Radio-TV EXPERIMENTER

WHITE'S RADIO LOG

- U.S. AM STATIONS
- WORLDWIDE SW
- POLICE/EMERGENCY

FEBRUARY-MARCH 75¢

Build our Sound-off, Short-out BURGLAR ALARM

Bong goes the gong, dead goes the engine, away goes the thief!

Foil thieves not one, but two ways—see page 33

21 SECOND TV CURE-ALL

- BUILD NO-TICKET HAM RADIO RIG
- SELF-CALIBRATING CB MOD CHECKER
- 10-BUCK BOOSTER FOR REAL BCB DX

THE AMAZING POOLROOM IN THE SKY

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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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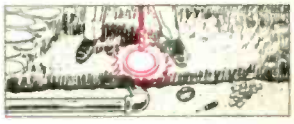

6 EXCITING NEW PROJECTS

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Radio-TV EXPERIMENTER

February/March 1969

White's Radio Log, Vol. 51, Part 1—page 90

Cover drawing by Joe Rak

Success in Electronics Comes as Naturally as 1–2–3 through Education

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with all the rights and privileges thereunto appertaining. In witness thereof this diploma duly signed has been issued by the School Administration upon recommendation of the faculty at the School on this

first day of October, 1965

D. J. Grantham
President

Acting Dean

Radio-TV EXPERIMENTER

Feb./Mar. 1969 Vol. 26/No. 1

Dedicated to America's Electronics Hobbyists

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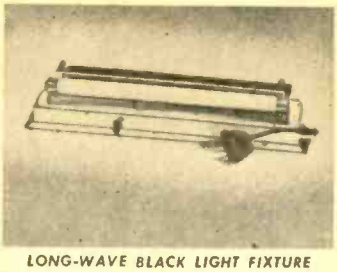
Stock No. 71,121HP.....$94.50 Ppd.
Solid Multi-Colored Glass Accessory Wheel
Stock No. 71,122HP—(9" Diam.) $15.00 Ppd.



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Terrific value—slightly used gov't surplus. Lightweight 5 cell, 6 volt, 4 Amp-hour battery with almost unlimited life. Extremely high current output. Recharges in 1 hour with Edmund kit. Won't deteriorate when left discharged. Minimum maintenance—few drops of water per year. Rugged, shock-and-vibration resistant nylon case. Delivered partially charged, filled with electrolyte. 3⅛"x2"x6". 2 lb.

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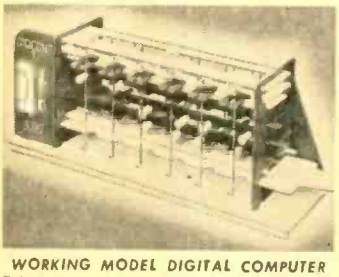

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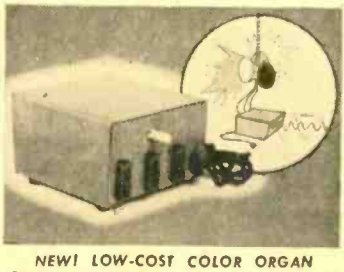
Stock No. 70,683HP.....$5.98 Ppd.

IT'S HERE—BIG, NEW DIGICOMP III
Stock No. 70,946HP.....$16.00 Ppd.



NEW! LOW-COST COLOR ORGAN

Create tremendous variety of unusual and beautiful effects. Simply plug in 3 diff. sets of colored lights and place near audio source. Notes picked up by interior "mike" determine which colored lights go on—loudness determines intensity. Surprising number of commercial, display and home uses—control lighting in pools and fountains, window and holiday decorations. Great for parties. Touch, compact unit with light intensity control. 4-9/16" x 2¼" x 4½". 1 lb. 6 oz.

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POSITIVE FEEDBACK

JULIAN M. SIENKIEWICZ, EDITOR

What may look like a *mod spider* made of plastic and metal bits is actually GE's new monolithic integrated circuit. It's a five-watt IC chip, and that's 5 watts *rms*, folks! Designated the PA246, the IC power amplifier is designed for consumer and industrial systems requiring up to five watts of audio power output into a 16-ohm load. Introduction of this integrated circuit makes GE's Semiconductor Products Department the first to offer a complete line of monolithic integrated circuit audio amplifiers. (In addition to the PA246, GE manufactures a one-watt audio IC—type PA234—and a two-watt audio IC—PA237).

To supply that five watts of audio, GE engineers developed an improved heat dissipation package design based on a modification of the plastic dual-in-line package (DIP). This new package provides lower thermal resistance from the IC chip to an attached heat sink.

The IC amplifier plastic package contains two heat sink tabs and eight leads in a staggered arrangement. The two tabs extend from each side of the package, along with the leads, and are made of copper for good heat transfer. The tabs can be readily attached to an external heat sink during the flow solder run of the printed circuit board used for mounting. Experimenters can solder copper sheets about 1½-in. square to each tab when the ICs push the full five watts.

The new IC device will operate from a wide range of power supply voltages up to 37 volts. Frequency response extends from 30 Hz to 100 kHz; noise output is typically −70 dB, rel-tive to five watts. At the full power output of five watts, input sensitivity is 180 mV and output harmonic distortion is under 1% at 1 kHz.

The really big news is price. One GE PA246 IC costs only $3.84. At this writing we know of one source that has units for sale. If you want one to ten PC246s, send $3.84 per IC plus 75¢ to cover shipping and handling costs to Electronics Hobby Shop, Box 124, Springfield Gardens, N.Y. 11413. ICs are shipped with complete specs and diagrams.

Here are three views of GE's new PA246 IC power amplifier that'll knock out 5 watts rms continuously—a big breakthrough for hobbyists.

★★★★★★★★★★★★★★★★★★★★★

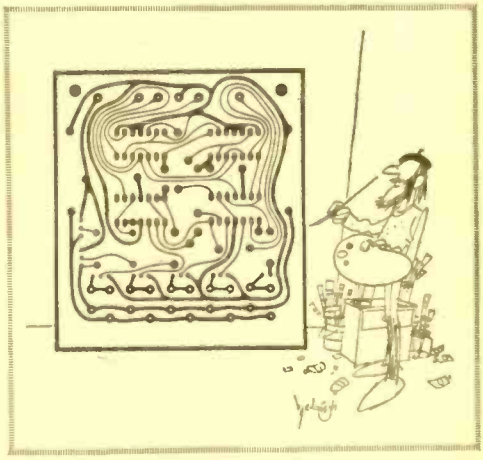
Tuff to Believe Dept.! One of our readers, John N. Ramsey of West Hartford, Conn., reports on a letter he received from the FCC. The message was in answer to a question he asked. "What should I do if I hear a distress call on my shortwave receiver?"

Reader Ramsey quotes the FCC's answer, ". . . If you should hear a distress signal that is not answered in 30 minutes, you should report the matter to the nearest FCC office giving all details of the message including call letters and the frequency on which the message was sent . . ."

So don't worry, folks. If you ever have to call for help on the old wireless, don't let no answer upset you. Some shortwave listener will report your trouble to the FCC in 30 minutes. Help will be on the way. This is a comforting thought for those who with only 25 minutes of fuel left are searching for an airport in a fog; or someone about to jump into shark-infested waters as his cabin cruiser burns to the water line; or—oh, you think of a situation! Old *Funny Crazy Chaos* has chalked up another boo-boo!

Hey, We Did It Again! If you haven't seen it yet, then go back to your favorite newsstand and look for our latest issue of Electronics Hobbyist. The Editors of Radio-TV Experimenter and Elementary Electronics packed the issue with the best construction projects that can be mustered. Projects were selected to cover two types of builders—those who like to finish the job in one evening and those who don't mind tinkering in the shop on weekends. And it makes no matter what your specialty is—SWL, amateur radio, audio, test gear, or projects just for fun—Electronics Hobbyist has the project you want packed between its covers.

So why don't you pick up a copy today. If you're snowed in, let the mail man do the toting for you. Just send $1.25 (that includes postage and handling) to Electronics Hobbyist, Spring/Summer 1969 Edition, 229 Park Ave. S., New York, N.Y. 10003. ■



Here's a new, complete ICS course in TV Servicing that costs less than $100.

With the first two texts, you can repair 70 percent of all TV troubles.

You need no previous experience to take this complete, practical course in TV Repairing.

You don't even have to know a vacuum tube from a resistor. Yet in a matter of months, you can be doing troubleshooting on color sets!

Course consists of 6 texts to bring you along quickly and easily. 936 pages of concise, easy-to-follow instruction, plus 329 detailed illustrations. You also receive a dictionary of TV terms geared directly to course material so you'll understand even the most technical terms.

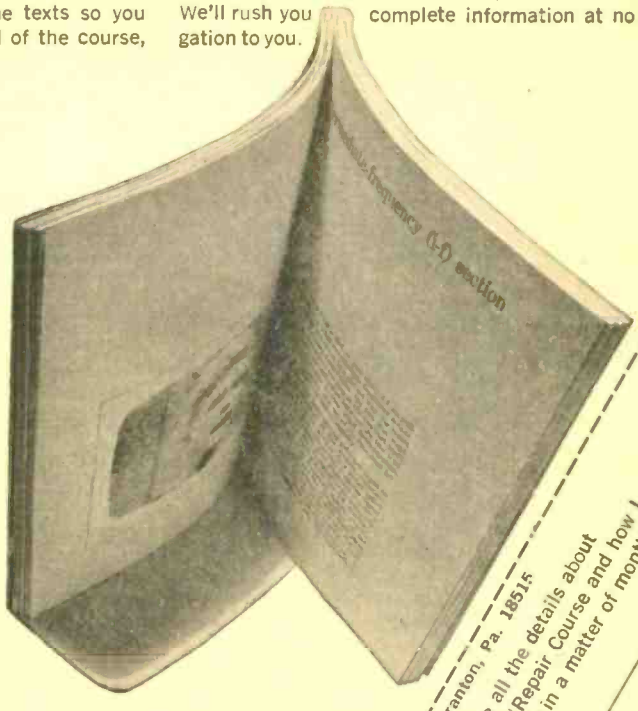
Instruction is simple, very easy to grasp. Photos show you what a TV screen looks like when everything is normal, and what it looks like when trouble fouls it up. The texts tell you how to remedy the problem, and why that remedy is best.

Quizzes are spotted throughout the texts so you can check your progress. At the end of the course, you take a final examination. Then you get the coveted ICS® diploma, plus membership in the ICS TV Repairman Association.

By the time you've finished the course, you should be able to handle tough, multiple TV problems, on color sets as well as black and white.

This new TV Servicing and Repair Course has been approved by National Electronic Associations for use in their Apprenticeship program. Because of its completeness, practicality and price, it is the talk of the industry. The cost is less than $100—just slightly over ½ the price of any comparable course on the market today.

Remember, the sooner you get started on your course, the sooner you'll be turning your spare time into real money. Fill out the coupon and mail today. We'll rush you complete information at no obligation to you.



ICS, Dept. J9484M, Scranton, Pa. 18515
Yes, I would like to have all the details about your new TV Servicing/Repair Course and how I can break into TV work in a matter of months.

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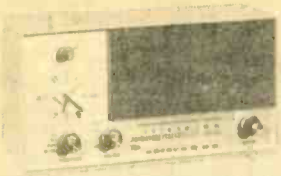
Introducing the new Heathkit GT-18 Trail Bike . . . it lets you go places other people can't . . . remote backwoods and forest areas . . . rugged mountain regions . . . isolated lakes & streams . . . rough country roads and long forgotten paths . . . even in the snow . . . places inaccessible by usual means. With the GT-18 you no longer have to depend on paved or dirt roads, or even trails. The GT-18 is only 24½" wide — if there's room to walk, you can ride with this one. But don't let the small size give you the wrong impression. The GT-18 is full of surprises. It's larger and huskier than a mini-bike, smaller, lighter and substantially more powerful than a motorcycle-type trail bike . . . and it has the agility, stability, traction and sheer guts of a mountain goat. Here's why: Pre-mounted on the welded ⅞" tubular steel frame is the easy-starting Briggs & Stratton 5 horsepower, 4 cycle engine, and it gives the 116 pound GT-18 extraordinary power. Performance? You can't touch it for any price. The tubeless front tire is big by trail bike standards (5.30 x 4.50"), but the tubeless rear tire is nothing short of huge — 18 x 8.50"!! And that's what's behind the amazing all-surface performance . . . that 8½" tread coupled with the two speed shift and 5 horse engine will power you thru mud, sand, snow, gravel, tall weeds and rough underbrush . . . up steep hills & rocky paths that would put other bikes totally out of it. And when the going gets snowy, just snap on the optional ski accessory (GTA-18-1 at $16.95). Heath's unique "grip-lock" mounting eliminates any need for tools too!

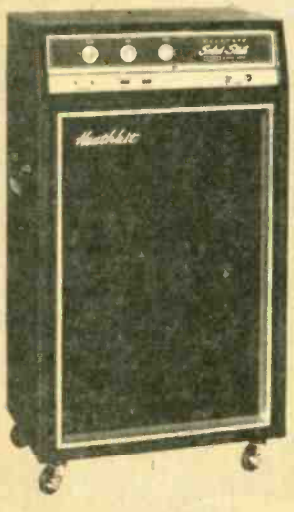
And stopping is easy and safe with the big hand-operated Bendix drum type rear brake. Loaded with other features too . . . welded steel skid pan, spring shock front suspension . . . big, comfortable seat . . . safety spring-loaded throttle . . . 400 pound load capacity and much more. The Heathkit All Season Trail Bike is so much fun you'll be looking for reasons to ride it. It's the only way to go when the going gets rough. Order yours today. 125 lbs.

NEW kit GR-58
$47.95



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

The easy way to get up in the morning. Choose the morning news & weather on AM or the bright sound of FM music. AFC makes FM tuning easy. The "Auto" position on the Telechron® clock turns only the radio on, or use the "Alarm" setting for both the radio and the alarm. You can even enjoy fresh coffee when you awake in the morning, thanks to the clock-controlled accessory AC socket on the back of the new GR-58. The handy "snooze" alarm feature lets you wake up gradually for ten minutes to the sound of the radio, then the alarm goes on . . . push the "snooze" button to silence the alarm for ten minutes more of music or news — the alarm sounds automatically every ten minutes and the "snooze" button turns it off, cycling continuously until the selector switch is moved to another position. Fast, easy circuit board construction, smart blue hi-impact plastic cabinet and top reliability make this GR-58 the clock radio for you. 8 lbs.



