KMNS	620
	KTRI	1470
	KVDB	1090
Sioux Falls, S.Dak.	KISO	1230
	KELO	1320
	KNWC	1270
	KSOO	1140
	KXRB	1000
Sitka, Alaska	KIFW	1230
	KSEW	1400
Skowhegan, Maine	WGHM	1150
Slaton, Tex.	KCAS	1050
Slidell, La.	WBGS	1560
Smithfield, N.C.	WMPM	1270
Smithville, Tenn.	WJLE	1480
Smyrna, Ga.	WYNX	1550
Snyder, Tex.	KSNY	1450
Socorro, N.Mex.	KSRC	1290
Soda Springs, Ida.	KBRV	790
Soldatna, Alaska	KSRM	920
Somerset, Ky.	WSFC	1240
	WTLO	1480
Somerset, Pa.	WVSC	990
Sonora, Calif.	KVML	1450
So. Bend, Ind.	WNDU	1490
	WJVA	1580
	WSBT	960
Southbridge, Mass.	WESO	970
So. Boston, Va.	WHLF	1400
Southern Pines, N.C.	WEEB	990
South Charleston, W. Va.	WRDS	1410
South Daytona Beach, Fla.	WELE	1590
So. Gastonia, N.C.	WGAS	1420
So. Haven, Mich.	WJOR	940
South Hill, Va.	WJWS	1370
Southington, Conn.	WNTY	990
So. Knoxville, Tenn.	WSKT	1580
South Lake Tahoe, Cal.	KOWL	1490
	KTHO	590
S. Miami, Fla.	WFUN	790
So. Paris, Me.	WKTQ	1450
So. Pittsburg, Tenn.	WEPG	910
So. St. Paul, Minn.	KDWB	630
	WMKT	1370
So. Williamsport, Pa.	WMPT	1450
Spanish Fork, Utah	KONI	1480
Sparks, Nev.	KBUB	1270
Sparta, Ill.	WHCO	1230
Sparta, N.C.	WCOK	1060
Sparta, Tenn.	WSMT	1050
Sparta, Wis.	WKLJ	990
	WCOW	1290
Spartanburg, S.C.	WHCQ	1400
	WORD	910
	WSPA	950
	WASC	1530
Spencer, Iowa	KICD	1240
Spencer, W.Va.	WVRC	1400
Spokane, Wash.	KGA	1510
	KUNC	1440
	KSPO	1230
	KPEG	1380
	KHQ	590
	KJRB	790
	KREM	970
	KXLY	920
	KCFA	1330
	KUDY	1280
Springdale, Ark.	KBRS	1340
	KSPR	1590
Springfield, Ill.	WCVS	1450
	WMAY	970
	WTAX	1240
Springfield, Mass.	WHYN	560
	WMAS	1450
	WSPR	1270
Springfield, Mo.	KGBX	1260
	KICK	1340
	KTTS	1400
	KWTO	560
Springfield, Ohio	WIZE	1340
	WBLY	1600
Springfield, Ore.	KCNW	1120
Springfield-Eugene, Ore.	KEED	1450
	KORE	1050
Springfield, Tenn.	WOBL	1590
Springfield, Vt.	WCFR	1480
Springhill, La.	KBSF	1460
Spring Lake, N. C.	WFBS	1450
Spring Valley, N.Y.	WKQW	1300
Spruce Pine, N.C.	WSUE	1470
Stamford, Conn.	WSTC	1400
Stamford, Tex.	KDWT	1400
Stanford, Ky.	WRSL	1420
Starke, Fla.	WPXE	1490
Starkville, Miss.	WKOR	980
	WSSO	1230
State College, Pa.	WMAJ	1450
	WRSC	1390
Statesboro, Ga.	WWNS	1240
Statesville, N.C.	WSIC	1400
	WDBM	550
Staunton, Va.	WTON	1240
	WAFC	900
Stephenville, Tex.	KSTV	1510
Sterling, Colo.	KGEK	1230
Sterling, Ill.	WSDR	1240
Steubenville, Ohio	WSTV	1340
Stevens Point, Wis.	WSPT	1010
Stillwater, Minn.	WAVN	1220
Stillwater, Okla.	KSPI	780
Stockton, Calif.	KJOY	1280
	KSTN	1420
	KWG	1230
Storm Lake, Iowa	KAYL	990
Streator, Ill.	WIZZ	1250
Stroudsburg, Pa.	WVPO	840
Stuart, Fla.	WSTU	1450
Stuart, Va.	WHEO	1270
Sturgeon Bay, Wis.	WDOR	910
Sturgis, Mich.	WSTR	1230
Sturgis, S.D.	KBHB	810
Stuttgart, Ark.	KWAK	1240

Location	C.L.	kHz
Suffolk, Va.	WLPM	1450
Sullivan, Ind.	WKQV	1550
Sullivan, Mo.	KTUI	1560
Sulphur, La.	KIKS	1310
Sulphur Sprgs., Tex.	KSST	1250
Summerville, Ga.	WGTA	950
Summerville, S.C.	WAZS	980
Sumner, Wash.	KDFL	1560
Sumter, S.C.	WFIG	1290
	WDXY	1240
	WSSC	1340
Sunbury, Pa.	WKOK	1070
Sunnyside, Wash.	KREW	1230
Sun Valley, Ida.	KSKI	1340
Superior, Nebr.	KRFS	1600
Superior, Wis.	WDSM	710
	WAKX	1320
	WWJC	1270
	WAXK	1320
Susanville, Calif.	KSUE	1240
Sutton, W. Va.	WSGB	1490
Swainsboro, Ga.	WJAT	800
Sweet Home, Ore.	KFIR	1370
Sweetwater, Tenn.	WDEH	800
Sweetwater, Tex.	KXOX	1240
Sylacauga, Ala.	WFEB	1340
	WMLS	1290
Sylva, N.C.	WMSJ	1480
Sylvania, Ga.	WSYL	1490
Sylvester, Ga.	WOGA	1540
Syracuse, N.Y.	WHEN	620
	WFBL	1390
	WNDR	1260
	WOLF	1490
	WSYR	570
Tabor City, N.C.	WTAB	1370
Tacoma, Wash.	KMO	1360
	KTAC	850
	KTNT	1400
	KVI	570
Taft, Calif.	KTKR	1310
Tahlequah, Okla.	KTLQ	1350
Tahoe Valley, Calif.	KTHO	590
Talladega, Ala.	WEYY	1580
	WNUZ	1230
Tallahassee, Fla.	WMEN	1330
	WQNS	1410
	WTAL	1450
	WTNT	1270
Tallassee, Ala.	WTLS	1300
Tallulah, La.	KTLD	1360
Tampa, Fla.	WALT	1110
	WDAE	1250
	WYOU	1550
	WFLA	970
	WHBO	1050
	WINQ	1010
	WTMP	1150
	WSOL	1300
Taos, N. Mex.	KKIT	1340
Tarboro, N.C.	WCPS	760
Tarpon Springs, Fla.	WCWR	1470
Tasley, Va.	WESR	1330
Taunton, Mass.	WPEP	1570
Tawas City, Mich.	WIOS	1480
Taylor, Tex.	KTAE	1260
Taylorsville, Miss.	WSCO	1280
Taylorsville, N. C.	WSTH	860
	WTLK	1570
Taylorville, Ill.	WTIM	1410
Tazewell, Tenn.	WNTT	1250
Tazewell, Va.	WTZE	1470
Tell City, Ind.	WTCJ	1230
Tempe, Ariz.	KUPD	1060
	KTUF	1580
Temple, Tex.	KTEM	1400
Terre Haute, Ind.	WBOW	1230
	WAAC	1300
	WTHI	1480
Terrell, Tex.	KTER	1570
Terrytown, Nebr.	KEYR	690
Texarkana, Ark.	KOSY	790
Texarkana, Tex.	KCMC	740
	KATQ	940
	KTFS	1400
Texas City, Tex.	KTLW	920
Thayer, Mo.	KALM	1290
The Dalles, Oreg.	KODL	1440
	KACI	1300
Thermopolis, Wyo.	KRTR	1490
	KTHE	1240
Thief River Falls, Minn.	KTRF	1230
Thibodaux, La.	KTIB	630
Thomaston, Ga.	WSFT	1220
	WTGA	1590
	WTHN	1500
Thomasville, Ala.	WJDB	630
Thomasville, Ga.	WPAX	1240
	WLDR	730
Thomasville, N.C.	WTNC	790
Thomson, Ga.	WTWA	1240
Three Rivers, Mich.	WLKM	1510
Thurmont, Md.	WTHU	1450
Ticonderoga, N.Y.	WIPS	1250
Tiffin, Ohio	WTTF	1600
Tifton, Ga.	WTIF	1340
	WWGS	1430
Tillamook, Oreg.	KTIL	1590
Tioga, N.D.	KTGO	1090
Titusville, Fla.	WRMF	1050
Titusville, Pa.	WTIV	1280
Toccoa, Ga.	WLET	1420
	WNES	630
Toledo, Ohio	WOHO	1470
	WSPD	1370
	WTOD	1560
	WCWA	1230
	WTTO	1520
Toledo, Oreg.	KTDO	1230
Tolleson, Ariz.	KRDS	1190
Tomah, Wis.	WTMB	1460
Tomahawk, Wis.	WELF	810
Tompkinsville, Ky.	WTKY	1370
Tooele, Utah	KDYL	990
Topeka, Kans.	WIBW	580
	KEWI	1440
	WREN	1250
	KTOP	1490
Toppenish, Wash.	KENE	1490
Torrington, Conn.	WTOR	610
Torrington, Wyo.	KGOS	1490
Towanda, Pa.	WTTC	1550
Towson, Md.	WTOW	1580
Trail, B.C.	CJAT	610
Travelers Rest, S.C.	WBBR	1580
Traverse City, Mich.	WTCM	1400
	WCCW	1310
Trenton, Mo.	KTTN	1600
Trenton, N.J.	WAAT	1300
	WBUD	1260
	WTTM	920
Trenton, Tenn.	WTNE	1500
Trinidad, Colo.	KCRT	1240
Troy, Ala.	WTBF	970
Troy, N.Y.	WHAZ	1330
	WTRY	980
	WXKW	1600
Troy, N. C.	WJRM	1390
Truckee, Cal.	KTRT	1400
Trumann, Ark.	KTMN	1530
Truth or Consequences, New Mexico	KCHS	1400
Tryon, N.C.	WTYN	1550
Tucson, Ariz.	KTUC	1400
	KXEW	1600
	KAIR	1490
	KCEE	790
	KIKX	580
	KCUB	1290
	KEVT	690
	KHOS	940
	KHYT	1330
	KTKT	990
	KOLD	1450
	KUAT	1550
Tucumcari, N. Mex.	KTNM	1400
Tulare, Calif.	KCOK	1270
	KGEN	1370
Tulia, Tex.	KTUE	1260
Tullahoma, Tenn.	WJIG	740
Tulsa, Okla.	KAKC	970
	KCNW	1300
	KRMG	740
	KELI	1480
	KVOO	1170
	KFMJ	1050
Tupelo, Miss.	WELO	580
	WTUP	1490
Turlock, Calif.	KCEY	1390
Tuscaloosa, Ala.	WJRD	1150
	WACT	1420
	WNPT	1280
	WTUG	790
	WTBC	1230
Tuscumbia, Ala.	WVNA	1590
	WRCK	1410
Tuskegee, Ala.	WABT	580
Twenty-Nine Palms, Calif.	KDHI	1250
Twin Falls, Idaho	KTFI	1270
	KLIX	1310
	KEEP	1450
Two Rivers, Wis.	WQTC	1590
Tyler, Tex.	KZAK	1330
	KDOK	1490
	KTBB	600
	KZEY	690
Tylertown, Miss.	WTYL	1290
Tyrone, Pa.	WTRN	1340
Uhrichsville, O.	WBTC	1540
Ukiah, Calif.	KUKI	1400
Ulysses, Kan.	KULY	1420
Union, S.C.	WBCU	1460
Union City, Tenn.	WENK	1240
Uniontown, Pa.	WMBS	590
Urbana, Ill.	WILL	580
	WKID	1580
Utica, N.Y.	WIBX	950
	WBVM	1550
	WRUN	1150
	WTLB	1310
Utuado, P.R.	WUPR	1530
Uvalde, Tex.	KVOU	1400
Valdese, N.C.	WSVM	1490
Valdosta, Ga.	WGOV	950
	WGAF	910
	WJEM	1150
	WVLD	1450
Valentine, Nebr.	KVSH	940
Vallejo, Calif.	KNBA	1190
Valley City, N.Dak.	KQVC	1490
Valparaiso, Fla.	WFSH	1340
Valparaiso, Ind.	WAKE	1500
	WNWI	1080
Van Buren, Ark.	KFDF	1580
Van Cleve, Ky.	WMTC	730
Vanceburg, Ky.	WKKS	1570
Vancouver, Wash.	KISN	910
	KKEY	1150
	KGAR	1550
	KVAN	1480
Vandalia, Ill.	WPMB	1500
Van Wert, Ohio	WERT	1220
Venice, Fla.	WAMR	1320
Ventura, Calif.	KVEN	1450
	KUDU	1590
Vermillion, S.Dak.	KUSD	690
	KVRA	1570
Vernal, Utah	KVEL	920
Vernon, Ala.	WVSA	1380
Vernon, Tex.	KVWC	1490
Vero Beach, Fla.	WAXE	1370
	WTTB	1490
Vicksburg, Miss.	WQBC	1420
	WVIM	1490
Victoria, Tex.	KNAL	1410
	KVIC	1340
Victorville, Calif.	KCIN	1590
Vidalia, Ga.	WVOP	970
Vieques, P.R.	WIVV	1370