NEW kit TA-38
$225.00

HEATHKIT TA-38 Solid-State Bass Amplifier

The new Heathkit TA-38 is the hottest performing bass amp on the market, for quite a few reasons. First, there's all solid-state circuitry for reliability. Then there's the tremendous power — the TA-38 puts out 120 watts of EIA music power, 240 watts peak, or 100 watts continuous. Extremely low harmonic & IM distortion too. Many amps suffer from "blow-out" problems, but not the new TA-38 — *YOU CAN'T BLOW IT* . . . it boasts two 12" heavy duty special design speakers with giant 3 pound 6 ounce magnet assemblies mounted in a completely sealed, heavily damped ¾" pressed wood cabinet — those speakers will take every watt the amp will put out, and still not blow. Sound? The TA-38 is tailored to reproduce the full range of bass frequencies delivered by bass guitars and its sound with combo organs and other instruments is remarkable. Easy 15 hour assembly to the wildest bass amp on the market. Order one now and surprise the guys with the high-priced gear. 130 lbs.

kit SB-310
$249.00

HEATHKIT SB-310 Professional SW Receiver

The finest shortwave receiver you can buy. Covers six shortwave broadcast bands (49, 41, 31, 25, 19 & 16 meters), 80, 40 & 20 meter amateur bands and 11 meter CB. And the new optional SBA-310-3 kit converts the 11 meter band to 15 meters for additional amateur coverage. Has many of the same features that have made Heathkit amateur gear the world's best selling . . . pre-built & pre-aligned Linear Master Oscillator . . . crystal-controlled "front end" for same-rate tuning on all bands . . . linear tuning with 1 kHz dial calibrations . . . separate RF and AF gain controls . . . 5 kHz crystal filter included for clear AM, CW & SSB reception . . . switch-selected upper and lower sideband coverage . . . built-in 100 kHz calibrator . . . headphone jack . . . calibrated "S" meter . . . famous Heathkit SB-Series styling and much more. For the finest shortwave listening, order your SB-310 today. 24 lbs. SBA-310-3, 15 Meter Conversion Kit, 1 lb., $9.95.

Idea For Every Budget

HEATHKIT AD-27 FM Stereo Compact

The new Heathkit "27" Component Compact was designed to change your mind about stereo compact performance. How? By sounding as if it were made of top quality stereo components . . . which in fact it is. Heath engineers took their highly rated AR-14 solid-state Stereo Receiver, modified it physically to fit the cabinet, and matched it with the precision BSR McDonald 500A Automatic Turntable. Performance? Here's the AD-27 in detail. The amplifier delivers 30 watts music power . . . 15 honest watts per channel — enough to drive any reasonably efficient speaker system. Response is virtually flat from 12 Hz to 60 kHz, and Harmonic & IM distortion are both less than 1% at full output. Tandem Volume, Balance, Bass & Treble controls give you full range command of all the sound. Select the FM stereo mode with a flick of the rocker-type switch and tune smoothly across the dial, thanks to inertia flywheel tuning. You'll hear stations you didn't know existed in your area, and the clarity and separation of the sound will amaze you. The adjustable phasing control insures best stereo separation at all times. And the automatic stereo indicator light tells you if the program is in stereo. AFC puts an end to drift too. The BSR Automatic Turntable has features normally found only in very expensive units, like cueing and pause control, variable anti-skating device, stylus pressure adjustment and automatic system power too. Comes complete with a famous Shure diamond stylus magnetic cartridge. The handsome walnut cabinet with sliding tambour door will look sharp in any surroundings, and the AD-27 performs as well as it looks. For the finest stereo compact you can buy, order your "27" Component Compact now. 41 lbs.

NEW kit AD-27 $169.95

HEATHKIT AD-17 Stereo Compact

Using the component approach of the AD-27, Heath engineers took the solid-state stereo amplifier section of the AD-27, matched it with the high quality BSR-400 Automatic Turntable and put both of these fine components in a handsomely styled walnut finish cabinet. The result is the "17" — featuring 30 watts music power, 12 Hz to 60 kHz response, auxiliary & tuner inputs, less than 1% Harmonic & IM distortion, adjustable stylus pressure & anti-skate control and much more. Order your "17" now. 27 lbs.

NEW kit AD-17 $109.95

HEATHKIT AS-18 Miniature Speaker System

Miniature in size, but not in performance. This new Heathkit acoustic suspension system features two Electro-Voice® speakers . . . a 6" woofer and a 2½" tweeter for 60 Hz to 20 kHz response. Handles 25 watts of program material. Adjustable high frequency balance control lets you adjust the sound to what you like. The 8¼" H x 15¼" W x 6½" D walnut cabinet is protected by clear vinyl for lasting good looks. Pick a pair of these performers for stereo compacts. 16 lbs.

NEW kit AS-18 $32.95

HEATHKIT GR-17 Solid-State AM-FM Portable

Everything you want in an AM/FM portable. The all solid-state circuit delivers clear, stable AM from distances the mini-portables can't match, and the FM section, with it's 34" whip antenna, three IF stages and 5 uV sensitivity performs like a high priced table model receiver. AFC for drift-free listening and easy tuning too. All critical circuits preassembled and prealigned, and the circuit board assembly makes construction even easier. For the greatest sound around, get your GR-17 today. 5 lbs.

NEW kit GR-17 $43.95

HEATHKIT MI-18 Solid-State Tachometer

The new Heathkit MI-18 has advanced performance features like unique inductive pickup for connection to any spark-type engine and any ignition system, 0-6000 & 0-9000 RPM ranges, temperature compensated ±4% accuracy, stainless steel hardware, splashproof black & chrome case. Pick the MI-18-1 for panel mounting, or the MI-18-2 with case and hardware. Send for yours now. 4 lbs.

NEW kit MI-18 $29.95 (panel mount)

$32.95 (case mount)

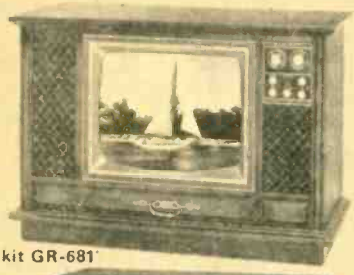
HEATHKIT GD-325C Low Cost Solid-State Organ

Put the sound of live music in your home now with this low cost, all solid-state Heathkit/Thomas Organ. It features all genuine Thomas factory-fabricated parts and 5-year warranty on the plug-in tone generators. Ten true organ voices . . . variable repeat percussion . . . 13 note heel and toe bass pedals for C_1 to C_2 range . . . two overhanging 37-note keyboards, range C_2 thru C_5 each . . . Color-Glo keylights . . . 75 watt peak music power amplifier . . . 12" speaker . . . vibrato . . . manual balance control. Thousands of people have already experienced the thrill and unique personal satisfaction of building this sophisticated, beautiful sounding musical instrument, and you can too. It takes no special skills or knowledge — the famous Heathkit manual with its easy to follow instructions and giant fold-out pictorials make the 50 hour assembly enjoyably simple. Comes with finished walnut cabinet and bench plus 40-lesson self-teacher course. Put the sound of music in your home this Christmas with the GD-325C from Heathkit. 172 lbs.

kit GD-325C $439.95

Heathkit® Christmas Gifts

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



kit GR-681

kit GR-295

kit GR-227

kit GR-180

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

New Wireless TV Remote Control
For GR-681
$59.95

Wish Your Family Merry Christmas This Year With A New Heathkit Color TV . . . A Better Buy Than Ever With New Lower Prices

New GR-681 Deluxe Color TV With Automatic Fine Tuning

kit GR-681 **$499.95** (less cabinet)

The new Heathkit GR-681 is the most advanced color TV on the market. A strong claim, but easy to prove. Compare the "681" against every other TV — there isn't one available for any price that has all these features. Automatic Fine Tuning on all 83 channels . . . just push a button and the factory assembled solid-state circuit takes over to automatically tune the best color picture in the industry. Push another front-panel button and the VHF channel selector rotates until you reach the desired station, automatically. Built-in cable-type remote control that allows you to turn the "681" on and off and change VHF channels without moving from your chair. Or add the optional GRA-681-6 Wireless Remote Control described below. A bridge-type low voltage power supply for superior regulation; high & low AC taps are provided to insure that the picture transmitted exactly fits the "681" screen. Automatic degaussing, 2-speed transistor UHF tuner, hi-fi sound output, two VHF antenna inputs . . . plus the built-in self-servicing aids that are standard on all Heathkit color TV's but can't be bought on any other set for any price . . . plus all the features of the famous "295" below. Compare the "681" against the others.

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

now only

Deluxe "295" Color TV... Model GR-295 $449.95

(less cabinet)

Big, Bold, Beautiful . . . and packed with features. Top quality American brand color tube with 295 sq. in. viewing area . . . new improved phosphors and low voltage supply with boosted B+ for brighter, livelier color . . . automatic degaussing . . . exclusive Heath Magna-Shield . . . Automatic Color Control & Automatic Gain Control for color purity, and flutter-free pictures under all conditions . . . preassembled IF strip with 3 stages instead of the usual two . . . deluxe VHF tuner with "memory" fine tuning . . . three-way installation — wall, custom or any of the beautiful Heath factory assembled cabinets. Add to that the unique Heathkit self-servicing features like the built-in dot generator and full color photos in the comprehensive manual that let you set-up, converge and maintain the best color picture at all times, and can save you up to $200 over life of set in service calls.

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

now only

Deluxe "227" Color TV... Model GR-227 $399.95

(less cabinet)

Has same high performance features and built-in servicing facilities as the GR-295, except for 227 sq. inch viewing area. The vertical swing-out chassis makes for fast, easy servicing and installation. The dynamic convergence control board can be placed so that it is easily accessible anytime you wish to "touch-up" the picture.

GRA-227-1, Walnut cabinet shown **$59.95**
Mediterranean style also available at $99.50

now only

Deluxe "180" Color TV... Model GR-180 $349.95

(less cabinet)

Same high performance features and exclusive self-servicing facilities as the GR-295 except for 180 sq. inch viewing area. Feature for feature the Heathkit "180" is your best buy in deluxe color TV viewing . . . tubes alone list for over $245. For extra savings, extra beauty and convenience, add the table model cabinet and mobile cart.

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

Now, Wireless Remote Control For Heathkit Color TV's

Control your Heathkit Color TV from your easy chair, turn it on and off, change VHF channels, volume, color and tint, all by sonic remote control. No cables cluttering the room . . . the handheld transmitter is all electronic, powered by a small 9 v. battery, housed in a small, smartly styled beige plastic case. The receiver contains an integrated circuit and a meter for adjustment ease. Installation is easy even in older Heathkit color TV's thanks to circuit board-wiring harness construction. For greater TV enjoyment, order yours now.

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 and GR-25 Color TV's **$69.59**
kit GRA-227-6, 9 lbs., for Heathkit GR-227 and GR-180 Color TV's **$69.95**

Keep On Giving

HEATHKIT AR-15 Deluxe Solid-State Receiver

The Heathkit AR-15 has been highly praised by every leading audio and electronics magazine, every major testing organization and thousands of owners as THE stereo receiver. Here's why. The powerful solid-state circuit delivers 150 watts of music power, 75 watts per channel, at ±1 dB, 8 Hz to 40 kHz response. Harmonic & IM distortion are both less than 0.5% at full rated output. The world's most sensitive FM tuner includes these advanced design features . . . Cascode 2-stage FET RF amplifier and an FET mixer for high overload capability, excellent cross modulation and image rejection . . . Sensitivity of 1.8 uV or better . . . Harmonic & IM distortion both less than 0.5% . . . Crystal Filters in the IF section give a selectivity of 70 dB under the most adverse conditions. Adjustable Phase Control for maximum separation . . . elaborate noise operated squelch . . . stereo only switch . . . stereo indicator light . . . two front panel stereo headphone jacks . . . front panel input level controls, and much more. Easy circuit board construction. For the finest stereo receiver you can buy anywhere, order your AR-15 now. 34 lbs. **Optional walnut cabinet, AE-16. 10 lbs. . . $24.95**

kit AR-15 **$339.95** (less cabinet)

Wired ARW-15 **$525.00** (less cabinet)

HEATHKIT AJ-15 Deluxe Stereo FM Tuner

The remarkable solid-state FM stereo tuner section from the famous Heathkit AR-15. If you already own a fine stereo amplifier, the AJ-15 is the stereo FM tuner for you. It has the exclusive design Heathkit FET FM tuner with two FET RF amplifiers and an FET mixer for 1.8 uV sensitivity and excellent cross modulation. The tuner section is completely factory assembled and aligned for easier construction too. Other features include the exclusive Heathkit Crystal filters in the IF section for perfect bandpass shape, noise-operated squelch, stereo threshold control, "Black Magic" panel lights and more. Put the world's best FM stereo tuner in your system now . . . the AJ-15. **18 lbs. Optional walnut cabinet AE-18, 8 lbs. . . $19.95**

NEW kit AJ-15 **$189.95** (less cabinet)

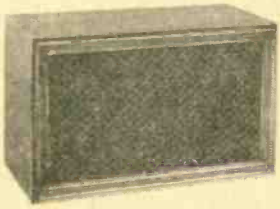
HEATHKIT AA-15 Deluxe Stereo Amplifier

The powerful solid-state amplifier section from the famous Heathkit AR-15. If you already have a fine stereo tuner, the AA-15 is the perfect mate for it. It features 150 watts of music power — 75 watts per channel . . . virtually flat response from 8 Hz to 40 kHz . . . less than 0.5% Harmonic & IM distortion at full output . . . individual input level controls . . . two front panel stereo headphone jacks . . . a tone-flat switch that bypasses the wide-range tone controls . . . loudness switch . . . positive circuit protection that makes the power amplifier circuits virtually short-circuit proof and "Black Magic" panel lighting. Put the world's best stereo amplifier in your system now . . . the AA-15. **28 lbs. Optional walnut cabinet, AE-18, 8 lbs. . . $19.95**

NEW kit AA-15 **$169.95** (less cabinet)

HEATHKIT AS-48 High Efficiency System

Our Finest Heathkit System . . . the new AS-48 with famous JBL® speakers. The specially constructed 14" woofer employs a 4" voice coil, 11½ pounds of magnet assembly and an inert, self-damping material to deliver clear, full-bodied bass down to 40 Hz. Crisp, open highs, up to 20 kHz come from the 2" direct radiator. LC-type crossover. The three position HF level control gives balance as you like it. All components are front mounted in the beautiful one-piece assembled pecan finish cabinet for easy construction. For very high performance stereo, order two of these amazing bookshelf systems today. **43 lbs.**



NEW kit AS-48 **$169.95**

HEATHKIT AS-38 Bookshelf System

The New Heathkit AS-38 is a medium priced system featuring JBL® speakers that's small enough to be used in apartments, yet delivers sound that qualifies it for use with the best of components. The 12" woofer and 2" tweeter produce clean, natural response from 45 Hz to 20 kHz and the variable high frequency level control lets you adjust the sound to your liking. For easier assembly and a more solid sound, all components mount from the front of the assembled walnut cabinet. Build in an evening, enjoy rich, complete sound for years. Order two for stereo. **38 lbs.**

NEW kit AS-38 **$144.95**

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 ham, marine, educational, CB, radio & hobby. Mail coupon or home Heath Company, Benton write Michigan 49022. Harbor,

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

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City_____ State_____ Zip_____

Prices & specifications subject to change without notice. CL-346

STAMP SHACK

BY ERNEST A. KEHR

●● Czechoslovakia's postal administration just issued a pair of stamps that would gladden the hearts of American broadcasters. The one commemorates the 45th anniversary of public radio; the other ballyhoos the importance of the national TV industry. They're intended to encourage domestic purchasers of radio and TV receivers since taxes on every set owned in Czechoslovakia contribute heavily to national revenues. They're also supposed to tell the rest of the world that Czechoslovak broadcasting is a long-established, popular industry.

Czechoslovakia New Issue
No Scott Catalog No. Yet

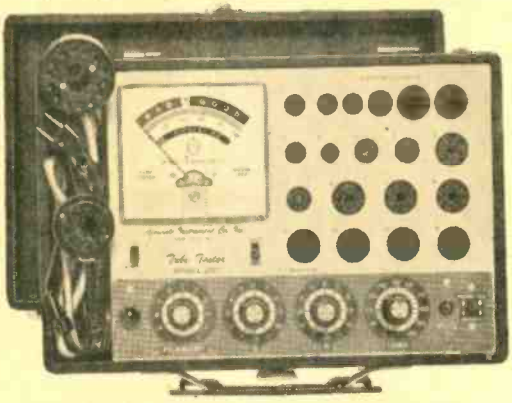
Collectors who have been making a topical specialty of accumulating stamps whose designs focus attention on communications progress will add these Czech issues to the hundreds already issued.

● "Radio" stamps are old stuff as far as philatelists are concerned. As far back as 1928, Newfoundland produced a nine-cent

(Continued on page 16)

The New 1968 Improved Model 257 **A REVOLUTIONARY NEW**

TUBE TESTING OUTFIT



- Tests all modern tubes including Novars, Nuvistors, Compactrons and Decals.
- All Picture Tubes, Black and White and Color

ANNOUNCING... for the first time

A complete TV Tube Testing Outfit designed specifically to test all TV tubes, color as well as standard. Don't confuse the Model 257 picture tube accessory components with mass produced "picture tube adapters" designed to work in conjunction with all competitive tube testers. The basic Model 257 circuit was modified to work compatibly with our picture tube accessories and those components are not sold by us to be used with other competitive tube testers or even tube testers previously produced by us. They were custom designed and produced to work specifically in conjunction with the Model 257.

COMPLETE WITH ALL ADAPTERS AND ACCESSORIES, NO "EXTRAS"

STANDARD TUBES:

- Tests the new Novars, Nuvistors, 10 Pins, Magnovals, Compactrons and Decals.
- More than 2,500 tube listings.
- Tests each section of multi-section tubes individually for shorts, leakage and Cathode emission.
- Ultra sensitive circuit will indicate leakage up to 5 Megohms.
- Employs new improved 4½" dual scale meter with a unique sealed damping chamber to assure accurate, vibration-less readings.
- Complete set of tube straighteners mounted on front panel.

BLACK AND WHITE PICTURE TUBES:

- Single cable used for testing all Black and White Picture Tubes with deflection angles 50 to 114 degrees.
- The Model 257 tests all Black and White Picture Tubes for emission, inter-element shorts and leakage.

COLOR PICTURE TUBES:

- The Red, Green and Blue Color guns are tested individually for cathode emission quality, and each gun is tested separately for shorts or leakage between control grid, cathode and heater. Employment of a newly perfected dual socket cable enables accomplishments of all tests in the shortest possible time.

The Model 257 is housed in a handsome, sturdy, portable case. Comes complete with all adapters and accessories, ready to plug in and use. No "extras" to buy. Only **$47.50**

NOTICE *We have been producing radio, TV and electronic test equipment since 1935, which means we were making Tube Testers at a time when there were relatively few tubes on the market, 'way before the advent of TV. The model 257 employs every design improvement and every technique we have learned over an uninterrupted production period of 32 years.*

Accurate Instrument Co., Inc.

SEND NO MONEY WITH ORDER
PAY POSTMAN NOTHING ON DELIVERY

Try it for 10 days before you buy. If completely satisfied then send $10.00 and pay the balance at the rate of $10.00 per month until the total price of $47.50 (plus P.P., handling and budget charge) is paid. If not completely satisfied, return to us, no explanation necessary.

ACCURATE INSTRUMENT CO., INC.
Dept. 609 2435 White Plains Road, Bronx, N. Y. 10467

Please rush me one Model 257. If satisfactory I agree to pay $10.00 within 10 days and balance at rate of $10.00 per month until total price of $47.50 (plus P.P., handling and budget charge) is paid. If not satisfactory, I may return for cancellation of account.

Name_____

Address_____

City_____ Zone_____ State_____

☐ Save Money! Check here and enclose $47.50 with this coupon and we will pay all shipping charges. You still retain the privilege of returning after 10 day trial for full refund.

one that depicts Cabot Tower, on a high hill above St. Johns, and from which Marconi sent his first signals to ships far out on the Atlantic.

● Television is something else, for the tube didn't get into wide use until after World War II. The first one was turned out by Switzerland, in 1952, as one of four special designs to mark the centenary of the first

Scott #340

Scott #341

Scott #342

Scott #343

Switzerland 1952 Telecommunications Union

Telecommunications Union. That organization was established in 1852, to formulate national and European regulations for the use of the telegraph as a public communications medium.

As the telephone, then radio and finally, TV were developed, and their use assumed by governments, these media's control were added to the union's jobs.

Switzerland's quartet of seventeen years ago are completely symbolic in design. Telegraphy is represented by a cross of dots and dashes stretching across the skies and one of the universe's galaxies; telephony, by a pole; radio by an antenna and radio waves; and TV by zig-zag waves emanating from an "eye" such as CBS has been using as its trademark.

● The first really realistic TV publicity stamp is the product of the Italian Postal Administration. On Feb. 25, 1954, when the government opened its first national TV

Italy TV Issue
Scott #649-560

network, it issued 25 and 60 lire stickers, each of which depicts a TV antenna along with an actual receiving set on whose screen a map of Italy and its off-shore islands can be clearly seen.

● A little more than a year later, on April 16, 1955, France joined the TV stamp parade. Its contribution consists of a 15-franc adhesive which features the Eiffel Tower, on top of which the French government's Parisian TV transmitting facilities had just then been installed. Circular waves emanate from it as rooftops in the foreground all have TV antennae to make the design as cluttered as the gay city's skyline.

France TV Issue—Scott #766

● Luxembourg was another European nation that marked the inauguration of TV, when on Sept. 1, 1955, it issued a stamp

A word about our columnist . . .
Ernest A. Kehr

Author of articles published in newspapers and magazines throughout the world and numerous books, including "Romance of Stamp Collecting" which has sold more copies and been in print longer than any other stamp book written; conducted courses in philately for City College of New York and Philatelic Foundation for over 20 years. Won Gainza Paz gold medal as "most distinguished philatelic writer" at international competition in Buenos Aires in which some 2,500 entries were judged. Member of jury at more than 30 international stamp exhibitions; founder and executive chairman of Philatelic Press Club; knighted by Queen Juliana, Grand Duchess Charlotte, Popes Pius XII and John XXIII; recipient of Grand Cross, Order of Merit by President Theodore Heuss (Germany) and made member of Honor of Ibero-American Academy of History, all for developing better understanding among people through philately and education. Advisor to many famous personalities including the late President F. D. Roosevelt, Cardinal Spellman, President Magsaysay; Gen. Mark Clark, Lauritz Melchior, etc.

showing its Dudelange transmitter. The following year the Saar (that territory had not yet become an integral part of Germany) issued a 15-franc stamp showing its new transmitter in Saarbrucken.

● Argentina and the Dominican Republic were the first Western Hemisphere nations to produce TV stamps. The first—issued in 1954, is a 5-peso value and again features the "CBS Eye" set against a symbolical pattern of TV waves. Trujillo's was a 25-centavo special delivery stamp, whose design consists of a close-up view of a transmitting head atop a tall antenna tower in the island's capital.

● Germany's 1957 TV stamp probably is the most unusual of all. Issued to publicize the industry, it shows a grid pattern and dimming ball of light such as one sees as a set is turned on or off.

● A Hungarian, 2-forint stamp of 1958, shows what is reported to be 14-story Telecommunications Building in Budapest, with radio and TV waves from a roof-top transmitter encircling the entire picture. In addition to the regular stamp, this same design was printed on a souvenir sheet with gold margins and inscribed, "To commemorate the Founders of Hungarian Television."

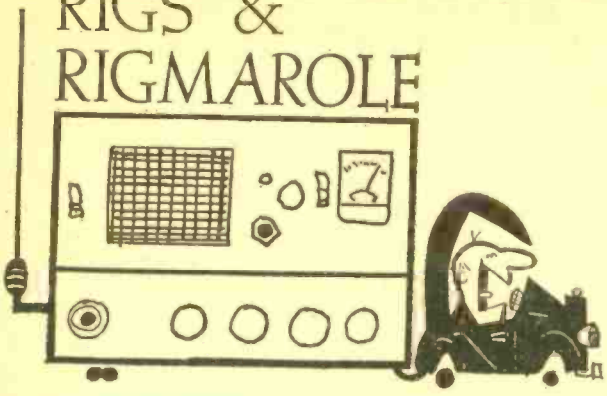
● Since these "early" years of TV postage stamps, literally dozens of other countries all around the world turned out their own. There are so many of them, in fact, that the American Topical Association, 3306 N. 50th St., Milwaukee, Wisc. 53216, has issued a special handbook which lists, describes and illustrates them as a guide for collectors who want to fill an album of their own. A few are a bit elusive, so hunting for them can add a bit of sport, but most are both readily available and inexpensive. ■

Some Other Television Issues

Switzerland
Scott #1001-9

Italy
Scott #C116-21

CB RIGS & RIGMAROLE



a what's new product column that's fun to read

☐ Here's how you can be a first baseman. Yes, you could be the first in your neighborhood to have a new CB base station from E. F. Johnson.

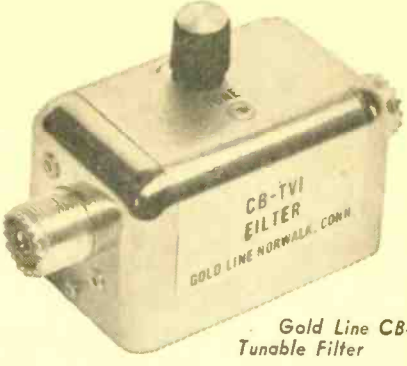
Johnson's new rig is dubbed the Messenger 223 and it's a doozy! It's got a 23-channel synthesizer circuit which means that you've got no crystals to buy for full coverage. You get 15 dB more audio gain than any of the previous Messenger series sets, and it delivers the maximum legal power to your antenna.

In the looks department it's as slick as a buttered billiard ball with its built-in S meter which also shows the power output of the transmitter at no extra charge. All in all, the 223 runs 10 tubes, 8 diodes, 6 transistors.

E.F. Johnson Messenger 223 CB Base Rig

Johnson will send you complete details. Just write to them at Waseca, Minn. 56093.

Anyone for Indians? Tennessee Valley Indians (*TVI*) is the popular CB term for TV Interference; and that's a popular term for Trouble. If you've got it you're a candidate for more problems than you need with neighbors and Uncle Sam. A standard remedy (and effective, too) is to rid thyself of this plague by the simple installation of a little TVI trap in your antenna line; right at the antenna connector on your rig. These traps are the famed "low pass filters" of song, story, and legend.



Gold Line CB-TVI Tunable Filter

A new twist has now been added to the TVI trap: it's a tuning knob atop the filter which permits you to actually peak the trap for maximum efficiency with your specific rig and installation. It's a good idea and we're happy to see it available from the Gold Line Co., Muller Ave., Norwalk, Conn. 06852. Write to them for the poop and tell 'em we sent you.

Mini Rig Dept. It's always a kick to see some company totally minimize a CB base station to the point where it can be carried around in hand or pocket; and that's what the Claricon folks did with their Century 5 rig.

Think of it this way: it's a 2-channel rig that runs a full 5 watts input (3½ out), the receiver has 0.5 μV sensitivity for better than 10 dB S+N/N, it features AGC, ANL, and adjustable squelch. It will operate from house current (with an optional converter) or from rechargeable batteries. Sounds like a standard CB rig, doesn't it? Well, it's a hand-held unit.

Claricon has authorized their dealers to make a cash refund on these units if they fail to surpass any other 5-watt hand-held unit presently available. They're $175.00 per pair. Claircon

Claricon Century 5 Hand Portables

Electronics holes up at 663 Dowd Ave., Elizabeth, N.J. 07207—write them there.

Reach! An outfit called Reach Electronics, Box 308, Lexington, Neb. 68850, has come out with a nifty handset-control panel for mobile rigs. While primarily designed for mobile telephone units, it can be adapted to any rig. Besides looking very sharp, it can be fitted with various decoders and encoders for the ultimate in professional selective calling. It permits 8 channels to be selected by pushbutton control and can even be locked with a key to prevent unauthorized use of your gear.

Reach Handset/Control-Panel

It's really a sophisticated chunk of electronics and if you want the complete scoop on it we suggest that you reach Reach.

Before We Sign Off. How about some of you CBers sending in a photo of yourselves with your CB gear? We'll be glad to run any so that your brother operators will see what you've got going for yourself! C'mon, don't be shy. Send to CB Rigs & Rigmarole, RADIO-TV EXPERIMENTER, 229 Park Ave. South, New York, N.Y. 10003. ■

BOOKMARK
BY BOOKWORM

CB Fix-it. Wanna discover how you can keep CB equipment in top shape, whatever the brand or special features? And it makes no matter whether you're just an operator, serviceman, or super-technician! *Practical CB Radio Servicing* by R. R. Freeland covers virtually every servicing problem the CBer will face.

A unique feature of Freeland's text is that each chapter is self-contained. The reader does not have to search through the entire book or

Soft cover
192 pages
$4.75

refer to other chapters to find procedures for specific servicing chores. This isolation of tasks makes the text an ideal tool for spot testing and troubleshooting.

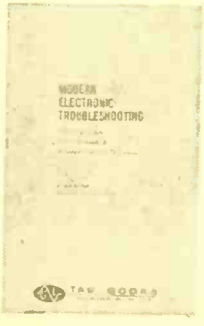
The book begins by detailing checkout procedures for both a fixed base station and for mobile units. Then it explains a step-by-step method for measuring transmission and receiving frequencies for optimum performance and compliance with FCC rules. Measurement and corrective procedures for modulation and symmetry, power input and output, sensitivity and selectivity are fully discussed. The following chapters show how to diagnose and repair receiver problems, transmitter problems and power supply troubles easily and rapidly. Procedures for locating and correcting causes of interference, which can seriously hamper CB transmission and reception are fully covered, as well.

Practical CB Radio Servicing was written by Roy R. Freeland, President of International Crystal Mfg. Co., Inc. Roy probably sold the first CB rig ever, way back in September, 1958, and the Editor of *Radio-TV Experimenter*, then with another electronics magazine, was probably the first editor to be photographed with that same model CB rig back in CB's first year. The text was edited by Leo G. Sands, Editor of *CB Magazine*. Leo is the columnist who takes care of our *Ask Me Another* column as well as being a regular contributing author for *Radio-TV Experimenter*. Your Ol' Bookworm knows all three gentlemen and his comment is "It's getting to be a small, small world!"