A THANK YOU NOTE FROM THE EDITORS

Thank you! The Editors of RADIO-TV EXPERIMENTER would like to thank all readers who offered information on station changes, additions and deletions during the past few months. Though many of the letters overlapped, each aided us considerably in making the task of keeping White's Radio Log as current as possible at press time. If we left your name out, please forgive us!

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Jimmy Thinnes, Nampa, Idaho
Stephen G. Turco, Jackson Heights, N.Y.
John Vanderplough, Bloomington, Ind.
Rex Walker, Burlington, N.C.
C. M. Wilkinson, Riverdale, Ill.

WHITE'S

RADIO LOG

Location	C.L.	kHz
Ville Platte, La.	KVPI	1050
Vincennes, Ind.	WAOV	1450
Vineland, N.J.	WWBZ	1360
	WOVL	1270
Vinita, Okla.	KVIN	1470
Vinton, Va.	WKBA	1550
Virginia, Minn.	WHLB	1400
Virginia Beach, Va.	WVAB	1550
Virouqua, Wis.	WISV	1360
Visalia, Calif.	KDNG	1400
Vista, Cal.	KMLO	1000
Vivian, La.	KNCB	1600
Waco, Tex.	WACO	1580
	KAWA	1010
	KBGO	1580
	KWTX	1230
Wadena, Minn.	KWAD	920
Wadesboro, N.C.	WADE	1210
Wagoner, Okla.	KWLG	1530
Wahpeton, N.D.-Breckenridge, Minn.	KBMW	1450
Wailuku, Hawaii	KMVI	550
Waipahu, Hawaii	KAHU	940
Wainalla, S.C.	WGOG	1000
Wallace, Idaho	KWAL	620
Wallace, N.C.	WLSE	1400
Walla Walla, Wash.	KHIT	1320
	KUJ	1420
	KTEL	1490
Walnut Ridge, Ark.	KRLW	1320
Walsenburg, Colo.	KFLJ	1380
Walterboro, S.C.	WALD	1220
Waltham, Mass.	WCRB	1330
Walton, N.Y.	WDLA	1270
Ward Ridge, Fla.	WJOE	1570
Ware, Mass.	WARE	1250
Warner Robbins, Ga.	WRBN	1600
	WAVC	1330
Warren, Ark.	KWRF	860
Warren, Ohio	WHHH	1440
	WDNL	1570
Warren, Pa.	WNAE	1310
Warrensburg, Mo.	KOKO	1430
Warrenton, Mo.	KWRE	730
Warrenton, Va.	WEER	1250
	WKCW	1420
Warsaw, Ind.	WRSW	1480
Warsaw, Va.	WNNT	690
Warwick-E.Greenwich, R.I.	WARV	1590
Waseo, Calif.	KWSO	1050
Washington, D.C.	WMAL	630
	WOL	1450
	WOOK	1340
	WUST	1120
	WWDC	1260
	WRC	980
	WTOP	1500
Washington, Ga.	WLOV	1370
Washington, Ind.	WAMW	1580
Washington, Iowa	KCII	1380
Washington, N.J.	WCRV	1580
Washington, N.C.	WEEW	1320
	WITN	930
Washington, Pa.	WJPA	1450
Washington Court House, Ohio	WCHO	1250
Walterboro, S.C.	WALD	1060
Waterbury, Conn.	WATR	1320
	WTBY	1590
	WWCO	1240
Waterbury, Vt.	WDEV	550
Waterloo, Iowa	KXEL	1540
	KNWS	1090
	KWWL	1330
Watertown, N.Y.	WATN	1240
	WOTT	1410
	WWNY	790
Watertown, S.Dak.	KSDR	1480
	KWAT	950
Watertown, Wis.	WTTN	1580
Water Valley, Miss.	WVLY	1320
Waterville, Me.	WTVL	1490
Watkins Glen, N.Y.	WGMF	1500
Watseka, Ill.	WGFA	1360
Watsonville, Calif.	KOMY	1340
Wauchula, Fla.	WAUC	1310
	WPRV	1600
Waukegan, Ill.	WKRS	1220
Waukesha, Wis.	WAUK	1510
Waukon, Ia.	KNEI	1140
Waupaca, Wis.	WDUX	800
Waupun, Wis.	WLKE	1170
Wausau, Wis.	WRIG	1400
	WSAU	550
	WXCO	1230
Waverly, Iowa	KWVY	1470
Waverly, Ohio	WPKO	1380
Waverly, Tenn.	WPHC	1060
Waxahachie, Tex.	KBEC	1390
Waycross, Ga.	WACL	570
	WAYX	1230
Wayne, Neb.	KTCH	1590
Waynesboro, Ga.	WBRO	1310
Waynesboro, Miss.	WABO	990
Waynesboro, Pa.	WAYZ	1380
Waynesboro, Va.	WAYB	1490
	WANV	970
Waynesburg, Pa.	WANB	1580
Waynesville, Mo.	KJPW	1390
	KFBD	1270
Waynesville, N.C.	WHCC	1400
Weatherford, Okla.	KZYX	1590
Weatherford, Tex.	KZEE	1220
Webster City, Iowa	KJFJ	1570
Weirton, W.Va.	WEIR	1430
Weiser, Idaho	KWEI	1260
Welch, W.Va.	WELC	1150
	WOVE	1340
Weldon, N.C.	WSMY	1400
Wellington, Kan.	KLEY	1130
Wellsboro, Pa.	WNBT	1490
Wellston, Ohio	WKOV	1330
Wellsville, N.Y.	WLSV	790
Wenatchee, Wash.	KPQ	560
	KUEN	900
	KMEL	1340
Wendell-Zebulon, N.C.	WETC	540
Weslaco, Tex.	KRGV	1290
West Allis, Wis.	WAWA	1590
W. Bend, Wis.	WBKV	1470
Westbrook, Me.	WJAB	1440
West Chester, Pa.	WCHE	1520
West Covina, Cal.	KGRB	900
W. Frankfort, Ill.	WFRX	1300
W. Hartford, Conn.	WEXT	1550
West Jefferson, N.C.	WKSK	1600
W. Liberty, Ky.	WLKS	1450
West Looma, Cal.	KGRB	900
W. Memphis, Ark.	KSUD	730
W. Monroe, La.	KUZN	1310
W. Palm Beach, Fla.	WEAT	850
	WJNO	1230
	WIRK	1290
West Plains, Mo.	KWPM	1450
West Point, Ga.	WBMK	1310
West Point, Miss.	WROB	1450
Westport, Conn.	WMMM	1260
W. Springfield, Mass.	WTXL	1490
W. Yarmouth, Mass.	WOCB	1240
W. Yellowstone, Mont.	KWYS	920
Westerly, R.I.	WERI	1230
Westfield, Mass.	WDEW	1570
Westminster, Md.	WTTR	1470
Weston, W.Va.	WHAW	980
W. Warwick, R.I.	WWRI	1450
Wetumpka, Ala.	WETU	1250
Wewoka-Seminole, Okla.	KWSH	1260
Wharton, Tex.	KANI	1500
Wheatland, Wyo.	KYCN	1340
Wheaton, Md.	WDON	1540
Wheeling, W.Va.	WHLL	1600
	WBZE	1470
	WKWK	1400
	WWVA	1170
White Castle, La.	KEVL	1590
Whitehall, Mich.	WLRC	1490
White Plains, N.Y.	WFAS	1230
White River Junc., Vt.	WNHV	910
Whitesburg, Ky.	WTCW	920
Whiteville, N.C.	WENC	1220
Wichita, Kans.	KAKE	1240
	KEYN	900
	KLEO	1480
	KFDI	1070
	KFH	1330
	KWBB	1410
Wichita Falls, Tex.	KNIN	990
	KTRN	1290
	KWFT	620
Wickenburg, Ariz.	KSWW	1250
Wickford, R.I.	WKFD	1370
Wiggins, Miss.	WIGG	1420
Willcox, Ariz.	KHIL	1250
Wildwood, N.J.	WCMC	1230
Wilkes-Barre, Pa.	WBAX	1240
	WBRE	1340
	WILK	980
Willcox, Ariz.	KHIL	1250
Williams, Ariz.	KCYN	1240
Williamsburg, Ky.	WEZJ	1440
Williamsburg, Va.	WBCI	740
Williamson, W.Va.	WBTH	1400
Williamsport, Pa.	WLYC	1050
	WRAK	1400
	WWPA	1340
Williamston, N.C.	WIAM	900
Willimantic, Conn.	WILI	1400
Williston, N.D.	KEYZ	1360
Willmar, Minn.	KWLM	1340
Willoughby, Ohio	WELW	1330
Willow Springs, Mo.	KUKU	1330
Willows, Calif.	KIQS	1560
Wilmington, Del.	WAMS	1380
	WDEL	1150
	WILM	1450
	WTUX	1290
Wilmington, N.C.	WMFD	630
	WHSL	1490
	WKLM	980
	WGNI	1340
Wilmington, O.	WMWM	1090
Wilson, N.C.	WGTM	590
	WLLY	1350
	WVOT	1420
Winchester, Ky.	WWKY	1380
Winchester, Tenn.	WCOT	1340
Winchester, Va.	WINC	1400
	WHPL	610
Windber, Pa.	WWBR	1350
Winder, Ga.	WIMO	1300
Windermere, Fla..	WVCF	1480
Windom, Minn.	KDOM	1580
Window Rock, Ariz.	KHAC	1300
Windsor, Conn.	WEHW	1480
Windsor, Colo.	KUAD	1380
Winfield, Ala.	WEZQ	1300
Winfield, Kan.	KNIC	1550
Winnemucca, Nev.	KWNA	1400