You can pick up a copy of *Practical CB Radio Servicing* at local and mail order electronic parts houses, or direct from the publisher—Hayden Book Company, Inc., 116 West 14th Street, New York, N. Y. 10011.

Troubleshooting. Introducing *Modern Electronic Troubleshooting*, a new down-to-earth handbook that deals with today's electronic servicing problems on a practical level using modern test instruments and advanced troubleshooting procedures to cope with the special problems created by printed boards and solid-state circuitry. It is hard to conceive of a book that encompasses monochrome and color TV, multiband radio receivers, hi-fi equipment, tape recorders, two-way communications equipment, and test instruments for servicing all this equipment. Yet this book does! How? By getting right to the subject of how to service the equipment without the usual wordy theoretical discussions of how the circuits work.

This is a book for knowledgeable service technicians, dealing with the problems which



Soft cover
256 pages
$4.95

are currently causing them the biggest headaches. The content is divided into five Sections. The first four deal with troubleshooting techniques and test instruments for servicing solid-state circuitry (in radio, TV, hi-fi, and communications gear), color-TV circuits, hi-fi and stereo equipment and two-way communications transceivers. The final section is on test equipment—not the usual run-of-the-mill theory, but special information such as how to add a triggered sweep to your old scope, how to use an R/C bridge effectively, how to service your own test equipment, etc.

In all, the 24 chapters provide the kind of all-inclusive servicing guidebook service technicians have been asking for—one that defines the troubles most prevalent in today's electronic equipment, and concentrates on quick troubleshooting procedures for locating the

causes. Get your copy direct from the publisher, Tab Books, Blue Ridge Summit, Pa. 17214.

One More Time. The years since the development of high fidelity have brought with them an ever-growing number of books on all

Soft cover
438 pages
$5.95

phases of the subject. Each, in its own way, has described the various advances and refinements made by the industry. Unfortunately for the hi-fi buff, too many of these volumes have been bogged down in unnecessary technical detail aimed at the technician. Now, the second edition of *Hi-Fi Loudspeakers and Enclosures* goes beyond the purely mechanical details to explore the possibilities of artistic excellence. Written by Abraham B. Cohen, the book recognizes that the listener himself is the final control on the realism of the reproduced sound.

To ensure a complete understanding of hi-fi sound reproduction, the book first examines the entire acoustic chain in step-by-step sequence. Each factor is treated individually and then combined in the analysis of integrated systems that follows. Recent developments, including three-element stereo and the all-in-one enclosure, are fully covered, and vital new information has been added on loudspeakers and enclosures. Pointing the way to improved acoustical performance, the book keeps the reader aware of such essentials as cost, size, appearance, and expansibility. As a special aid to the "do-it-yourself" enthusiast, 27 different basic enclosures have been provided. All of them appear in a simplified format and will suit any builder's room size and use requirements. Available at bookstores, electronic parts dealers and mail-order houses, or direct from the publisher—Hayden Book Company, Inc., 116 West 14th Street, New York, N. Y. 10011.

Got A Watch? Here is a mammoth, quick-answer guide to over 700 TV circuit troubles—Tab's new *Pin-Point TV Troubles in 10 Minutes* by Harold P. Manly.

For those who service TV receivers, this book offers *practical* help of a type not usually found in books of this type. Using 63 large-size photos of different picture-troubles, keyed

Soft cover
372 pages
$4.95

to trouble-finding charts which identify over 700 probable defects, the reader can pinpoint almost any TV circuit or component defect in a matter of minutes. Nearly 50 detailed trouble-finding charts pinpoint the most probable causes for defects in every circuit or major component—from tuner to picture tube, from sound and audio to power supply. A 5-page trouble-symptom chart allows the reader to quickly find the appropriate reference chart. For certain faults requiring special methods to locate and correct, not covered in the trouble-finding charts, suggested troubleshooting procedures are clearly presented in number-keyed paragraphs following the associated chart. Further, the beginning of each section gives information on circuit peculiarities, methods for improving performance, making service tests and adjustments, checking components, etc. You can get your copy direct from the publisher—Tab Books, Blue Ridge Summit, Pa. 17214.

What a Buy! Looking for a replacement for a DS501, GE-4, SM-3012, ET-7, TR-03, or 2N3314? HEP-231, the 15-amp, 150-watt germanium *pnp* power transistor in the TO-36 "Door Knob" package replaces them all (and some 55 other devices). But, these are only seven of the 12,000 transistors, rectifiers, zener diodes, dual diodes, and SCR semiconductor devices that hobbyists, experimenters, and professional service dealers will find cross-referenced in alpha-numeric order in the new Motorola HEP *Cross Reference Guide*. This useful and practical 62-page guide is available now at HEP representatives and distributors throughout the country, or directly from HEP, Motorola Semiconductor Products, Inc., P.O. Box 13408, Phoenix, Arizona 85002.

Paper cover
62 pages
25¢

After analyzing thousands of published device specifications, HEP engineers compared those HEP devices that best met, or exceed the major characteristics and used these as the HEP preferred type substitute device. In addition to the semiconductor cross-reference this guide also includes sections on Important Tips on Using Universal Replacement Semiconductors; Outline Dimensions of HEP Devices, and the HEP Price List.

Fix That Set. The next time you need schematic diagrams and service information on a specific radio and TV set—don't despair! Supreme Publications, the home fix-it fan's family friend, is offering to send promptly by mail service material on almost any television, tape recorder, radio, stereo or record changer. Supreme is able to supply such information from its own service manuals, extensive files going back to the 1930s, and from factory released material. The usual charge is $1 for radio material, and $1.50 for TV material covering a specific set.

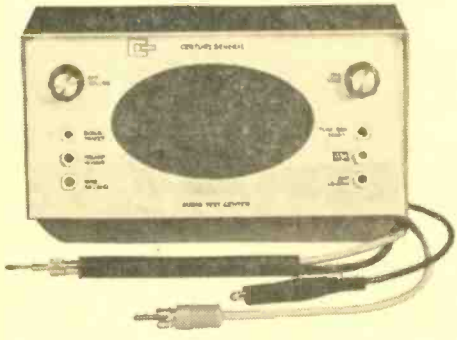
Your ol' Bookworm chatted with James Lynch, manager of Supreme Publications who stated, "Each request for material is a challenge to us. And while most items can be easily and quickly filled, at times our Mr. Beitman (who has been connected with diagrams and servicing for 40 years) spends an hour or more to find a hard one." Where else now-a-days can you get this personalized service for only a buck?

It is good to know that there is a large organization ready to supply service material on a radio or a TV set you may find hard to repair and for which you do not have a diagram and other helpful service data. Next time you run into a dog, and don't have a schematic diagram, write to Supreme Publications, Dept. JMS, 1760 Balsam Road, Highland Park, Ill. 60035.


". . . it's only a one week vacation!"

Troubleshooting Audio at Home

This all-in-one Audio Test Center was designed by a professional audio service man. In one versatile, battery-operated unit it incorporates all you need for fast audio-system servicing. Model 140 contains the following in only 4¼x7x3½-in. of space: RF/IF/AF signal tracer, tone generator, multi-input amplifier, and scope preamplifier. It is specifically designed *not* to



Century General 140 Audio Test Center

overload or damage transistors. Other specs: gain, 70 dB with volume control; noise, better than −60 dB; frequency response, ±3 dB, 100-12,000 Hz; harmonic distortion, less than 3%; power output, 200 mW; power supply, 9 VDC at 50 mA. Weighing only 2 lb., the Audio Test Center sells for $48.00, complete with six penlite cells and probes. For further information, write the Century General Corp., 570 7th Ave., New York, N.Y. 10018. (*Turn page*)

NEW PRODUCTS

Phone Valet

The Crown Telephone Valet will automatically answer calls with your message, and record callers' incoming messages. The Valet answers incoming telephone calls by lifting the receiver and playing into it a message in the user's voice, recorded on an endless loop cartridge. The unit then receives and records the caller's message,

Crown CTA-4400 Automatic Telephone Valet

after which it shuts off, ready to take the next call. Voice-activated, the cassette unit can double as a table model auxiliary recorder. The instrument features digital tape counter; push-reset counter button; tone and volume controls; function selector switch; five piano-type keys for operate, fast forward/reverse controls; and three lamp indicators for power, start, and record functions. It has a frequency response of 100 to 10,000 Hz; uses 20 transistors and 4 diodes. Price of $199.95 includes microphone and small accessories. Get more literature on the Model CTA-4400 from Crown-Industrial Suppliers Co., 755 Folsom St., San Francisco, Calif. 94107.

Massage Your Media Onto Tape

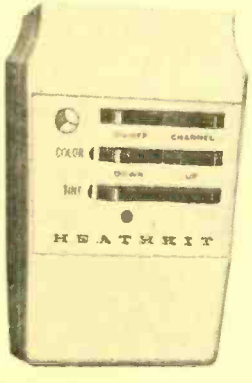
In its price bracket, this tape recorder has a lot of things going for it. Panasonic's Console-Aire, Model RS-790S, has continuous automatic or manual reverse with directional lights, three-speed operation with four-track stereo, a four-head system, two vu meters, pause control, a 4-position digital tape counter, and two 7-in. oval dynamic speakers. A dual capstan drive stereo tape recorder, the Console-Aire produces 20 watts of music power. On its 7-in. reel you can have sound on sound or sound with sound. Separate volume and tone controls are provided for each channel. It has simple lever operation and comes with dust cover. The Model RS-790S contains 14 transistors plus 10 diodes and 5 thermistors, and weighs 38¼ lb. Along with it you get two dynamic microphones and stands, a 7-in. reel with tape, an empty 7-in. reel, reel

Panasonic RS-790S Stereo Tape Recorder

holders, splicing and sensing tapes. Price is $329.95. For more specs, drop a line to Matsushita Electric Corp. of America, Pan-Am Bldg., 200 Park Ave., New York, N.Y. 10017.

For Armchair Channel Hoppers

If you're fortunate enough to own a Heathkit color TV, or have one in the works, you'll want the new Heathkit wireless remote control. This gratifying gimcrack lets you turn your Heathkit color TV on and off, set the volume, adjust color saturation, change picture tint, and select vhf channels by sonic control—without ever getting off your duff. The remote receiver uses an integrated circuit containing 15 resistors, 10 transistors, and 1 diode, and it has a built-in meter.



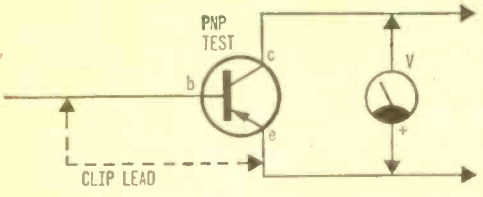
Heathkit Wireless Remote Control for Color TVs

The remote transmitter is powered by a 9-V battery. There are two types: the GRA-295-6 for the GR-25 and GR-295 color TVs; and the GRA-227-6 for Heathkit's GR-180 and GR-227. Both are priced at $69.95. Want more info? Write the Heath Co., Benton Harbor, Mich. 49022. ■

Transistor Tester

The only test equipment I have is a VOM. How can I test the transistors in my radio with it?

—T. J., Duluth, Minn.



Connect the negative lead of the VOM (set to measure DC volts) to the collector of a pnp transistor and the positive lead to its emitter. If it is an npn transistor, the VOM leads should be just the reverse. Finally, use a clip lead and short the base to the emitter. If the voltage increases, the transistor is active and you're in business.

The Beat Goes On

My small, portable eight-transistor radio picks up CW signals on 930 kHz and at about 690 kHz when I'm in Newport Beach. With my communications receiver operating in the 200-400 kHz band, I hear CW signals exactly the same as on the BCB except that they are much stronger. Could you please explain this?

—L. C. Tucson, Ariz.

It could be that the signals from the CW station are being heterodyned with a signal from a strong BCB station. For example, if a CW signal on 290 kHz beats with a BCB station on 640 kHz their sum frequency would be 930 kHz. You would hear the CW signal as an *audio* tone since the sum frequency and the carrier of the BCB station on 930 kHz would

not be exactly the same. Also, the 290-kHz signal beating with a 980-kHz BCB signal would produce a beat at 690 kHz.

These may not be the actual conditions that existed when you heard the CW signals, but the principles are the same. The CW signals could have come from a beacon, Naval, or commercial shore station, or from a nearby ship.

These signals will produce a beat if the first stage of your receiver is non-linear—which would be the case if it has no RF stage ahead of it. If it has one, the RF stage could be overloading or be biased improperly for linear operation.

Uneven Exchange

I read somewhere that it is possible to pep up a receiver by replacing the RF amplifier with a tube of higher gain. I decided to do this with my Lafayette HA-63. I replaced the 6BA6 with a 6GM6 (making all socket changes). Now my "S" meter no longer works, there's no increase in sensitivity, but there is some distortion. Can you tell me what I did wrong and possibly how to correct it.

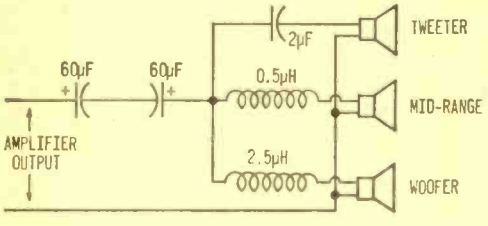
—P.A.J., Maspeth, N.Y.

The two tubes have somewhat different characteristics. Make sure you wired socket terminals 2 and 7 together! In general, it's better not to tamper with a receiver. The man who designed it obviously had good reasons for selecting the tubes he did; there is only a small difference in price between these two types. Gain is usually dependent on overall circuit design and the parameters given in tube manuals should not be taken too literally.

Triangle Sound

I need a crossover system which will pass all frequencies below 700 Hz to a woofer, those between 700 to 5000 Hz to a mid-range speaker and those above 5000 Hz to a tweeter. It should handle 35 watts. Can you help?

—R. T., Manchester, Conn.

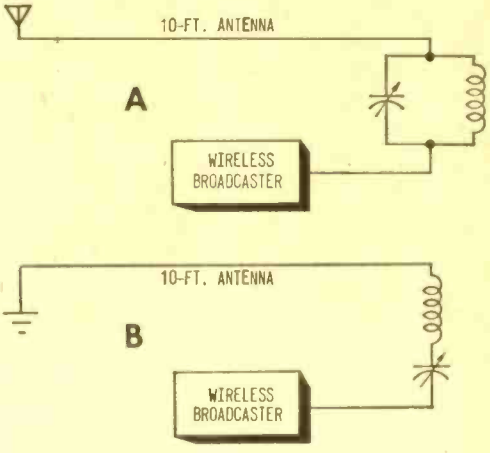


Here's a diagram of a crossover network for 8-ohm speakers. If you use 16-ohm speakers, the capacitors should be half the listed value. As to exact frequency crossover, juggle the values of your capacitors and chokes until you get what sounds best to you.

Peak Power

I have a Lafayette wireless broadcaster which operates in the BC band. To increase its range, I have installed a tuner and loading coil on the antenna (see A). With a receiver nearby, I attempted to peak the antenna. No audible change in the signal was produced by turning the condenser plates, except at a point about halfway through its rotation where the signal seemed to disappear. Conversely, a field strength meter indicates the transmission is strongest at this fade-out point. What am I doing wrong?

—S. S., Wyncote, Pa.



For one thing, at the fade-out point you have a parallel, resonant wave trap in series with the antenna. The wave trap blocks passage of your signal.

Why don't you try connecting the coil and capacitor to form a *series* resonant circuit with the far end of the antenna grounded as shown in the second diagram? (See B.) This should get more current into the antenna whose length must be limited to 10 ft. according to FCC rules.

Spy Stations?

Recently I have heard transmissions on about 11.5 MHz which consist of a series of numbers, spoken in Spanish, and usually in groups of four, although there have been groups of five and six. The station signed off at 0630 GMT by saying "Hasta Luego. Hasta Luego." Could this be some sort of spy station?

Highly doubtful, but who knows? Castro never gives up. Perhaps they were price quotations of coffee.

Beefier Bass

I have a Knight-kit KG-250 24-watt stereo amplifier. I would like to add additional bass to it since I feel it does not put out enough. Other than this, it works perfectly. Could you please

(Continued on page 115)

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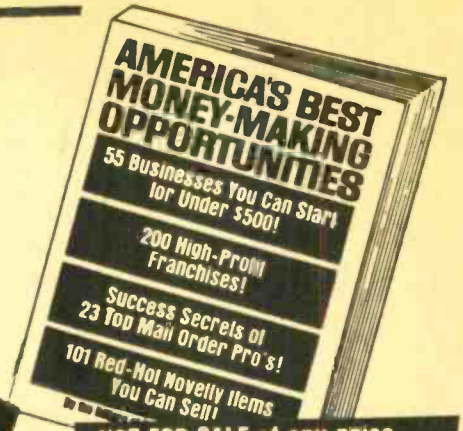

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LITERATURE

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!

★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!

★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.

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.

★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.

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.

★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.

TOOLS

78. *Xcelite's* new "Trav Bien" nutdriver sets feature plastic trays that lie flat or sit up on your workbench, or pack neatly in your tool box. All the poop's in *Xcelite's* Bulletin N666—get it!

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

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.

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.

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.

★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.

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.

50. Get your copy of *Amphenol's* "User's Guide to CB Radio"—18 pages packed with CB know-how and chit-chat. Also, *Amphenol* will let you know what's new on their product line.

54. A catalog for CBers, hams and experimenters, with outstanding values. Terrific buys on *Grove Electronics'* antennas, mikes and accessories.

ELECTRONIC PRODUCTS

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

66. Try instant lettering to mark control panels and component parts. *Datak's* booklets and sample show this easy dry transfer method.

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.

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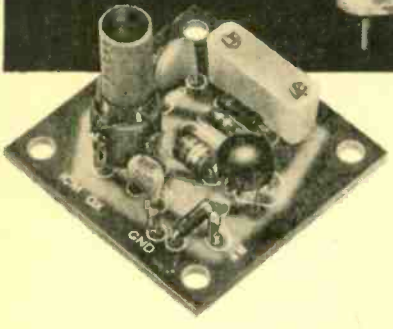

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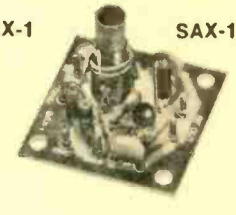

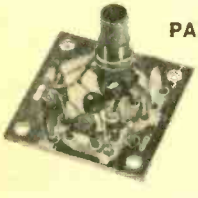

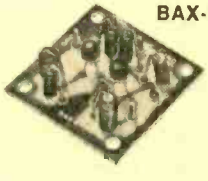

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Now play it safe! Put an end to light fingers that make a beeline towards your unprotected car. Turn off the crooks—turn on . . .

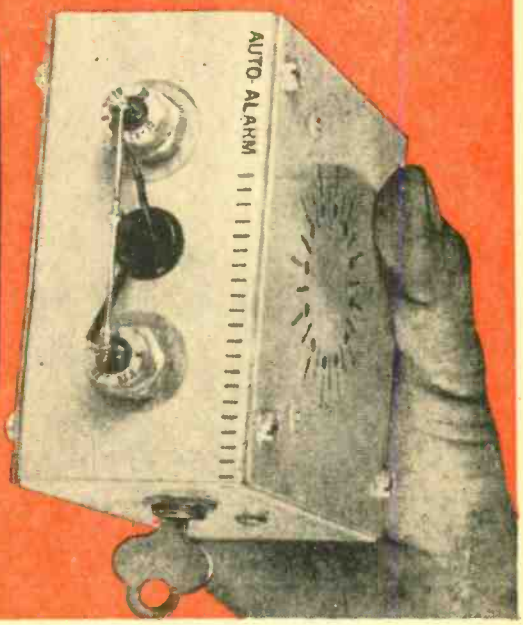
AUTOGUARD

By Ron Michaels

It would take an experienced car thief about 15 seconds flat to silence the conventional burglar alarm in your car (once he'd set it off). No kidding. I didn't pull this number out of a hat. It's my estimate based on the length of time it took me to kill the alarm in my car.

The sad news? Just 7 seconds, including the time needed to locate the power wire running to my alarm, and the time needed to snip the wire. (It's been a while since I installed the system, so I had to do some hunting.) I figure that a pro car crook who has been around but doesn't know where the alarm box is located would take twice my time . . . about 15 seconds.

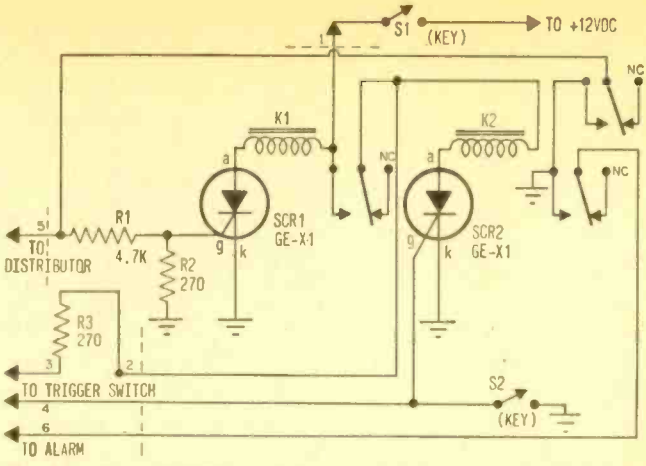
Most conventional alarms are really just noise makers. The majority use your car's horn as the noise source that's supposed to scare the crook away. The fact is that many thieves don't scare easily. It's unfortunate, but in most crowded cities the sound of a blaring horn (or even a siren, where such alarms are legal) usually



AUTOGUARD

won't even raise eyebrows, let alone summon help. So you can bet that any light-fingered thief who has his eye on your buggy may just stick around for the few seconds it takes to disable an ordinary alarm.

Consider these facts and you'll understand why I designed Autoguard—the back-up auto alarm to *prevent* car theft. Autoguard goes into action *after* my conventional horn alarm is silenced. In short, it's my second line of defense against car crooks! Any thief who'll hang around long enough to also try and disable this baby probably wants my car so badly that nothing short of taking out the engine will stop him.



Combination of SCR1 and K1 arms device when ignition is switched on. Triggering stage consists of SCR2 and K2.

In addition, my second alarm actually becomes the only effective alarm I have when my car is parked in a deserted lot or in some rural area. In these far-away places, even a novice crook might try to silence a horn. Of course, even if you don't have a conventional alarm in your car, you should consider installing Autoguard as a "first-line" alarm; it's better than most you'll find on the market.

Inside Story. The alarm system operates in two steps. The first step *arms* the alarm; the second step *triggers* it. The arming stage is controlled by your car's ignition system so that the instant the engine is started (with or without an ignition key) the Autoguard circuit arms itself. (Remember, this alarm works after the first-line alarm has been silenced and the thief has had time to *jump* the ignition.)

The second step—the triggering stage—can be controlled by almost any type of switch you can dig up. As I'll explain later, you can rig the device so that the alarm fires as soon as the car moves, as soon as the hand brake is released, or as soon as the transmission lever is moved. (You have lots of options.)

When Autoguard does fire, two things happen at once. First, a hidden alarm sounds (a gong is ideal); second, a short circuit is slapped across the ignition system, stopping the engine dead in its tracks.

Given enough time, a hard-boiled pro could defeat this alarm. But you've got to admit that it's not very likely he'll even try. The surprise of a second alarm firing after being comfortably seated behind the wheel should shake up even the most steel-nerved car thief.

Pulse to Gate. The Autoguard circuit is built around a pair of silicon controlled rectifiers. These solid-state switches act like electronic bear traps. Once they're made to conduct a current (upon application of a short trigger pulse to their gate electrodes), nothing will stop them from conducting except turning off the current at its source.

Once this is done they automatically reset themselves in anticipation of the next trigger pulses. Each SCR controls a 12-V relay. When the SCR is triggered, it permits

PARTS LIST FOR AUTOGUARD

K1—Relay assembly, 12-VDC coil and 10-A, spdt contact switch (Guardian 200-12D and 200-M1, Allied 41E5714 and 41E5718)

K2—Relay assembly, 12-VDC coil and 10-A, dpdt contact switch (Guardian 200-12D and 200-M2, Allied 41E5714 and 41E5719)

R1—4700-ohm, 1-watt resistor

R2, R3—270-ohm, ½-watt resistor

S1, S2—Spst, normally open, key switches (Allied 56B4158 or equiv.)

SCR1, SCR2—Silicon controlled rectifier (GE-X1, Allied 49B3 GE-X1-GE)

1—4 x 4 x 2-in. aluminum chassis box (Bud CU883, Allied 42B7606 or equiv.)

1—6-terminal barrier strip (Cinch-Jones 6-140, Allied 47E1802 or equiv.)

Misc.—Trigger switch, alarm, 6-lug terminal strip, heat-sink silicone compound (Dow Corning 340, Allied 60E7021), #14 hook-up wire, grommets, bus wire, solder, hardware, etc.

current to flow through the relay's coil, thereby closing its contacts.

Rectifier SCR1 is in the arming part of the circuit. Its gate is connected to your car's distributor (at the *hot* ignition terminal) via a simple voltage divider composed of R1 and R2. This divider scales down the 200-V pulses produced across the points to a triggering voltage that the SCR's gate terminal can handle.

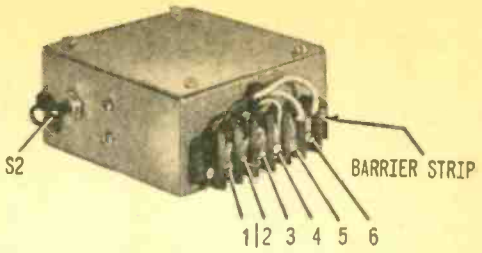
When SCR1 is triggered, relay K1 closes, and its spdt contacts (only half the contact assembly is used) apply +12 VDC from the car's battery to the second (triggering) circuit composed of SCR2 and K2. Note that the gate terminal of SCR2 is connected to terminal 4 of the barrier strip mounted on the case. Next to it, terminal 3 is connected to +12 VDC through resistor R3, which is mounted externally on the strip.

Heavy bus wire connects two ground leads from rectifiers. Since unit doesn't reveal itself, author used fake title to fool friend thief.

Shorting these two terminals together will supply a firing signal to SCR2, making it conduct, and thus causing K2 to close. Relay K2's dpdt contacts are both grounded when they close. One short-circuits the ignition system via the same lead that brings ignition pulses to the gate of SCR1; the other acts as a switch for the hidden alarm.

Though I have specified a 12-VDC source using your car's battery, there's no reason why you can't use a large 12-V lantern battery (the new heavy-duty alkaline types are perfect) to power both the circuit and the sounding alarm. (As I've said, a gong is ideal, but a siren or a second auto horn can be used as well.) The battery can be hidden in the trunk or under a seat. This arrangement has the advantage of keeping the alarm going even if the car battery is disconnected by the thief.

Trigger Switch. What closes the connection between terminals 3 and 4 that triggers SCR2? Any type of switch you choose. A simple motion-activated switch,



Barrier strip provides connections for car's electrical system. Type of trigger switch and alarm mechanism you use are up to you.

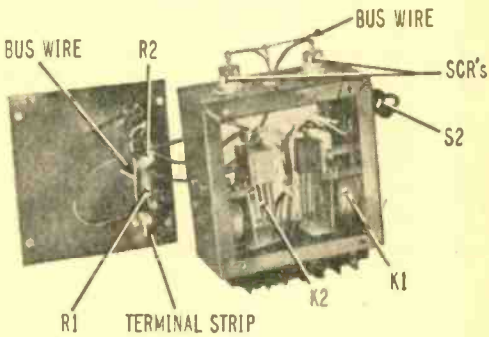
for example, can be made by hanging an insulated metal chain in a small tin can. The first lurch of the can will swing the chain against the can's inner surface, thereby triggering SCR2. Remember: one of the distinct advantages of using an SCR is that a pulse lasting only a few millionths of a second will trigger it. Thus, the briefest contact of a chain against the can will set off the alarm.

As an alternate, you can use a snap-action switch (Microswitch) mounted so that it will be actuated when the hand brake is released, the accelerator pedal is depressed, the transmission lever is moved, or the brake pedal is touched. Use your ingenuity and you'll think of many more possibilities.

If you keep your car in a garage, you might even use a photoconductive cadmium-sulfide cell as a switch. This will trigger the alarm as soon as the car is brought into the sunlight or when it passes under a street lamp at night. The more odd-ball the triggering mechanism, the better are your chances of foiling friend thief.

Safety switch S2 shorts the gate of SCR2 to ground when it is closed. This prevents the alarm circuit from working should an accidental short circuit provide power to the

(Continued on page 118)



Only half of relay K1's contact assembly is used. Make certain terminal strip doesn't short against metal parts when box closes.

IT'S SEX THAT MAKES THEM DIFFERENT

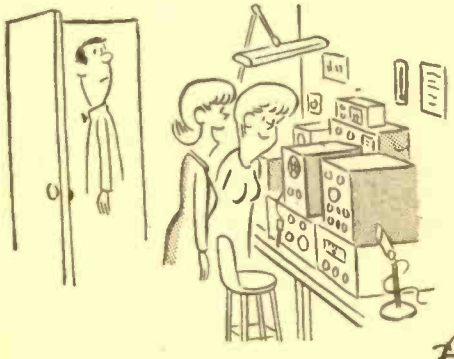
By Marvin Townsend

"It's finished!"

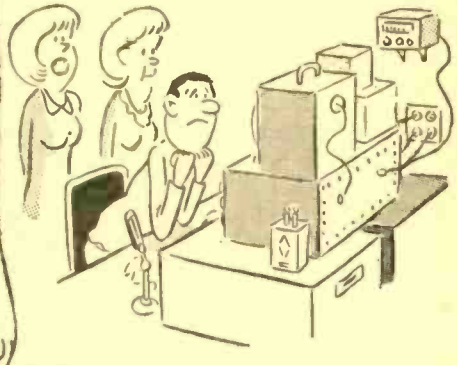
"Let's see, that transistor battery should be in here someplace!"