Winnfield, La.	KVCL	1270
Winner, S.Dak.	KWYR	1260
Winnsboro, La.	KMAR	1570
Winnsboro, S.C.	WCKM	1250
Winona, Minn.	KWNO	1230
	KAGE	1380
Winona, Miss.	WONA	1570
Winslow, Ariz.	KVNC	1010
	KINO	1230
Winston-Salem, N.C.	WAAA	980
	WAIR	1340
	WFCM	1550
	WSJS	600
	WTOB	1380
	WKBX	1500
Winter Garden, Fla.	WOKB	1600
Winter Haven, Fla.	WSIR	1490
	WINT	1360
Winter Park, Fla.	WABR	1440
Wisconsin Rapids, Wis.	WFHR	1320
	WTMB	1460
Wolf Pt., Mont.	KVCK	1450
Woodburn, Ore.	KWRC	940
Woodbury, Tenn.	WBFJ	1540
Wood River, Ill.	WRTH	590
Woodruff, S.C.	WSJW	1510
Woodville, Tex.	KVLL	1220
Woodward, Okla.	KSIW	1450
Woonsocket, R.I.	WNRI	1380
	WWON	1240
Wooster, Ohio	WWST	960
Worcester, Mass.	WAAB	1440
	WNEB	1230
	WORC	1310
	WTAG	580
Worland, Wyo.	KWOR	1340
Worthington, Minn.	KWOA	730
Worthington, Ohio	WRFD	880
Wynne, Ark.	KWYN	1400
Wyoming, Mich.	WERX	1530
Wytheville, Va.	WYVE	1280
Xenia, O.	WELX	1110
	WGIC	1500
Yadkinville, N.C.	WYDK	1480
Yakima, Wash.	KIT	1280
	KIMA	1460
	KBBO	1390
	KQOT	930
	KUTI	980
	KYAK	1390
Yankton, S.D.	KYNT	1450
	WNAX	570
Yauco, P.R.	WKFE	1550
Yazoo City, Miss.	WAZF	1230
York, Nebr.	KAWL	1370
York, Pa.	WNOW	1250
	WORK	1350
	WSBA	910
York, S.C.	WYCL	980
Youngstown, Ohio.	WBBW	1240
	WFMJ	1390
	WKBN	570
Ypsilanti, Mich.	WSDS	1480
	WYNZ	1520
Yreka, Calif.	KSYC	1490
Yuba City, Calif.	KUBA	1600
	KZIN	1450
Yuma, Ariz.	KBLU	1320
	KVOY	1400
	KYUM	560
Zanesville, Ohio	WHIZ	1240
Zarephath, N.J.	WAWZ	1380
Zebulon-Wendell, N.C.	WETC	540
Zephyrhills, Fla.	WPAS	1400
Zion, Ill.	WZBN	1500

World-Wide Shortwave Stations

☐ We're going to forego our usual quickie quiz this time so that we can "take 5" to discuss a little matter which seems to crop up in so much of our mail. Seems that many of our readers want a capsule summation of tips and techniques on sending out reception reports which are accurate, useful to the station which receives it, and at least stand a 50/50 or better chance of pulling back a QSL card or letter for your wall.

Before we go any further, let's clear the air—always be honest! Never try to fake a report from published schedules or from reports of reception by other listeners. Obviously it isn't cricket, it will probably be insufficient data, and mainly it will get you blacklisted by many broadcasters. Now that we understand that little matter, let's get on with it.

1. Reports should contain detailed facts on from at least 15 minutes of program monitoring —closer to 30 minutes is preferred. List songs by title, ads by product name, names of personalities or locations discussed, program names,

etc. If you don't savvy the lingo, then guess at as much as possible and give close descriptions of what you think was going on.

2. Give the time and *date* in *Greenwich Mean Time*. That sounds stupid to you? Well, when it's 0100 GMT in London on January 5th, it's 2000 in New York, and still January 4th. It won't become January 5th in New York for another 4 hours. Nevertheless, if you are in New York and hearing a transmission at 0100 GMT Jan. 4th, you'll want to list the correct GMT *date* (Jan. 5) or else the station may not be able to check you out in its log.

3. List the exact or approximate frequency; many stations operate on several frequencies and you'll have to let them know which one. Give a signal report which discusses S-Meter readings, modulation quality, fading, interference from noise or other stations, and the overall quality of the reception. You might add some opinions on the programming. Don't lie or exaggerate in your signal report, if the reception is a fizzle, don't be afraid to say so.

4. Give details of your receiving station; the receiver, antenna, and any accessories. Toss in some details about yourself; your age, occupation, other hobbies, number of verifications already collected. Throw in a plug for any SWL clubs to which you belong.

5. Although it is not really necessary to do so with government owned broadcasting stations (such as Radio Sweden, Radio Australia, etc.), it is standard policy for all reception reports to be accompanied by return postage. This can be done by means of uncancelled stamps of the country to which the report is being sent, or by an International Reply Coupon (available for purchase at post offices).

6. Request that the station kindly honor your desire for a verification of reception, do not demand one. QSL's are a courtesy to the DX'ing hobby which are offered by the majority of stations. Some broadcasters (such as BBC) do not QSL under any circumstances, others need reminding, so if you draw a blank on your first report, wait 3 or 4 months then send another report. If 3 reports fail to bring a QSL, then either you're doing something wrong or the station is filing your letters. Some stations take a full 90 days (or even more) to QSL.

7. Send reports in either English or in the language of the country to which the report is being sent. Latin American stations prefer Spanish reports. Foreign language report forms are available from several SWL clubs. Now's a good time to join one!

8. While a report addressed to *Radio Australia, Melbourne, Australia* will be promptly delivered, you will get a better chance for delivery to smaller stations (especially in foreign language countries) if you use the full street address. Publications such as *The World Radio-TV Handbook* give this data along with current schedules and frequencies of all broadcasters. WRTH is available by mail from Gilfer Associates, P.O. Box 239, Park Ridge, N. J. 07656—write for their catalog of DX-ing aids and accessories.

9. If you follow all of these suggestions and still get poor returns, perhaps you would be interested in a subscription to Nifty Knitting Notions Magazine!