"I wish you'd jar loose and buy yourself a soldering iron!"

"Going to build my own loudspeaker!"



"It's John's new hobby. It has something to do with interfering with TV and blowing fuses."



"Poor Henry—spent so much money on his gear he can not pay the electric bill and operate it!"

21-SECOND TV CURE-ALL

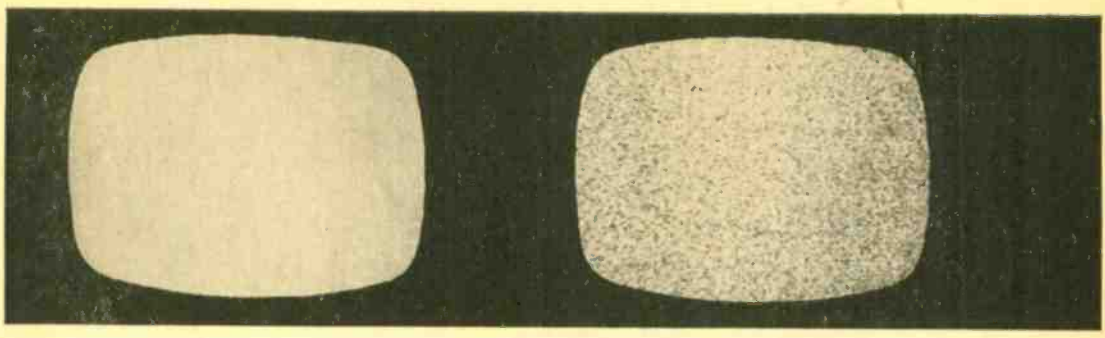
By Homer L. Davidson

Nothing pleases like an AOK TV set (well, almost nothing, let's say), and nothing irks like a TV set on the fritz. Thing is, TVs have a way of telling you what—if anything—ails them with a message plain as the nose on your face. It's the image on the picture tube that tells the story; the problem lies in interpreting what it's trying to say. But that's easy—our 21-Second TV Cure-all includes 21 of the most frequently encountered TV ills, tells where the fault lies and how to go about correcting it. Let's start with the nicest story of all—a properly displayed test pattern on an AOK TV set.

1 Typical TV test pattern is transmitted perfectly round, perfectly centered, and with all wedges of equal length. Height and width have 3:4 ratio.

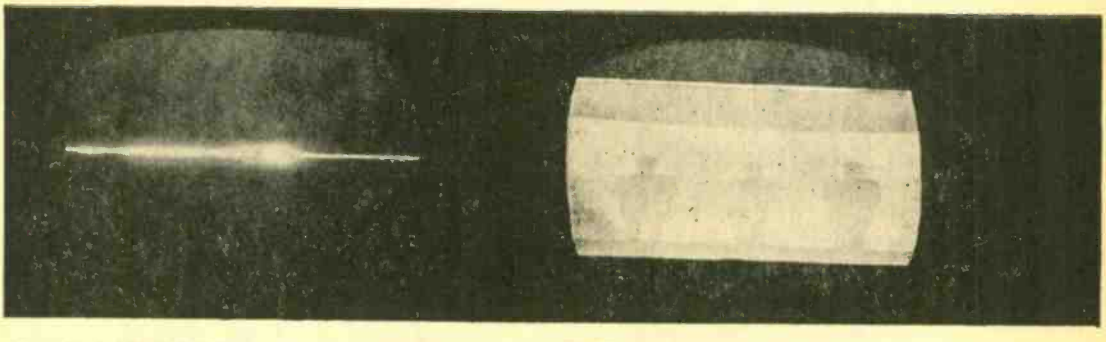
(Continued overleaf)

TV CURE-ALL



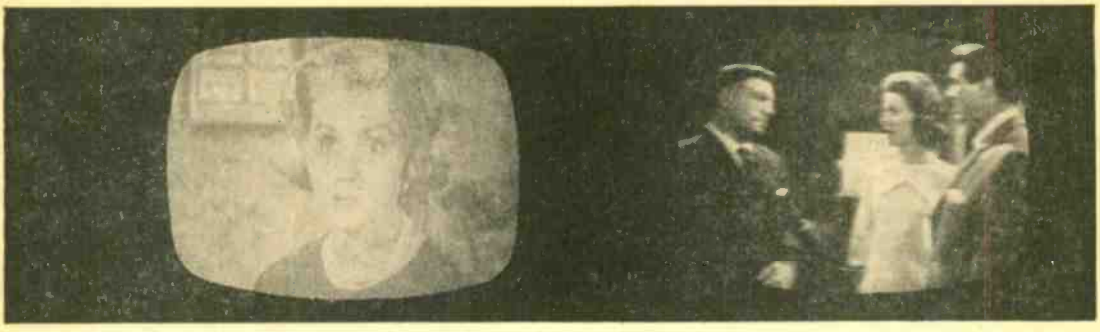
2 **WHITE ALL OVER.** OK, so your set isn't pouring forth with the beautiful TV test pattern shown on the preceding page. Let's say all you can see is a white screen with raster lines. There may be a tweeting sound or perhaps no sound at all coming from the speaker. First thing to check is the local oscillator tube. Next, check the first RF tube. If there's still no picture, check the IF and first video tubes. If you're still up the TV creek, check the IF tuner cable between tuner and chassis; a loose or poor soldered connection will result in no picture or an intermittent picture on the TV screen. As a last resort, check the AGC and second detector tube. And if yours is an older set, check even the sound output tube. Reason is that sets have been made where the sound tube actually furnished voltage to the tuner and IF stages.

3 **RUSH, RUSH, RUSH!** Here we have a TV screen with no picture, snowy screen, and a loud rushing sound issuing from the speaker. Switching the tuning selector from channel to channel has no effect whatever. And while the screen can be lightened or darkened, there's still no picture or intelligible sound. Thing to do is check the first RF amplifier tube in the tuner (most RF tubes are located at the rear of the tuner). If the oscillator tube in the tuner were defective, there would be no snow on the screen or rushing sound in the speaker. And since we have plenty of both in this picture, replacing the RF tube should do it. If not, check the antenna lead-in. Assuming this passes with flying colors, take a close look at the antenna matching coils on the top of the tuner next to the lead-in. These may be shorted or open.



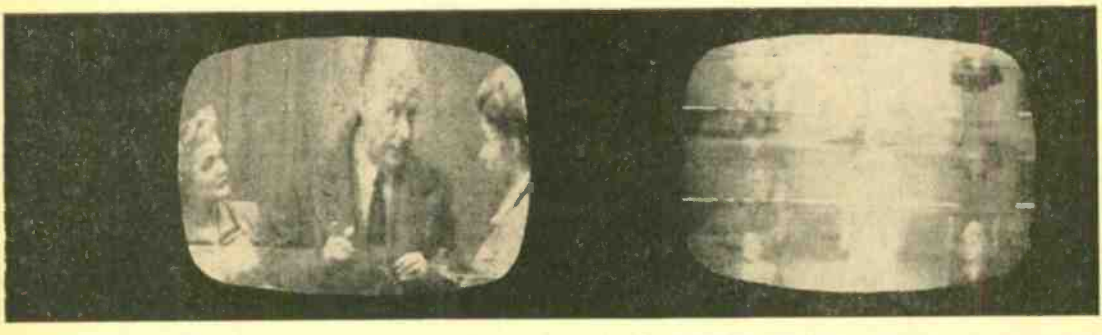
6 **LIKE A LASER BEAM.** A horizontal white line on the screen indicates lack of vertical sweep. First things to check are the vertical oscillator and vertical output tubes (dual-purpose tubes are often found in late-model TV receivers). Also check adjustment of vertical linearity height controls. Be sure to first turn the brightness control down so only a faint white line remains, however, since leaving a bright horizontal line on the screen can easily burn a line across the phosphor on the pic-tube face. If you're handy with a VOM, you may want to pull the TV chassis. This done, check voltages on the vertical oscillator and output tubes, then give the vertical output transformer a resistance test.

7 **SHORT AND SQUATTY.** Trouble here is plain and simple: insufficient vertical sweep. Best bet for locating culprits is to check both the vertical output and oscillator tubes, though you might start by checking the settings of the vertical linearity and height controls. A shorted or vertical transformer winding will cause the same trouble. Can't find the vertical output tube? Here's a quick rundown—in consoles: 6AQ5, 6BL7, 6CG7, 6CM6, 6CM7, 6CS7, 6CW5, 6CZ5, 6CY7, 6DE7, 6DR7, 6EA7, 6EM7, 6EW7, 6FD7, 6GE7, 6GL7, 6K6GT, 6KY8, 6S4, 6SL7, 6SN7, 6U8, 12AT7, 12AU7, 12AX7, 12BH7, 12BZ7, 12B4; and in portables: 5AQ5, 5CZ5, 5V6, 7AV7, 8CG7, 8CM7, 8CW5, 8CS7, 10CW5, 10DE7, 10DR7, 10EM7, 10GF7, 11CY7, 13DE7, 13DR7, 13FD7, 13GF7, 15KY8.



4 **ALL WASHED UP.** Even with the contrast control wide open, the best we can get out of this one is a light, washed-out picture. While local stations can be picked up, distant stations come in ever so faintly or not at all. The problem is likely a weak video or IF tube or perhaps the AGC control setting. In the event the picture has a slight trace of snow, check the RF tube or TV antenna. For the record, common video tubes for AC sets are 6AC7, 6AG5, 6AG7, 6AM8, 6AN8, 6AW5, 6AS8, 6AU8, 6AW8, 6AZ8, 6BA8, 6BH8, 6BK5, 6BK8, 6CB6, 6CH8, 6CL6, 6CL8, 6CV8, 6CX8, 6EB8, 6GN8, 6FH8, 6HL8, 6JV8, 6K6GT, 6KV8, 6LF8, 6U8, 6V6GT, 6W6GT, 12BH7, 12BY7, 12GH7; common video tubes in portables are 3BU8, 5AM8, 5AN8, 5AQ5, 5AS8, 5U8, 5V6, 8AU8, 8AW8, 8BA8A, 8BH8, 8CX8, 8EB8, 8GN8, 8JV8, 10GN8, 10HF8, 10JA8, 11KV8, 11LQ8, 12AT7, 12L6, 12W6, 16GK6, 25BK5.

5 **LOOKS LIKE SNOW.** A snowy picture can be caused by a weak RF or oscillator tube. First step is to replace the RF tube, and, if that doesn't pay off, replace the oscillator tube. Also, check the lead-in going to the TV tuner and try rotating the fine-tuning control to clear up the picture. If a lightning- or thunderstorm has been in the area, check for a burned or open antenna coil. Some coils are mounted on top of the tuner close to the lead-in cable; others are mounted within the TV tuner itself. Still another thing to check is the outside antenna for a broken lead-in wire. Then, too, wind or rotator may have turned the antenna in the wrong direction. And, last but not least, the antenna may actually have damaged elements.

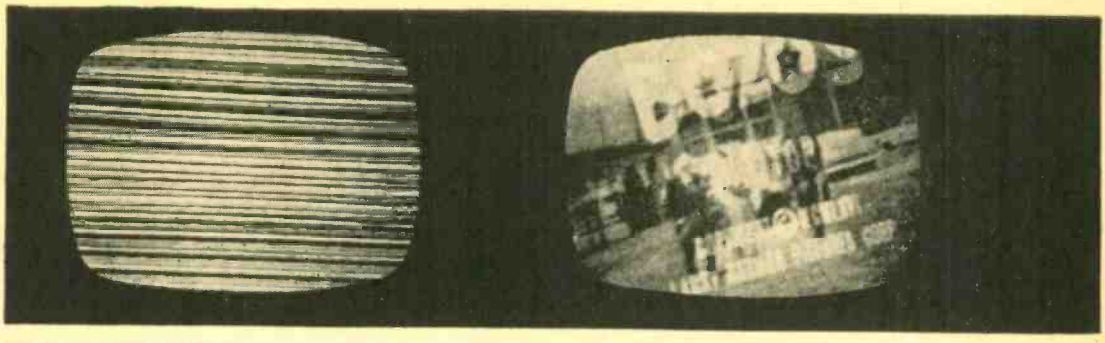


8 **TALLER THAN TALL.** A distortion of the sort pictured here would never be the case with a properly adjusted TV set, so it's obvious that this set's owner didn't take full advantage of the TV test pattern shown in case No. 1. If you go in for fun-house mirrors, you may also dig the TV equivalent. Lacking this rather rare proclivity, you'll no doubt want to adjust the set so it displays an image as faithful to the original as possible. The vertical linearity control is your tool in this case. And while you could try to alter its setting until heads here assumed reasonable proportions, you would be far better advised to make such adjustment with a test pattern. Also, remember that many sets incorporate not one but two controls affecting vertical linearity (the second is usually termed an auxiliary control), so both must be adjusted.

9 **RUNNING UPHILL.** Though a picture can roll both up and down, the site of the trouble is almost always the same: the vertical sync section. Best remedy is to replace both the vertical oscillator and sync tubes (often found in the one and same envelope). If this doesn't solve the problem, try adjusting both the vertical height and linearity control settings. In some TV sets, incorrect adjustment of these two controls will result in a rolling picture. Physically check the vertical hold control for possible loose or poorly soldered connections. Should the vertical hold control let the picture roll in one direction only, look for a defective resistor or capacitor in the plate circuit of the vertical oscillator tube. And should vertical fold-over occur only at the bottom of the TV screen, it's a safe bet that the trouble is the vertical output tube.

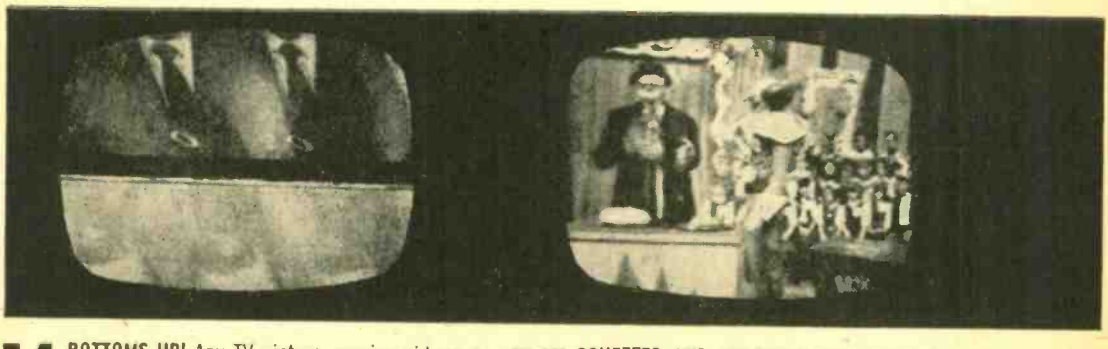
(Continued overleaf)

TV CURE-ALL



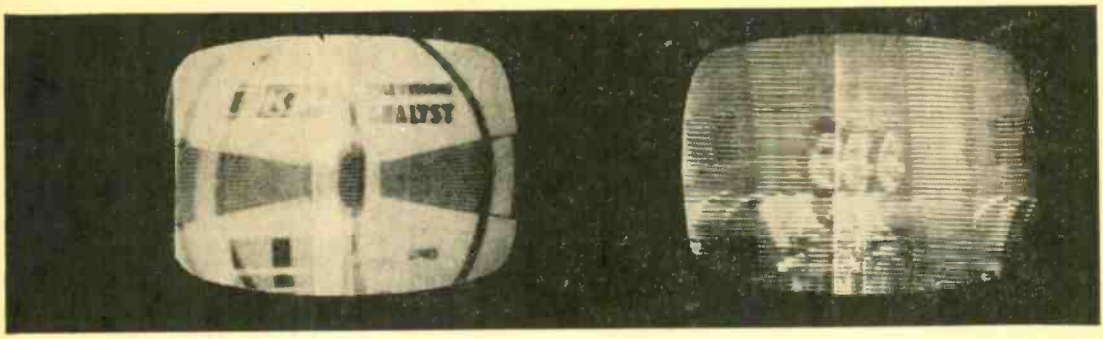
10 **THE LINES HAVE IT.** A screenful of black and white lines can be caused by a defective horizontal oscillator tube. First, check to see if the horizontal hold control is properly set. Once it is, check the horizontal oscillator frequency setting as well as the AFC and sync clipper tube. Since the AFC tube has been replaced by a dual-diode solid-state receiver in many of the newer sets, you may discover such a unit either plugged into a socket or soldered directly into the PC board. However, all is not lost—you can replace the soldered job by snipping off the three leads close to the body of the diodes, then forming small loops in new diode rectifier leads and soldering them to the ends of the leads you just snipped off. Bear in mind that there are two basic types of hookups: a series and a parallel.

11 **TILT!** A tilted picture can be caused by only one thing: a loose mounting screw on the deflection yoke assembly. In other words, the deflection yoke has turned on the neck of the picture tube, which can easily happen if the mounting bolt on the deflection yoke is the least bit loose. Most older TV sets have a wing nut at the top of the yoke assembly; newer ones generally have a metal yoke band with a ¼-in. cinch-nut tightener. In the latter case, the metal band fits over the plastic tabs of the yoke assembly and snugs against the neck of the picture tube. In both instances, the procedure is exactly the same: you first set the yoke level with the frame of a picture at the top of the TV screen, then adjust this picture into position with the vertical hold control. You then recheck the level, and lock the yoke in place.



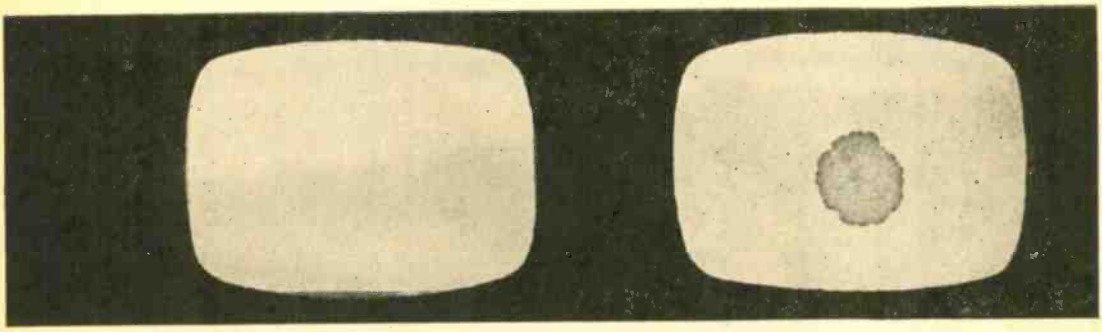
14 **BOTTOMS UP!** Any TV picture running sideways or up-and-down is sure indication that sync trouble is at hand. Check both the horizontal and vertical sync tubes, bearing in mind that these tubes may be in two separate envelopes or, conversely, snug as a bug in a rug in but a single vacuum bottle. Can't find the sync tubes? In consoles, the most probable types are 6AL8, 6AM8, 6AN8, 6AU6, 6AU8, 6AX8, 6HZ8, 6BE6, 6BH8, 6BU8, 6BY6, 6CG7, 6CH8, 6CS6, 6CQ8, 6CU8, 6CX8, 6EA8, 6EB8, 6GN8, 6GW8, 6GY6, 6HF8, 6JV8, 6KA8, 6LC8, 6SN7, 6U8, 12AU7, 12AX7, 12BZ7; and in portables, 3BU8, 3BY6, 3CS6, 3GS8, 4BU8, 4CS6, 4GS8, 4HS8, 5AM8, 5AN8, 5EA8, 5U8, 7AU7, 8AU8, 8AW8, 8CG7, 8CN7, 8CX8, 8EB8, 8GN8, 8JV8, 8KA8, 8LC8, 9AU7, 10GN8, 10HF8, 10JA8, 11KV8, 11LQ8, 12AT7, 12AU7, 12BH7, 12SN7.

15 **SQUEEZED AND SQUASHED.** Bigger-than-life objects on an advertised-in-Life TV are normally the result of a defect in the low-voltage power supply. In older consoles, you can suspect a rectifier tube of some description; in later model sets and portables, you can expect to find a selenium rectifier or a silicon diode in its place. Pinpointing a defective solid-state job with a voltmeter is a pretty simple task: with the lead between the positive terminal and chassis ground, a half-wave rectifier should produce a voltage of 125 to 150 VDC. And given a full-wave job or a voltage-doubler, output should be something on the order of 225 to 260 VDC. Should this approach prove fruitless, you might also check for improper setting of the tube positioning magnet on the rear of the deflection yoke (it can also produce roughly the same symptoms).



12 **CHRISTMAS IS HERE!** An extreme condition known as the Christmas tree effect, this problem stems from a horizontal oscillator tube or a horizontal output tube. (It generally takes the form of a vertical white bar somewhere on the screen.) Also worth checking are the horizontal drive and horizontal frequency controls. First, make sure that the horizontal drive trimmer isn't more than ½-turn from its tight-up position. Next, set the horizontal hold control to its center-rotation position, then adjust the horizontal frequency slug within the horizontal oscillator coil with a plastic adjustment tool. Turn the slug until the fine horizontal lines become wider and then plop into a full picture (if the slug is turned too far, the lines will slant in the opposite direction). Once this looks satisfactory, try rotating the station selector to see if the picture stays in view.

13 **FOLDED GRILLE.** Looking much like the dented grille of a brand-spanking new chrome-plated gas-eating chariot, this condition can result from the very same ills that were responsible for the problems in photo 12. The demon may be the horizontal oscillator tube. Again, it may be the dual-diode AFC rectifier, so if replacing the horizontal oscillator tube doesn't help, the next thing to tackle is the AFC diodes. Should a shorted or leaky dual-diode rectifier be the defective component, you'll generally hear a high-pitched whistle or peeping sound from the speaker. In this case, your course of action is to replace those lousy diodes as outlined previously, turn on the set, and search for a folded grille that hopefully will be no more.

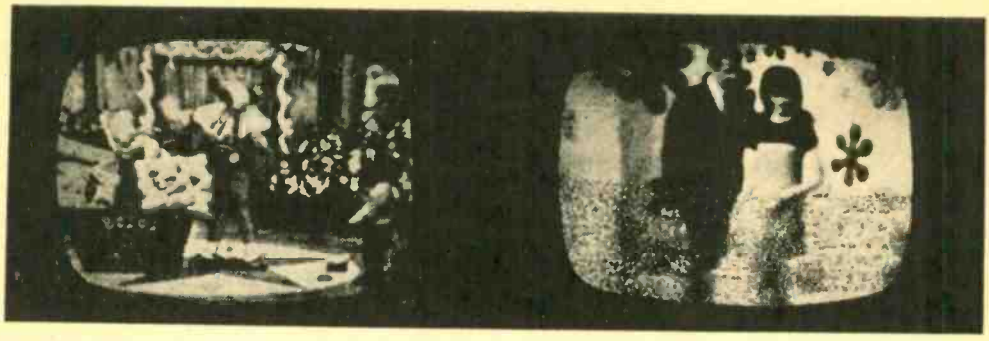


16 **WIGGLE WORM.** Though a trifle hard to show photographically, wiggles on a TV screen are ordinarily due to a 60- or 120-Hz component in the low-voltage power supply. They normally evidence themselves by causing the image to wobble back and forth; oftentimes, there will also be one or two dark stripes across the screen. First thing to suspect is an electrolytic capacitor in the doubler circuits. To remedy the situation, simply bridge a 100-μF, 450-V electrolytic capacitor across the suspect. Should things improve, replace the tired and testy old job with a brand-new one, having the exact capacity and voltage ratings. Also worth knowing is the fact that a defective input filter capacitor in AC/DC portables can even result in no picture, no sound, or no raster!

17 **SPOTTED SCREEN.** The trouble shown above started with a spot the size of a pin head, which, within two weeks, had grown to be big as an orange. Wha hoppen? Simple! The phosphor on the pic-tube was burning off. And the only remedy is replacement of the pic tube itself. Thing to watch for here, with older TVs at least, is incorrect setting of the ion trap (newer TVs are devoid of this device). The ion trap should always be set as close as possible to the picture-tube pin base so as to produce the greatest possible brightness. Still another way to ruin a pic tube is to operate a set having a defective vertical oscillator tube. As pointed out in case No. 6, the single horizontal white line across the screen will produce devastating destruction in short order, unless the brightness control is turned way, way down.

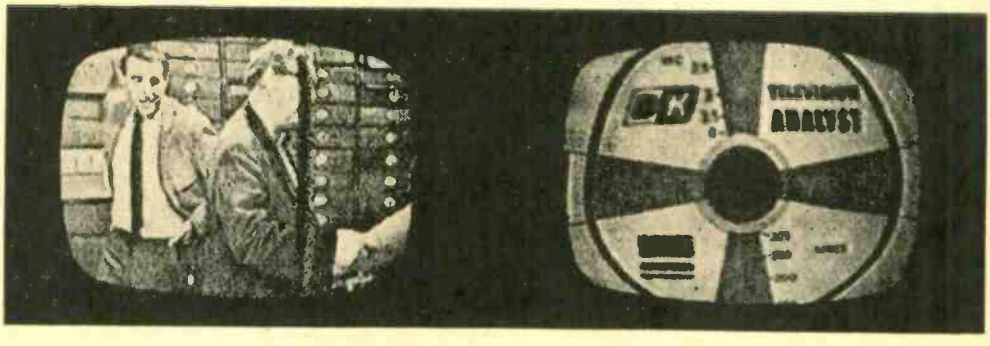
(Continued overleaf)

TV CURE-ALL



18 **BLURRY, FUZZY, AND DIM.** TV pic tubes that come on with all the speed of a turtle in Tipperary are probably tired as a fleet-footed floozy after an 8000-meter race. For like all tubes, boob tubes begin their journey to tube burying ground the first time they're turned on. Eventually, images are blurred and fuzzy, even though brightness and contrast controls are wide open; closeups of faces reveal extreme white and blotchy areas even though such blemishes aren't present in the flesh. Tube brighteners or a special process called charging can stave off the inevitable for a time, but stalling for time is only delaying the inevitable. Best bet is to do the thing you'll eventually have to do—replace the picture tube.

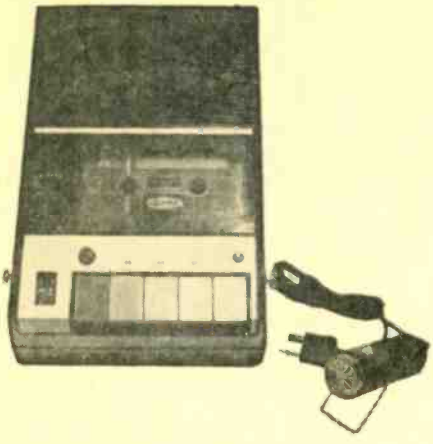
19 **ROAR! ROAR! ROAR!** Though images of this sort make for anything but pleasurable viewing, there's really little you can do to relieve the situation. The particular form of TV interference (TVI) shown here was caused by a defective power transformer somewhere on the same power line; roughly half the picture is covered with dots and dashes, and there is a good deal of picture tearing. Since there are so many causes of TVI—police radio, CB equipment, hams, even radio-TV stations—pinpointing the culprit may take some time. Installing a TVI trap in series with the antenna lead-in sometimes helps. And anything you can do to increase signal strength at the receiver itself is also worth trying. Among the various steps in this direction are installing a narrow-band (yagi) antenna; raising the antenna in height; and using shielded lead-in cable between antenna and TV set.



20 **STRING OF ROPE.** A vertical weaving line down the TV screen is generally evidence of Barkhausen, snivets, or RF oscillation (Barkhausen and snivet lines predominate on VHF channels). First step is to replace the horizontal output tube, which, though it may check out OK in a tube tester, may still be oscillating and causing interference. In many cases, this same type of oscillation will become more pronounced on weak or distant stations. Dressing the antenna leads away from the high-voltage cage should help. Should there be a white vertical line present on the screen, the horizontal drive control should be backed off until the line disappears. In extreme conditions, it may also be necessary to replace the horizontal output and oscillator tubes.

21 **TEST PATTERNS, AGAIN!** Having examined case after case of typical TV ills, we're back again to the faithful test pattern. The reason is easy to explain: nothing else tells you half as much about a TV set's performance—good or bad. When you come right down to it, there are dozens of TV test patterns, since each station transmits its own particular version (the one shown in case No. 1 is that transmitted by New York's WCBS-TV; the one above is that produced by the B&K Television Analyst). But regardless of which pattern you have at your disposal, you can use it to determine whether your set is properly adjusted for aspect ratio, linearity, and contrast; and how it stacks up in terms of line count, line resolution, and low-frequency phase shift. In short, TV happiness is a properly displayed test pattern!

Radio-TV EXPERIMENTER LAB CHECK



ALLIED MODEL 1150
Battery- and AC-Operated Portable Cassette Recorder

☐ Here's an attractive unit that's likely to prove the perfect answer to those who want the convenience of a cassette portable without the tinny sound quality and poor operating features that beset many a low-priced recorder. Selling for only $89.50, Allied's 1150 manages to provide surprisingly good sound quality along with features common to recorders priced well over $100.00.

The 1150 measures just 9⅜ x 6 x 2⅝ in. and uses the better type of pop-up mechanism. When the OPEN button is depressed, the cassette immediately pops up and out; there's no fumbling to dig the cassette out of the well.

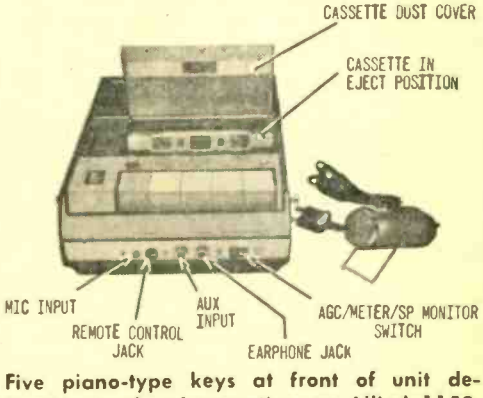
Five piano keys determine operating function. There are keys for fast-forward, fast-rewind, and play/record. A fourth key provides the pause function which permits the recorder to be maintained in any mode of operation with the tape drive stopped; a fifth key controls both the stop and eject functions (a slight pressure on the key stops the recorder; additional pressure pops the cassette up and out). Two separate, top-of-deck pushbuttons provide the record interlock and the pause release.