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90-Meter Band—3200 to 3400 kHz

kHz	Call	Station Name	Location	GMT
3300	—	Brit. Hodnuras BC	Belize, Brit. Honduras	0035
3315	—	R-TV Francaise	Fort de France, Martinique	0230
3953	—	BBC	London, England	0530
3975	—	BBC	London, England	0500
4670	—	R. Nacional Espejo	Quito, Ecuador	0515
4730	HCEH3	R. El Progresso	Loja, Ecuador	0255

60-Meter Band—4750 to 5060 kHz

kHz	Call	Station Name	Location	GMT
4775	ZYR81	R. Progresso	Sao Paulo, Brazil	0240
4787	—	R. Popular	San Jose, Costa Rica	0230
4807	—	R. Popular de Cuenca	Quito, Ecuador	0250
4810	YVMG	R. Popular	Maracaibo, Venez.	0230
4820	CR6RZ	Emissora Oficial	Luanda, Angola	0400
4830	—	R. Hanoi	Hanoi, N. Vietnam	1230
4835	—	R. Mali	Bamako, Mali	0600
4840	VUD	All India Radio	Bombay, India	1230
4865	—	R. Clube de Para	Belem, Brazil	0230
—	—	R. Cenit	Quito, Ecuador	0445
4885	ZYG26	R. Pioneer	Teresina, Brazil	0815
4890	—	R. Caracas	Caracas, Venez.	1000
—	VLT4	Austral. BC	Port Moresby, Papua	0830
4920	—	R. Mil	Santo Domingo, D.R.	0230
—	VLM4	Austral. BC	Brisbane, Australia	1300
4940	—	R. Mil	Santo Domingo, D.R.	0250
4972	—	R. Yaounde	Yaounde, Cameroon	2210
5010	—	R. Bocono	Caracas, Venez.	0100
5040	—	R. Tbilisi	Tbilisi, USSR	0230
5045	—	R. Lome	Lome, Togo	2200
5875	HRN	V. de Honduras	Tegucigalpa, Honduras	2320

49-Meter Band—5950 to 6200 kHz

kHz	Call	Station Name	Location	GMT
5955	TGNA	R. Nacional	Guatemala City, Guat.	0430
5970	—	R. Canada	Montreal, P.Q.	0135

WORLD-WIDE SHORTWAVE STATIONS

kHz	Call	Station Name	Location	GMT
5985	WNYW	R. New York WW	New York, N.Y.	0030
6010	CJCX	CJCX	Sydney, N.S.	1130
6025	CSA	R. Portugal	Lisbon, Portugal	0100
6030	CFVP	CFVP	Calgary, Alberta	1000
6050	—	BBC	London, England	0530
6065	—	R. Reloj	San Jose, C.R.	0200
6075	HJHV	R. Sutatenza	Bogota, Colombia	2345
6085	VUD	All India Radio	Madras, India	1400
6100	DMQ6	Deutsche Welle	Cologne, W. Germany	0000
6110	—	BBC	London, England	2350
6115	—	R-TV Congolaise	Brazzaville, Congo	0450
6125	—	V. Friendship	Brussels, Belg.	0100
6130	—	R. Nacional	Madrid, Spain	0330
6145	DMQ6	Deutsche Welle	Cologne, W. Germany	0150
6200	—	R. Moscow	Moscow, USSR	2155
6210	ZAA	T. Tirana	Tirana, Albania	0230
6215	—	R. Peking	Peking, China	0100
6480	—	R. Pyongyang	Pyongyang, N. Korea	1100

41-Meter Band—7100 to 7300 kHz

7105	—	BBC	Ascension I.	0440
	—	V. Thailand	Bangkok, Thailand	1145
7130	—	V. America relay	Rhodes, Greece	0445
	—	BC China	Taipei, Taiwan	0945
7165	—	V. America relay	Okinawa	1245
7170	—	R. Noumea	Noumea, New Caledonia	1030
7205	—	V. America relay	Thessaloniki, Greece	2140
7210	—	R. Dakar	Dakar, Senegal	0445
7275	—	RAI	Rome, Italy	0420
9065	—	R. Peking	Peking, China	1045
9400	—	R. Alma Ata	Alma Ata, USSR	0120

31-Meter Band—9500 to 9775 kHz

9505	ZAA	T. Tirana	Tirana, Albania	2030
9510	YVXJ	R. Barquisimeto	Barquisimeto, Venez.	1200
9515	—	R. Ankara	Ankara, Turkey	2015
9525	—	R. Habana	Havana, Cuba	0130
9580	VLM	R. Australia	Melbourne, Australia	1245
9585	—	RRI	Djakarta, Indonesia	1345
9590	—	R. Pres Balmaceda	Santiago, Chile	1110
9600	—	R. Tashkent	Tashkent, USSR	1210
9605	—	Trans World R.	Bonaire, Neth. Antilles	2330
9615	—	V. Friendship	Brussels, Belg.	0055
	HVJ	R. Vatican	Vatican City	0115
9620	—	R. Belgrade	Belgrade, Yugoslavia	2210
9635	—	R. Nacional	Bogota, Colombia	1200
9645	TIFC	Faro del Caribe	San Jose, C.R.	0145
9650	—	R. Nacionale	Conakry, Canary Islands	2210
9655	OAX9G	R. Nor Peruana	Chachapoyas, Peru	1100
9660	—	R. Kiev	Kiev, USSR	0045
9685	—	R. Kiev	Kiev, USSR	0345
9690	—	BBC	London, England	0500
9695	—	Trans World R.	Bonaire, Neth. Ant.	0300
9700	—	R. Sofia	Sofia, Bulgaria	2300
9705	—	R. RSA	Johannesburg, U. S. Africa	0000
9725	—	Kol Yisrael	Jerusalem, Israel	2120
9735	—	R. Peking	Peking, China	0010
9745	HCJB	V. Andes	Quito, Ecuador	0430
9760	—	R. Sweden	Stockholm, Sweden	1235
9770	OEI47	Viennese R.	Vienna, Austria	2345
	—	R. Ghana	Accra, Ghana	2030
9784	ZAA	R. Tirana	Tirana, Albania	0220
9800	—	R. Peking	Peking, China	0400
9810	—	R. Moscow	Moscow, USSR	0345
10530	—	R. Alma Ata	Alma Ata, USSR	0145
11445	—	R. Peking	Peking, China	2210

25-Meter Band—11700 to 11975 kHz

11700	—	West Indies BC	St. Georges, Grenada	2230
	TGQB	TGQB	Quezaltenango, Guat.	1930
11710	—	R. Nacional	Madrid, Spain	2300
11720	—	R. Canada	Montreal, P.Q.	1920
11735	—	V. America relay	Tangier, Tangiers	1845
11740	XEMP	XEMP	Mexico City, Mex.	0220
11780	—	R. Clube Mozamb.	Lourenco Marques Mozamb	0355
11800	—	R. Ceylon	Colombo, Ceylon	1300
11805	—	RFE	Lisbon, Portugal	0500
11820	—	BBC	London, England	2030
11850	—	R. Accra	Accra, Ghana	2000
11855	WNYW	R. New York WW	New York, N.Y.	0110
11865	—	R. Lubumbashi	Lubumbashi, Congo	2015
11875	—	NHK	Tokyo, Japan	1020
11890	—	Far East BC	Manila, Phil.	1015
11900	CEI190	Valparaiso	Valparaiso, Chile	0300
11905	—	BBC relay	Cyprus	0430
11910	—	R. Budapest	Budapest, Hungary	0440
11955	—	BBC Far East	Tebrau, Malaysia	2345
11990	—	R. Prague	Prague, Czech.	2145

19-Meter Band—15100 to 15450 kHz

15095	—	West Indies BC	St. Georges, Grenada	1745
15105	—	NHK	Tokyo, Japan	0210
15115	HCJB	V. Andes	Quito, Ecuador	1445
	—	R. Senegal	Dakar, Senegal	2100
15125	BED60	V. Free China	Taipei, Taiwan	0215
	—	V. West	Lisbon, Portugal	1515
15135	—	R. Japan	Tokyo, Japan	0215
15153	—	R. Corporacion	Santiago, Chile	0150
15155	—	R. Habana	Havana, Cuba	1345
15190	—	R. Congolaise	Brazzaville, Congo	1800
15220	—	R. RSA	Johannesburg, U. S. Africa	2300
15230	—	R. Moscow	Moscow, USSR	1900
15235	—	R. Japan	Tokyo, Japan	0215
15260	—	BBC relay	Ascension I.	0100
15270	ETLF	R. V. Gospel	Addis Ababa, Ethiopia	1550
15285	—	R. Ghana	Accra, Ghana	2030
15310	VUD	All India R.	Delhi, India	1330
	—	R. Sweden	Stockholm, Sweden	1615
15335	—	R. Pakistan	Karachi, Pakistan	0200
15345	—	R. Nacional	Buenos Aires, Arg.	1730
15360	—	Trans World R.	Bonaire, Neth. Ant.	2330
15400	ETLF	R. V. Gospel	Addis Ababa, Ethiopia	1445
15410	DMQ15	Deutsche Welle	Cologne, W. Germany	2230
15425	VLX15	Australian BC	Perth, Australia	0110
15430	HLK41	V. Free Korea	Seoul, S. Korea	0210
15435	—	BBC Far East	Tebrau, Malaysia	2350
15440	DZF8	Call of Orient	Manila, Phil.	0145
15445	ZYN32	R. Nacional	Brasilia, Brazil	0240
15520	—	R. Pakistan	Karachi, Pakistan	0125
16315	—	R. Pyongyang	Pyongyang, N. Korea	0030
17675	—	R. Peking	Peking, China	0110

16-Meter Band—17700 to 17900 kHz

17715	—	R. Australia	Melbourne, Australia	2145
17720	WINB	WINB	Red Lion, Pa.	1745
	BEC39	V. Free China	Taipei, Taiwan	0200
17730	—	R-TV Francaise	Paris, France	0245
17750	—	R. Habana	Havana, Cuba	2110
17765	—	Deutsche Welle	Kigali, Rwanda	1700
17775	—	R. Moscow	Moscow, USSR	2345
17805	—	R. RSA	Johannesburg, U. S. Africa	1800
17820	—	V. America relay	Poro, Phil.	2215
17845	—	R. Prague	Praque, Czech.	1810
17855	HCJB	V. Andes	Quito, Ecuador	2110

13-Meter Band—21450 to 21750 kHz

21455	—	V. Nigeria	Lagos, Nigeria	0610
21470	—	BBC	London, England	1845
21580	—	R-TV Francaise	Paris, France	1830
21450	—	R. Prague	Prague, Czech.	1720
	—	V. Nigeria	Lagos, Nigeria	1515
21500	—	R. Brazzaville	Brazzaville, Congo	1530
21535	—	R. RSA	Johannesburg, S. Afr.	1545
21540	HER	Swiss BC	Berne, Switz.	1500
25610	—	R. Nederland	Hilversum, Neth.	1430
25650	—	BBC	London, England	1450
25730	LLL	R. Norway	Oslo, Norway	1630
25790	—	R. RSA	Johannesburg, S. Afr.	1800
25900	LLA	R. Norway	Oslo, Norway	1800

Emergency Radio Station Listings for San Francisco County and portions of Alameda, Contra Costa, Marin, Napa, San Mateo, Santa Clara, Salamo, and Sonoma Counties.

☐ RADIO-TV EXPERIMENTER and SCIENCE AND ELECTRONICS furnishes this exclusive listing of emergency radio stations as an aid to our many readers now engaged in the fascinating and rapidly growing hobby of monitoring emergency radio communications. We have and will be publishing similar lists devoted to different metropolitan areas in forthcoming issues so that you'll be able to accumulate a sizable array of this difficult-to-obtain data. Refer to the index on page 83 for our 1969 program.

If you desire to obtain similar lists from other areas in the United States that have not or will not be published in this magazine in 1969, then we suggest you write to Communications Research Bureau, Box 56, Commack, N. Y. 11725. They may have a list of emergency radio services that covers your locality. Include a stamped, self-addressed envelope with your request.

Station	Police	Fire
SAN FRANCISCO POLICE DEPT.		
KBL512	45.10 45.14 45.58	
KMA438	45.58 155.55 155.67	
KMJ408-17	45.10 45.14 45.58	
(Univ. Campus PD: KMG226 155.55)		
SAN FRANCISCO FIRE DEPT.		
KBL513	154.43	KMA526 46.46
KBL514	46.46	KMB488-98 46.46
KMA473-5	46.46	KMK510-11 46.46
MUNICIPAL DEPARTMENTS		
Alameda	KMA217 155.61	KMB873 154.13
Albany	KMA247 155.31	mobiles 154.385
	KMA247 155.67	
Alto		KMH439 46.50
		KMJ614 46.50
American Canyon		KMH234 33.82
Antioch	KMB427 155.31	KDB502 154.385
	KMB427 155.67	
Atherton	mobiles 155.07	KMC901 154.37
		KMD854 154.37
Belmont	KBR220 155.07	mobiles 153.89
		mobiles 154.28
Belvedere		KAQ941 46.50
Berkeley	KGJ719 155.85	KMA704 154.19
	KGJ719 155.97	KMA704 154.28
	KMA550 155.97	
(U. Cal.)	KMC290-1 155.85	
Brisbane	KFZ809 45.62	KJK560 154.01
		KJK560 154.28
		KML238 154.01
		KML238 154.01
Burlingame	KMA959 159.15	KCX952 153.95
		KCX952 154.28
		KJI519 153.95
		KJI519 154.28
Castro Valley		KJL666 154.07
		KJL666 154.28
		KME904-5 154.07
Cherryland		KME903 154.07
Colma	KFZ285 45.62	
Concord	KMC308 155.31	
	KMC308 155.67	
	KML968 155.31	
Corte Madera	KDI234 39.82	
Daley City	KMA519 155.07	KCT600 154.28
Dublin		KBF242 46.38
		KBF242 154.07
		KBF242 154.28
		KJK522 154.07
		KJK522 154.28
E. Palo Alto		KMC902 154.37
El Cerrito	KMA963 34.96	KBQ628 154.385
	KMA963 155.31	
	KMA963 155.67	
El Granada		KDA730 46.14
Emeryville	KMB294 39.46	KDK719 154.07
	KMB294 155.67	KDK719 154.28
	KMB294 158.85	
Fairfax	KMJ215 39.82	KAR970 46.50
Fairview		KFR710 154.07
Fremont	KAY979 155.07	KAR980 154.07
	KAY979 155.67	KAR980 154.28
	KAY979 156.03	KDA429 same
		KFB977 same
		KMF852 same
		KMG326 same
		KMG384 same
		KMJ266 same
Half Moon Bay	mobiles 45.78	KMH427 46.14
		KMH427 154.28
Hayward	KMG876 154.89	KET379 154.07
	KMG876 155.07	KME907 154.07
		KME907 154.28
		KFR710 154.07
		KMF896 154.07
		KMF896 154.28
		KMG877 154.07
		KMJ316-7 154.07
Hillsborough	KMA398 159.15	KCY551 153.95
		KCY551 154.28
		KFF377 same
Kensington		KBU663 154.385
Larkspur	KFF269 39.82	KMM600 46.50
Los Altos	KCV356 154.74	
Marinwood		KFG493 46.50
Martinez	KMG537 155.31	KMA727 46.10
	KMG537 155.67	KMA727 46.38
Menlo Park	KMF934 154.95	KMC309 154.28
		KMC309 154.37
		KME630 same
		KMC900 154.37
Millbrae	KMJ310 159.15	KCW710 154.28
Mill Valley	KMG956 39.82	KAT237 46.50
		KBZ298 46.50
		KML703 46.50
Mountain View	mobiles 39.06	
Mulford Gardens		KMF853 154.07
Newark	KDB523 155.07	KME906 154.07
	KDB523 156.03	KME906 154.28
	KJE249 155.67	
Novato	KAW383 39.70	KIZ234 46.50
	KAW383 39.82	KME663 46.50
		KMJ591 46.50
Oakland	mobiles 42.18	KMA703 154.355
	mobiles 42.28	
	mobiles 155.79	
	mobiles 159.21	
	mobiles 458.34	
Orinda		KMG983 46.10
		KMG983 46.38
Pacifica	KMA741 154.95	KDE237 154.28
Piedmont	KMA819 155.67	
	KMA819 158.73	
Pinole	KMJ446 155.31	KME945 46.10
	KMJ446 155.67	KME945 46.38
Pittsburg	KMA779 39.66	KMF876 46.38
	KMA779 155.67	KMH388 46.38
Pleasanton	KBS330 155.01	KJS748 154.07
	KFK590 155.625	KJS748 154.28
		KMF477 same
Point Montara		KML266 46.14
Redwood City	KMA663 154.86	KMF960 153.89
	KMA455 159.15	KMF960 154.28
		KML302 153.89
Richmond	KMA358 39.46	KMB332-9 33.70
	KMA358 155.37	KMB332 46.38
	KMA358 155.67	
Ross	KDB408 39.82	KAX590 46.50
San Anselmo	KMA861 39.82	KMM608-9 46.50
San Bruno	KME410 159.15	KGN533 154.28
San Carlos	KMF253 154.77	KMH830 153.89
	KMH864 154.77	KMH830 154.28
	KBR218 155.07	
	KCW727 155.67	
San Jose	KMA359 155.07	KMH603 154.01
	KMA359 155.13	
	KMA359 155.58	

EMERGENCY RADIO STATIONS

Station	Police		Fire	
	KMA359	155.67		
	KMJ398	458.95		
San Leandro	KJH316	154.80	KJF896	154.07
	KDB522	155.07	KJF896	154.28
			KME901	154.07
			KME902	154.07
			KME902	154.28
			KME911	154.07
			KMF628	154.07
			KMF849	154.07
			KMF850-1	154.07
			KMF853	154.07
San Lorenzo			KME900	154.07
San Mateo	KMA822	154.77	KMH426	153.95
	K8R219	155.07	KMH426	154.28
	KGR360	155.67		
San Pablo	KMA863	39.46		
	KMA863	155.31		
	KMA863	155.67		
	KMD936	155.31		
San Rafael	KMA224	39.46	KAR967	46.50
	KMA224	39.82	KFG493	46.50
			KGW771	46.50
Sausalito	KME375	39.82	KAQ934	46.50
S. San Francisco	KML269	45.62	KMH665	154.01
	KML269	155.67	KMH665	154.28
Terra Linda			KGW771	46.50
Tiburon			KAX591	46.50
			KUA750	46.50
Union City	KIZ604	155.07	KMF848	154.07
			KMF848	154.28
Vallejo	KGJ658	37.06	KMH234	33.82
	KGJ658	154.83		
	KMA818	155.67		
	KMA818	155.91		
Walnut Creek	KMF388	155.31		
	KMF388	155.67		
Winters			KMD894	154.19
Woodside			KMK430-1	153.89
			KMK431	154.28

COUNTY AGENCIES

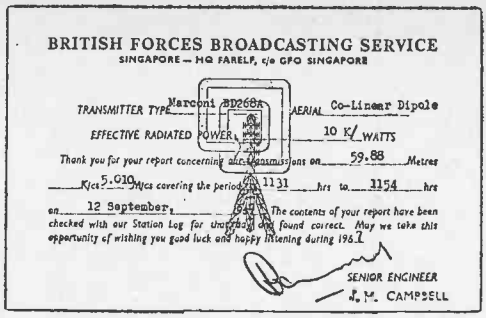
Station	Police		Fire	
ALAMEDA COUNTY				
Alameda	KMA217	155.61		
Hayward			KME910	154.07
Pleasanton			KMG325	154.07
			KMG325	154.28
San Leandro	KMA539	39.46	KME911	154.07
	KMA539	154.80	KME911	154.28
	KMA539	155.07		
	KMA539	155.25		
	KMA539	155.67		
	KJT997	154.80		
Sunol Ridge			KME911	154.07
county			KJJ393	154.28
			KJJ393	154.28
portable	KME908	154.80	KJF895	154.07
	KME908	155.07	KJF895	154.28
	KME908	155.25		
	KME908	156.03		
	KME908	453.75		
Forestry stations:	44.92			
CONTRA COSTA COUNTY				
Alamo			KMK522	46.10
			KMK522	46.38
Clayton			KMB392	same
Concord			KMA467	46.10
			KMA467	46.32
Crocket			KMB592	46.10
			KMB592	46.38
Danville			KMA635	same
Dublin			KBF242	same
El Sobrante			KMB591	same
Kregor Peak	KMA371	155.19	KMF371	same
	KMA371	155.64	KMF371	46.32
Lafayette			KMA461	46.10
			KMA461	46.38
Marsh Creek Rd.	KMA499	155.64		
Martinez	KJF892	155.19	KJN818	46.38
	KJF892	155.64	KMA462	46.10
	KMA371	155.19	KMA462	46.38
	KMA371	155.64	KMF371	same
	KFK694	155.67	KMF371	46.32
	KJF892	155.67		
Moraga			KMD877	46.10
			KMD877	46.38
Oakley	KMG264	155.19	KMH648	46.10
	KMG264	155.64	KMH648	46.38
Pinole			KEY923	46.10
Pleasant Hill			KEY923	46.38
			KME945	same
Port Chicago			KMA466	same
			KMA466	46.32
Rodeo			KEY922	46.10
San Pablo			KEY922	46.38
			KMA470	same
San Ramon			KMA463	same
Walnut Creek	KFK695	155.19	KMD937	same
portable	KJC967	155.19	KDN478	same
	KJC967	155.64	KJH267	same
			KJH267	46.32
MARIN COUNTY				
Mill Valley	KMA224	39.70	KML959	46.28
Point Reyes			KDG801	46.28
				46.50
San Rafael	KMA224	39.46	KML964	same
	KMA224	39.70	KML958	same
Woodacre			KML962	same
portable	KMA862	39.46		
	KMA862	39.70		
	KMA862	39.82		
	KMA862	155.67		
NAPA COUNTY				
Napa	KMA518	154.43	mobiles	154.415
	KML505	154.43		
	KMD523	155.67		
SAN MATEO COUNTY				
La Honda	KMG962	45.78		
Redwood City	KFD601	45.78	KDJ539	154.28
	KMA455	45.62		
	KMA455	45.78		
	KMA455	154.83		
	KMA455	154.86		
	KMA455	154.95		
	KMA455	155.07		
	KMA455	155.52		
	KMA455	155.67		
San Mateo	KFD601	45.78		
county	KMG961	45.78		
SANTA CLARA COUNTY				
Campbell			KAU447	154.25
			KBC202	154.25
			KMA668	154.25
Cupertino			KMA667	154.25
Los Altos	KCV356	154.74	KEX213-4	154.40
			KMB314	154.40
			KMB449	154.28
			KMB449	154.40
Los Gatos			KBP901	154.25
			KMA669	154.25
Menlo Park			KGK683	154.40
Milpitas			KDN997	154.25
			KMG456	154.25
Mountain View			KAT234	154.40
San Jose	KMA376	39.92	KMA670	154.25
	KMA376	154.74	KMB448	154.52
	KMA376	154.875	KMD228	154.25
	KMA376	155.67	KMM242	154.25
	KMA376	155.70		
	KMA376	156.15		
	KMA376	156.21		
	KMD403	156.15		
Saratoga			KFV911	154.25
Sunnyvale				154.28
			KDG370	154.40
			KDN998	154.40
county			KMD419	154.28
			KMD419	154.40
portable			KMF786	154.25
			KMF786	154.28
			KMF786	154.40
SOLANO COUNTY				
Benicia			KAW893	154.34
Cordelia			KET233	154.34
Fairfield		155.13		
	KB1701	155.49	KAW891	154.28
	KMA755	155.49	KB1702	154.34
	KMA755	155.67		
	KMA755	158.79		
	KGV202	155.67		
Vallejo			KAW892	154.34
portable	KMH571	154.83		

Station	Call	Frequency
		155.49 155.91
SONOMA COUNTY		
Guerneville	KBP408	45.98
Santa Rosa	KMA392	155.67
county	mobiles	39.74
CALIFORNIA HIGHWAY PATROL		
Concord	KMB442	42.12 42.34 42.40 42.44 42.54 42.56 45.86
Contra Costa Co.	KMG445	42.12 42.34 42.40 42.44 42.54 42.56
Los Gatos	KEL350	42.12 42.34 42.44 42.54 42.56
	KMB441	same
Martinez	KJS942	154.92
Mt. Tamalpais	KDV752	42.12 42.34 42.44 42.54 42.56
Napa	KMH961	42.12 42.34 42.40 42.44 42.54 42.56 45.86
Oakland	KJK725	42.12 42.34 42.44 42.54
	KMG612	155.67
Redwood City	KAY845	42.12 42.34 42.44 42.56 45.86
San Francisco	KBH635	39.10
	KMA962	42.12 42.34 42.44 42.54 42.56 45.86
	KML204	42.34 42.44
San Jose	KFB975	42.12 42.34 42.44 42.54 42.56
	KMH700	same & 45.86
	KBV889	154.92
San Leandro	KMD592	42.12 42.34 42.44 42.54 42.56 45.86
San Quentin	KMA890	42.34
San Rafael	KMD773	42.12 42.34 42.44 42.54 42.56
Vallejo	KFA802	42.12 42.34 42.44 42.54 42.56
	KFA408	same & 42.40
portable	KMF588	42.12 155.07 155.43 155.67
	KML270	155.67
	KME923	42.34
	KMF454	42.34 42.42 42.56 45.86
	KJF891	154.92
CALIFORNIA DEPT. OF JUSTICE		
Contra Costa Co.	KBE462	154.68
San Francisco	KBS993	154.68
	KMA962	154.68
portable	KCX979	154.68
CALIFORNIA STATE FIRE DEPTS.		
Belmont	KMK252	33. 66. 33.98
	KJR229	154.28
Martinez	KMK251	33. 66. 33.98
Mt. Diablo	KMF694	154.16
San Francisco	KMF687	154.16
San Jose	KMJ567	154.16
San Lorenzo	KMJ562	154.16
Woodacre	KMJ564	33. 66. 33.98
portable	KMJ876	33. 66. 33.98
	KMG412	33. 66. 33.98
	KCY631	154.16
Forestry conservation networks:		30.86 31.26 45.00 151.205 151.295 151.340 151.355 151.385 151.415 151.445 151.475 159.30 159.345
MISCELLANEOUS EMERGENCY STATIONS		
E. Bay Reg. Parks Dist., Orinda	KBB840	44.64
Am. Red Cross, Oakland	KBI776	47.42
Richmond	KDP299	47.42
San Francisco	KBI955	47.42
San Rafael	KJS924	47.42
Walnut Creek	KDQ287	47.42
Golden Gate Assn., San Rafael	KGJ712	155.16
various hospitals 47.62 154.34		154.40
Calif. State CD net 47.58		

☐ Did you miss any of the Emergency Stations Listings in our previous issues? Well, they are still available for the New York and Chicago Areas. Just send your check or money order for $1 for each issue—see page 83 to determine which issue you want. ■

Tommy's Dying Voice

Continued from page 82


BRITISH FORCES BROADCASTING SERVICE
SINGAPORE — HQ FARELF, c/o GPO SINGAPORE

TRANSMITTER TYPE Marconi AD260A AERIAL Co-Linear Dipole

EFFECTIVE RADIATED POWER 10 K/ WATTS

Thank you for your report concerning our transmissions on 59.88 Metres

Kcs 5.010 Mcs covering the period 1131 hrs to 1154 hrs

on 12 September, The contents of your report have been checked with our Station Log for that period and found correct. May we take this opportunity of wishing you good luck and happy listening during 1961.

SENIOR ENGINEER
J. M. CAMPBELL

Singapore, the gateway to Asia and the land of the vanishing British Forces Broadcasting Service QSL card. The author pulled in the above valuable prize two years ago when Tommy and friends where stationed there.

with West Coast DXers finding reception better during the last part of the schedule.

QSL Today! BFBS-Singapore responds to correct listeners' reports with QSL cards, provided return postage is sent. International reply coupons, available at your post office, may be used. Reports go to BFBS, c/o GHQ, FARELF, General Post Office, Singapore.

How much longer will the station be around? Probably even Parliament couldn't answer that one now. But surely its life expectancy is short. So get busy, Bunky. Time's running out! ■

Positive Feedback

Continued from page 9

Dog Talk. We received a letter from one of our readers requesting a device which consists of a transmitter and receiver—the transmitter being held by a dog trainer and the receiver secured to the collar of the dog being trained. The writer describes the setup in this manner: "A signal from the transmitter causes the receiver to impart a shock to the dog through high-voltage electrodes that are also mounted on the collar." Dog lovers of America, how does that grab you?

Now before you start writing Dear John letters to me, I suggest you read my reply to the sender.

"Recently I have had my dog, an Irish setter, trained by a recognized and reputable dog trainer. My dog now performs beautifully on voice and hand signals from me, as well as from other members of my family. We have found our dog to be an excellent member of the family now, well mannered and a delight to have in our presence.

"This was all done with love and care by the trainer as well as the members of my family. At no time did we physically punish our dog. It is my recommendation that any trainer who wishes to use such a device as your letter describes, should have the device attached around his neck, and pulsed periodically as a reminder that pain can never replace love."

Okay, dog lovers, don't send letters—send pictures of your dogs. I'd like to see them. ■

"Wow! This homestudy electronic course is really complete!"

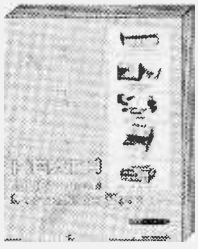
New Products

Continued from page 13

Lafayette LA-125TA Stereo Amplifier

source selector, concentric balance/volume, treble, bass, loudness, and tape monitor. The rear panel includes low and high tuner inputs, ceramic phono, magnetic phono, aux., tape input, tape output, speakers outputs (4, 8, 16 ohms), and 2 AC outlets (1 switched, 1 unswitched). Measures 13 x 3⅞ x 10 in., and has simulated walnut-grained metal enclosure. Price of the LA-125TA is $129.95 at Lafayette Stores or write to Lafayette Radio Electronics, 111 Jericho Tpke., Syosset, N. Y. 11791.

NOT EXACTLY A PRODUCT



Heath 1969 Scientific Instrumentation Catalog

But we thought some of you more sophisticated experimenters would like to know about the availability of the 1969 Heath Scientific Instrumentation Catalog. In its 68 pages are full specifications, illustrations, and many schematics for, e.g.: Malmstadt-Enke spectroscopy system, instrumentation laboratory, chart recorders, recording pH electrometers, polarography system, Berkeley Physics Laboratory, and Heath oscilloscopes, power supplies, voltmeters, signal generators, testers, bridges, etc. Write on your school or company letterhead for your free copy to Heath Co., Benton Harbor, Mich. 49022.

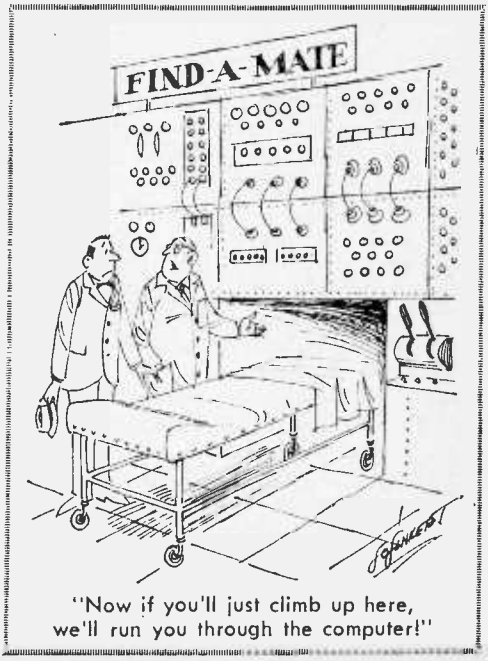
TUNE IN, TURN ON, WHEREVER YOU ARE

If you're fortunate enough to have speaker systems throughout your house, the Alco Audio Control Center allows up to 4 or 6 stereo speaker systems to be selected for simultaneous operation. Its *push-on* and *push-to-release* switches allow the user to opt for the speaker systems of his choice of one up to six speaker pairs. The six models have easy access rear panel connectors to suit your particular systems. No external power required for operation; no internal resistors to affect impedance matches. The leather-look black metal has a brushed aluminum escutcheon plate, and the size is 5⅝ x 2⅛ x 3$^{9}/_{16}$ in. In the 4-channel models there are: *CC4RCA* for RCA jacks ($19.95), *CC4PHM* for miniature phone jacks ($21.95), *CC4PHS* for standard phone jacks ($22.95). If you gotta have six channels, there's *CC6RCA* for RCA jacks ($26.95), *CC6PHM* for miniature phone jacks ($28.95), and *CC6PHS* for standard phone jacks ($29.95). Anything else you want to know, write to AE Div. of Alco Electronic Products, Inc., Lawrence, Mass. 01840.

Alco Audio Control Center

TOO LAZY TO HOLD THE PHONE?

The Knight-Kit KG-205 Telephone Amplifier has many uses and requires no electrical connection to the phone. A suction cup mount on the pickup attaches itself instantly to any telephone. The solid-state circuit amplifies telephone sound to room level for hands-free conversation and group listening, and it's a nice little device for the hard-of-hearing. Easily assembled with basic tools, the KG-205 is equipped with volume control and on-off switch. It's priced at $6.95 with 9-volt battery and step-by-step instructions. Write for Sales Book No. 283, free from Allied Radio Corp., 100 N. Western Ave., Chicago, Ill. 60680.



"Now if you'll just climb up here, we'll run you through the computer!"

Liquid Window

Continued from page 35

arrays resembling bundles of sticks.

The RCA display panel consists of a one mil thick layer of clear liquid crystal sandwiched between two glass plates. The rear plate has a reflective mirror-like conductive coating (it can be made transparent), while the front plate has a transparent conductive coating of tin oxide.

When an electric charge is applied to the two coatings, the liquid crystal molecules are disrupted from their orderly, parallel positions and the sandwich takes on the appearance of frosted glass because of increased light *reflectivity* rather than transmission as in the case of the Marks system.

Note that the effect of the applied electric field is just the opposite to that in the *VARAD* system. In the latter system, the crystals are in random disarray when the current is off and tend to align when the current is on. In the RCA system the crystals are in alignment when in the *rest state,* and become disarrayed when the electric field is applied. Despite the differences, Marks Polarized Corp. claims it holds the basic patents which it licenses to RCA.

To display stationary patterns such as letters or images of other kinds, the *coatings* are shaped in accordance with the desired pattern. To display motion, the conductive coatings are laid down in the form of a fine mosaic whose individual elements can be charged independently, in accordance with a scanning signal such as is used for facsimile, television, and other electronic displays.

Applications envisioned for RCA liquid crystal display panels include all-electronic clock and watch displays, auto dashboard displays, scoreboards, stock tickers, and—well in the future—pocket-size TV receivers.

Polarized Palaces. If the Marks ideas really take hold, every man's home will become a new kind of castle—a *polarized* palace. As the company name (Marks Polarized Corp.) implies, the firm has more than passing interest in the application of polarized light.

Light control by the use of *VARAD* windows would be just one part of an overall light-control program in a truly modern home. Ceiling lights should be polarized to reduce glare and make colors appear more "natural." Wall reflections should be eliminated with polarizing coatings. Even drapes should receive anti-glare treatments. ■

Baseball Timer

Continued from page 63

Using the Timer. The frame supporting the foil strips should be placed about 10 ft. from the "pitchers' mound" at a height to keep it centered along the line of travel of the ball. In addition to the "pitcher," another person should operate the timer. To time the speed of a ball, he first turns *on* power switch S3. He depresses S1 just before the pitcher tosses the ball, and releases it as quickly as possible after the ball has cleared the second foil ribbon. At the moment S1 is released the meter reading should be taken since delays will result in inaccurate readings. This assures a peak reading before the pointer begins to drop.

Reset the instrument to zero before timing another ball, by turning *off* power switch S3 for a minimum of 10 seconds. Oh yes, before tossing another ball you must insert new foil strips.

A full-scale reading of the meter represents a time interval of 1/10 second. This is equivalent to a ball speed of about 20 feet per second, a very slow ball. A reading of 0.11 on the meter scale represents a time interval of approximately 0.011 seconds, which is equivalent to a ball speed of over 180 feet per second (about 120 miles per hour). The latter is just about as fast as a human can toss a ball. Your most speedy pitch will most likely be between these two extremes. ■

Stamp Shack

Continued from page 64

Europe, is generally used in intensive care sections of hospitals, to enable the medical staff to constantly watch the heart action of seriously afflicted coronary patients.

● Until now, there're only three such instruments in use in Israeli facilities. These have been manufactured by Elta Electronics Industries, Ltd., a subsidiary of Israel Aircraft Industries, Ltd., at the Lod Airport, outside of Tel Aviv. ■

Design Solid-State Circuits

Continued from page 70

Now that R1 is attached to the collector, an increase in Ic decreases the voltage across R1 as it reduces the voltage across the collector to emitter. And, since

$$I_B = \frac{\text{voltage across } R1}{R1,}$$

IB goes down if Ic goes up. This tends to keep Ic constant.

With all this going on, how can we calculate a value of R1 in order to change our circuit from Fig. 3 to Fig. 4?

First, let's assume that all conditions are the same. Current Ic, in order to meet the collector conditions, has to be 10 microamperes. Our formula for R1 is now:

$$R1 = \frac{V_{CE} - V_{BE}}{10\ uA}$$

Since the VBE is still 0.2 volt (as it is for all germanium transistors), and the collector voltage is 4.5 volts, the VBE is less than 5% of the voltage across R1 and can be ignored. However, if the VBE becomes larger than 5% it will have to be dealt with. Therefore:

$$R1 = \frac{V_{CE}}{10\ uA} = \frac{4.5\ V}{10\ uA} = 450{,}000\ ohms$$

Although IB now flows through R2 along with Ic, and will increase R2's voltage drop slightly, 10 microamperes is only 1% of Ic and can also be ignored.

Feedback. By the act of connecting R1 from the transistor's collector to base we have introduced a negative feedback path to the circuit. A portion of the output voltage developed at the collector is fed back to the input and is compared to the input voltage. As we've just seen, with feedback any thermal changes which cause a change in Ic are compensated for at the transistor's base, and this buys us *stability*.

The feedback path sends back a signal in opposite phase which partially cancels out the base signal, and we end up with a loss in gain. In order to *buy stability* we *sell* off some *gain*.

Rules of the Road. Let's stack up the rules and tips for designing these circuits:

1. The battery voltage (Vcc) should be well below the transistor breakdown voltage.

2. The Vcc determines the maximum output swing, so don't look for 20 volts of AC output with a 9-volt battery.

3. Design your collector voltage to be half your battery voltage in order to get the maximum undistorted output voltage.

4. Remember the *rms* output is about ⅓ the peak-to-peak swing.

5. The collector load resistor should be much smaller than the load it's driving, or your amplifier gets swamped.

As for the formulas, just follow them in succession and you can't go too far off:

1. For maximum undistorted power output:

$$V_{CE} = \frac{V_{CC}}{2}$$

2. For selecting R2:

$$R2 = \frac{\text{load impedance}}{5\ (\text{minimum})}$$

3. To find Ic:

$$I_C = \frac{V_{CE} - V_{CC}}{R2}$$

4. To find IB:

$$I_B = \frac{I_C}{H_{FE}}$$

5. To find R1:

$$(\text{in Fig. 3})\ R1 = \frac{V_{CC}}{I_B}$$

$$(\text{in Fig. 4})\ R1 = \frac{V_{CE}}{I_B}$$

From Amplifier to Test Set. So far everything is pretty straightforward, provided we know the HFE of the transistor. But what happens to the amplifier in Fig. 5 (it's just like Fig. 3 with the addition of a meter) if the HFE of the transistor is 90 instead of 100?

For an HFE of 100, which the circuit was designed for, 1.0 mA flows in the collector circuit. Now, let's change the transistor to one with an HFE of 90. What happens to the IB?

In Fig. 5, IB is basically determined by the formula.

$$I_{BJ} = \frac{V_{CC} - V_{BE}}{R1}$$

VBE is a negligible part of the equation. We can then say that IB is fixed for any *pnp* transistor we plug in. Now back to the collector. Since IB is fixed, with an HFE of 90, the meter in the collector circuit would read

90 × 10 uA, or 0.9 mA. If we change the HFE to 50, the meter will read 0.5 mA.

If we multiply the meter reading by 100 we can read the HFE *directly from the meter*. Now our amplifier is an HFE tester.

Since full scale on the meter equals an HFE of 100, how can we measure an HFE greater than 100? Well, we would have to change the base resistor. If we use the formula—hold it!

Let's let you, the reader, figure this one out. In fact let's put it in quiz form. Answer these two questions:

1. What value of base resistor is needed to extend the scale range of the meter shown in Fig. 5 to HFE = 1000 at full scale?

2. What switching arrangement do we need to change the circuit in Fig. 5 from an *npn* to *pnp* transistor type with one switch?

The answers to the above questions will appear in the next issue of SCIENCE AND ELECTRONICS. Also, some more facts on transistor circuit design will be offered. ■

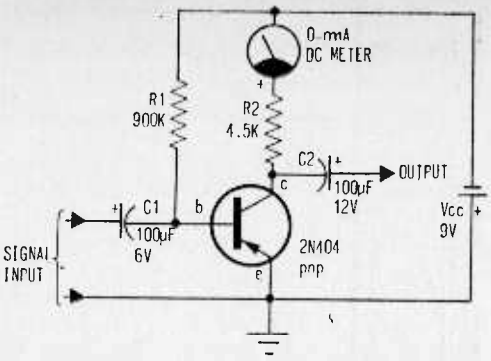


Fig. 5. Capacitors C1 and C2 are not used when preamp circuit is used as HFE tester.

CB Club Publicity

Continued from page 66

Canned Or Fresh? There are two ways to give your story to the press—1) a written news release, 2) personal contact with a reporter. But whether you send the paper a release or give your story to a newsman in person (the latter is usually your best bet, at least initially), remember that the typical reporter scarcely knows the difference between CB and TV. Unless you want to see the MyTee Five Watters described as a ham radio club, explain carefully and simply the distinction between CB and amateur operators.

And stick to the facts, man, just the facts! Give full names, dates, places, and anything else pertinent. But don't pad or polish them. Make it "nine club members joined in the search," if that was the case, not "many local CBers took part."

The Pitfalls. Now for a few don'ts.

Don't bother the editor or reporter when his deadline is staring him in the face. There are times when he literally doesn't have 30 seconds to spare to talk to you.

Don't tell the reporter how to write his story. If club prexy Herkimer Heterodyne was home in bed catching a few z-z-z-z's while the rest of the boys were freezing out in the fields with their walkie-talkies, don't expect the reporter to work in ol' Herk's name just to keep him happy.

Don't overdo CB jargon. Talk American, boy, big A-A-A! Terms like "10-20" and "Fox-Charlie-Charlie," mean nothing to the average reader unless they're explained. And that's usually not worth the effort *unless* such terms are critical to the story.

Don't push photographs. Let the editor decide if there's a picture possibility in your article. Sure, you'd like to get yourself in good with the boys by arranging a group shot of the MyTee Five Watters' officers. But three columns of nothing but wall-to-wall grins makes your friendly, neighborhood newsman shudder.

Don't fail to make a friend of the fellow who writes your story. He carefully combs and curries his daily news contacts. Do the same. And the next time you have a good story, seek him out. He'll remember you and your club and will be better able to do the job because of this background.

Having made a friend, don't bug him! Wait until you think you have a real news story. Don't figure you can get him to cover the club's banquet and good deeds award night by offering him a free meal. What you're really saying is, "Come and work overtime as my guest." And that's asking a bit much of anyone.

Unless it is a dire emergency, don't ever, ever call him at home! An annoyed reporter is an exceedingly unfriendly one. Rub him the wrong way and your press releases will surely join the 102 from other community groups already in the circular file.

In short, learn the rules of the publicity game. Follow them, and your efforts will stand a far better chance of boosting the MyTee Five Watters to even greater glory. ■

The Value of a Hobby

Continued from page 79

for the short time they were in range. It was growing late, and only a few people walked the street. A drunk, whose incoherent ramblings disgusted Ed, a policeman (and Ed gained a new sympathy for law officers), a couple returning from a movie who fascinated him. Finally Ed fell into bed exhausted.

◎ Ed slept until ten o'clock the following morning, Tuesday. He called his boss. Ed explained that he was sick with the flu and the doctor had ordered him to stay in bed for the rest of the day. His boss, George Royal, was a little short with him, well, maybe more than a little short. He had been complaining that Ed had not been up to his old standards during the last few months, and lately he had hardly spoken to Ed at all. Ed had worked for five years and in all that time he had only received one small raise. Really, he thought, there was nothing for him there but year after year at the same job, maybe a foremanship and perhaps a small pension.

◎ For the rest of the day Ed sat at the receiver, listening in on people on the street below. He made himself a sandwich and drank a glass of milk around two, and ate a TV dinner a little after five. He was starting on the green beans when George Royal happened to walk past. Ashamed, but none the less unable to resist, with his antenna he followed his employer on his way to his car. He discovered that George was thinking about him. He intended to give Ed only a little more time until the seasonal rush was over and then fire him. Ed had worked hard for little enough for five years now, and they were just going to dump him. It hurt, and made Ed mad. Why should he work year after year for a small company doing the same thing day in, and day out. With his receiver there must be an easier and more enjoyable way to make a living.

Ed thought of gambling, but he knew hardly anything about it, and the inconvenience of a quarter ton of equipment and an antenna that must be pointed at someone's head were too much to overcome. Besides, it seemed like a fine way to get hurt to win too often at cards or other games. But how else? Maybe as a salesman of some sort? It would be very handy to overcome a customers objections before he voiced them, to be able to appeal to a persons deepest emotions and desires, to know exactly whether a person was a potential buyer or not. All good salesmen have an instinct for this type of thing, but to be certain . . .

As Ed was thinking about this a prominent councilman happened to walk by the house. Ed was intrigued as he listened on the receiver. Maybe he could become a political advisor. But then, why be just an advisor?

◎ With the last of his savings, Ed bought an old panel truck. He carefully shock mounted the receiver in the rear, and concealed the antenna in a small searchlight on top. Then he drove to that little restaurant next to city hall, stopped the engine, and climbed into the back, which was completely enclosed. He started the tape recorder, sat back, and listened.

◎ All this took place about four years ago. Ed is the mayor of our town, and is very popular with the people and greatly respected by the opposition party. He seems to know just the right things to say to make people like him. The party is considering him for the Senate next year, and Ed seems very confident. He still works on his electronics hobby, although he doesn't have as much free time as he used to. Someone asked him the other day what he was building now, and he mentioned something about a transmitter. ■

"Designed that CB set myself, Harry—it has a built-in whip antenna!"

Ham Traffic

Continued from page 77

The situation keeps flopping back and forth—first Ma Bell wins a round, then the radio folks win a round. With all the money and legal talent Ol' Ma has, this could go on for a long time.

Meanwhile, presumably to cover themselves in case they lose their case, the good folks at Bell have put together a gadget called a voice coupler. This may be what they require you to rent, at a regular monthly charge, if you connect your radio gear to their phone lines. (Everything Ma Bell has in her kit bag has a regular monthly charge attached to it.)

While the battling goes on, keep two things in mind. First, phone patches are neither legal nor illegal—and they never were. There's no law that says they'll throw you in the jug if you hook your rig to the phone line. But there is a clause in most telephone company regulations that says they can deny you telephone service if you hook up something that causes them trouble.

Second, this phone-patch situation may not clear up for quite a while. The "winner" of the battle probably will change several times as Ma Bell and the radio folk keep maneuvering for advantageous positions. So, don't be suckered in by the latest rumor—it may be true for only a short time.

A Back-Door Ticket. For fellows who dropped out of ham radio and want an easy way to get back in, the FCC has good news. Now, anyone not licensed as an amateur for the previous 12 months may take the Novice exam. Formerly, Novice exams were not allowed for anyone who had been licensed previously. At the same time as they handed out this one, the FCC denied a request that Technician operators be allowed to take the Novice test.

Maybe there's more here than meets the eye, but it seems to me they got things 180 degrees out of phase from what they should be. I see *no* reason for allowing a person who has had a higher class license, then let it drop, to be allowed back into ham radio by a softer route. And, for the Technician who wants to get some on-the-air code practice in preparation for the General test, I think the Novice ticket *should* be permitted.

After all, the whole purpose of the Novice license is supposed to be to provide a chance for on-the-air CW experience. Anyone who has ever tried to make a CW contact on a Technician band knows it's virtually impossible. Those guys turn a deaf ear to CW signals. The Tech who really wants to improve his communications ability by improving his CW has two strikes against him. Now the FCC has added a third.

Zooks, George! In a recent column, I briefly described the use of commercial FM communications equipment by hams who have converted it to the 2- and 6-Meter ham bands.

This is a growing trend, which quite a few of the more technically-minded members of our hobby are involved in. A lot of them put considerable study and work into learning how this modern gear works and into wringing the maximum potential from it in their ham operating. My hat is certainly off to those FM operators who use this activity to improve their knowledge of electronics.

However, there's another side of the coin, as evidenced by a letter in a ham magazine recently. Part of it reads:

"It's certainly a relief and a satisfaction to be able to drop my mobile unit off at the local two-way service shop and pick it up later with the assurance that it's in tiptop shape and meets specifications."

How about that, sports fans? Isn't that a nice attitude for a fellow who claims to be a ham? ■

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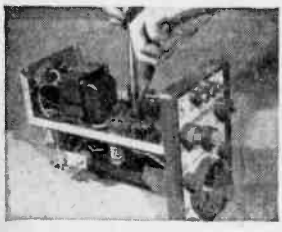

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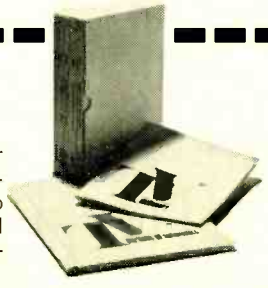

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