The 1150 cassette recorder works off either six internal C cells or the AC line. The recorder is normally set for battery operation and automatically switches to AC operation when the AC line cord is plugged in.

Jacks and controls include microphone, remote control, auxiliary-in (high level), and earphone jacks; AGC-METER-SP MONITOR selector switch; and volume and tone controls. The microphone normally supplied with the 1150 (with a high-level patch cord and a plug-in line cord) has a remote-control switch built in. The mike connector simultaneously provides the mike and remote-control connections.

The meter selector switch actually controls three modes of recording operation. In the AGC position the record volume control is disconnected and the amplifier works at maximum gain, with peak limiting to prevent overload. With the switch set to the METER position, the recording level is determined by the setting of the volume control, while record level is indicated on the built-in level/battery meter. (This same meter indicates the battery condition when the recorder is in the play mode.) And with the switch in the SP MONITOR position, the volume control and meter are used to set record level and the record signal input can be heard in the speaker. However, this last arrangement is useful only for monitoring the aux. input since feedback, with its attendant howl, will occur when the mike is used.

The 1150 is all electronic in the sense that the bias oscillator also provides the erase head current. Since a magnet is not used for



Five piano-type keys at front of unit determine mode of operation on Allied 1150.

LAB CHECK

erase, the background hiss level is considerably below the audible hiss level of cassette recorders using DC erase. The tone control, the usual high-cut type, goes in very slowly, providing a long, slow range of treble attenuation.

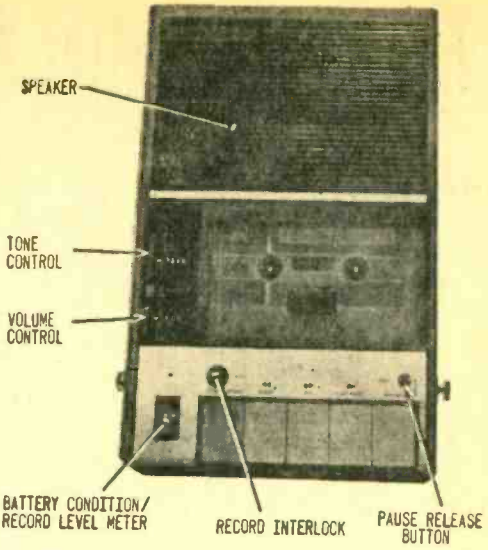
How It Sounds. Frequency measurements of budget portable recorders are rather pointless, since the units simply aren't intended for hi-fi use. We therefore judged performance of the 1150 on the basis of comparison with recorders of similar price and features.

Considering its low cost, the 1150 has a very good sound quality. Definitely not tinny, the sound is well balanced and the equal of that obtained from a very good quality solid-state table radio and somewhat better than that obtained from budget stereo record players. Playback sound level is notably high, and with very low distortion.

Motor speed is remarkably stable, even when battery-powered. Wow and flutter are reasonably low, though certainly not of hi-fi standards. We were able to make quite good music recordings even with battery power, and pre-recorded cassettes played back with acceptably low wow and flutter. Certainly the rock-and-roller will have no complaints.

The standard cassette provides, via two tracks, approximately two hours of recording. Extended-play cassettes provide proportionately longer recording times. Since all cassettes are interchangeable, a recording made on the 1150 can be played on any other cassette machine; the converse, of course, is also true.

Like other cassette recorders, the 1150 provides the tab interlock. On the back of the cassette are two punch-out tabs, one for each track. When the tab is punched the record interlock is locked-out and the user cannot accidentally erase the recording. To re-use the cassette for recording, the punch-out is covered with a small piece of tape.



Close-up of Allied 1150 reveals speaker in top of case, tone and volume controls at left, dual-purpose meter near piano keys.

Summing Up. The Allied Model 1150 Cassette Recorder provides a sound quality and convenience of operation well above that normally expected from battery-powered cassette portables. It can easily serve for specialized applications or as a family recorder.

Priced at $89.95, the Allied 1150 is supplied complete with remote control microphone, patch cord, AC cable, carrying case, shoulder strap, and one cassette; batteries are optional. For additional information, write Allied Radio Corp., Dept. JR, 100 N. Western Ave., Chicago, Ill. 60680. ■

ELECTROMAGNETIC PULSE PICKUP

☐ A new electromagnetic pulse pickup that monitors speeds without physical contact can sense from 2 to 200,000 revolutions per minute. Yet it sells for under $5.00 in quantity lots.

Heart of the pickup is a wirewound magnet, which induces a tiny electric pulse whenever a bit of ferrous material passes through its field. In our photo at left, the unit is measuring a fan's rpm. But Honeywell engineers who developed the unit foresee the day when speedometers, tachometers, and similar devices will all be electromagnetic rather than mechanical, as current versions are. ■

Mini-Mod...

. . . a hi-speed meter wired for power that zeros in on your rig's modulation

By Herb Friedman, W2ZLF/KBI9457

■ By now, just about every CBer and ham realizes the importance of an *on-the-air* modulation meter—the kind found in every broadcast station from here to Formosa. For only a carrier-operated meter can show you the actual percent modulation. And only with such an instrument can you establish a reference for proper mike amplification and the precise adjustment of a clipper or speech compressor.

Only catch is, there's one little-known fact about professional modulation meters that often results in a CBer overmodulating his rig and coming across like a dime store squawk box. And this happens even though his meter may show modulation is under 100%.

The little known fact? It's that professional modulation meters don't use *damped* vu meters! Instead, they rely on high-speed meters which can accurately follow the peaks of a modulating waveform. For it is the peaks that determine the actual percentage of modulation.

The vu meter is an average-power indicating device that is specifically damped so that it doesn't follow the peaks, thereby making it easier to read. Since a transmitter having a vu meter will not indicate peak modulation levels, when the vu meter reads 100% modulation chances are that you've already gone over the limit. This overmodulation will result in considerable distortion and some sideband splatter.

How do you know just where your rig is peaking? Simple. Spend half an evening building our Mini-Mod and you'll have a peak-indicating modulation meter that's a CBer's and ham's delight.

Peak Power. Heart of the Mini-Mod is the high-speed meter. Its 1-in. dial has an expanded scale and its reaction time is nothing less than spectacular. Since the pointer follows all modulation peaks, it actually appears to be flying. The expanded scale between 0.2 and 0.8 (20 to 80% modulation) allows you to get in close so that you can adjust whatever accessories you use to boost talk power. This range is just where your speech clipper or compressor will function most of the time.

The meter's original dial calibration is used for percentage of modulation, so you use it exactly as you get it (0.4 is 40%, 0.6 is 60%, 1 is 100%, etc.). Further, the *built-in* calibration for carrier-to-modulation is good enough for the average CBer or QRP ham. Later on we'll show you how to get a precise calibration for readings of carrier power and percent modulation.

One last item. The Mini-Mod is an *in-line* device; it connects in series with the transmission line and provides full-time monitoring of modulation levels. Almost any negligible amount of RF power will drive it.

Portable Package. The Mini-Mod can be built into a 5¼ x 3 x 2⅛-in. chassis box

Mini-Mod...

and will shrink even further if space is critical. The device can fit into a coat pocket, mount on the side of a QRP rig, or even go mobile under the dash. Parts layout is flexible, but our pictorial should help you get off to a flying start.

The meter mounts in a $1\frac{1}{16}$-in. hole and is secured by a large mounting nut which screws directly onto the threaded body of the meter. Make certain you place the fiber washer between the mounting nut and the panel; then screw the nut moderately tight—

High-speed meter has expanded scale between 0.2 and 0.8 so CB accessories such as speech compressors and clippers can be readily adjusted.

don't use a wrench. The washer provides enough friction to prevent movement.

Calibration control R2 should be mounted as close as possible to jacks J1 and J2. Either an audio or linear taper will do. The miniature version (as shown) is easier to position and costs far less. Jacks J1 and J2 should match the transmission line connectors of your present rig. (The author used phono jacks, but if your gear takes uhf plugs, by all means get the corresponding jacks.)

Calibration switch S1 is a normally closed pushbutton switch that mounts directly below the meter. Note that the modulation connection is made through the normally closed contact. The DC carrier level (read through R3) goes to the normally open terminal.

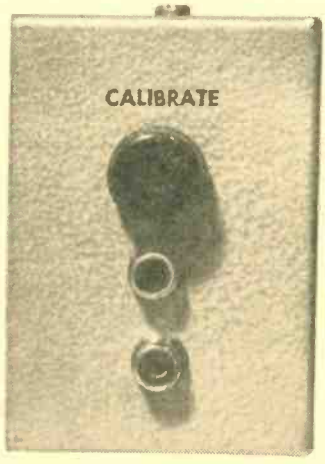
Terminal strip TS1 has 8 lugs, two of which are grounded at either end of the strip. The values of all components are critical and no substitutions (except for J1, J2, and R2) should be made. Be sure that D1, D2, and D3 are germanium diodes (not silicon), and check their polarity as well as the polarity of C2 and C4.

The polarity of the DC panel meter isn't marked on the meter's case. Looking toward the *back* of the meter with the terminals near the top, the positive terminal is on the left (with the lead going to S1).

Take another look at how R1 is connected to J1 and J2. The jacks are connected together in parallel with a jumper, and R1 connects between the jumper and TS1. Keep this resistor's leads as short as possible (about ¾ in.), and do the same with D1. Under no circumstances should you try to stuff R1's lead into the phono jack; the excess solder will hinder insertion of a plug later on.

Check Out. Hook up your transceiver's output to either J1 or J2, and your antenna to the remaining jack. Depress S1 (into the calibration position) and key the rig by pressing down on the mike's PTT switch. You should get a meter reading when the rig is keyed. If you don't, advance R2 until you do.

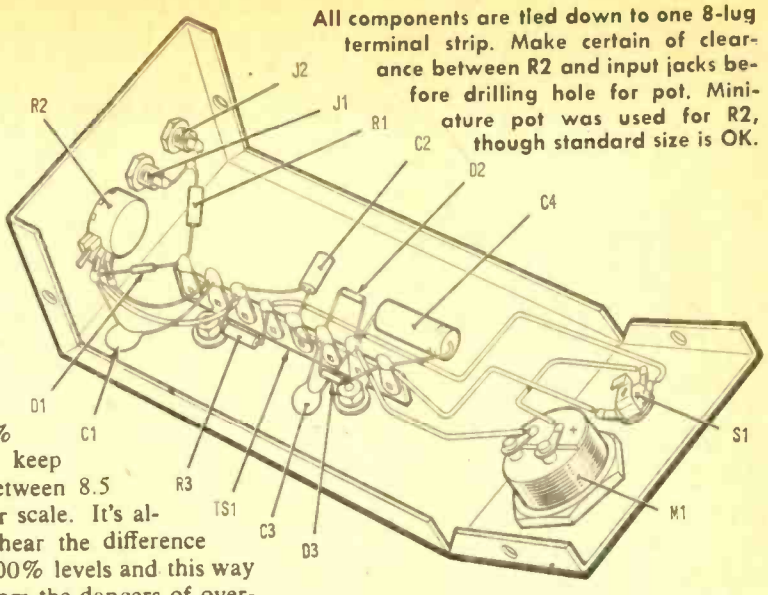
If no indication is forthcoming when S1 is depressed, check for a wiring error (polarity of D1, etc.). Should the meter read offscale with D1 installed correctly, look for reversed connections to the meter. When you do get the correct upscale reading on the



RF jacks on rear apron mate with existing transmission line connectors. Calibration control, once set, needn't be reset if power remains same.

meter, adjust R2 until the meter reads full scale. Now release S1 and speak into the mike. The *peak* reading on the meter is the percent modulation.

Due to the tolerances of components used in the Mini-Mod, the built-in calibration is not 100% accurate, so try to keep modulation peaks between 8.5 and 9.0 on the meter scale. It's almost impossible to hear the difference between 85% and 100% levels and this way you are protected from the dangers of overmodulation.

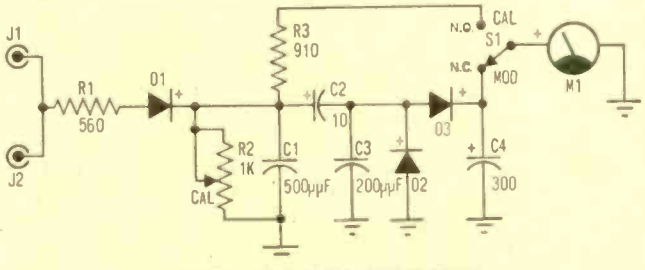


All components are tied down to one 8-lug terminal strip. Make certain of clearance between R2 and input jacks before drilling hole for pot. Miniature pot was used for R2, though standard size is OK.

Calibration. If you have access to an oscilloscope you can calibrate the Mini-Mod with greater precision. Measure your rig's modulation on the scope and then adjust R2 until the meter indicates 100% modulation. Depress S1 and note the carrier level. This reading is the new reference for calibration (now the unit can be moved from rig to rig since it is not dependent on the transceiver for calibration).

Suppose, for example, you get a reading of 0.8 with S1 depressed. To obtain a precise indication of your modulation level, you would set R2 for a 0.8 indication regardless of the transceiver you are using. If you want a full-scale calibration (at 1.0), simply adjust the value of R3 until you have a full-scale reading with S1 depressed.

Your meter has a high-speed movement, so don't try to calibrate it against another modulation meter unless you're sure the test meter isn't damped. If you're realistic about your power needs and can keep the needle between 8.5 and 9.5 (maximum), you'll be talking cleaner than ever. ■



PARTS LIST FOR MINI-MOD

C1—500-pF, 25-VDC disc capacitor
C2—10-uF, 10-VDC ceramic capacitor
C3—200-pF, 25-VDC disc capacitor
C4—300-uF, 3-VDC tubular capacitor
D1, D2, D3—1N60 or 1N34A germanium diode
J1, J2—See text
M1—0-1 mA, DC panel meter (Alco P-1000, Custom Components 32P101)
R1—560-ohm, ½-watt 10% resistor
R2—1000-ohm miniature potentiometer (Lafayette 32H7354 or equiv.)
R3—910-ohm, ½-watt 5% resistor
S1—Spdt pushbutton switch (normally closed)
TS1—8-lug terminal strip (2 grounded feet)

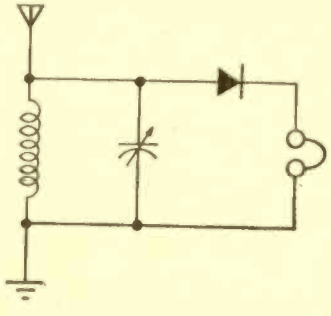
Misc.—5¼ x 3 x 2⅛-in. aluminum chassis box (see text), decals, wire, hardware, solder, etc.

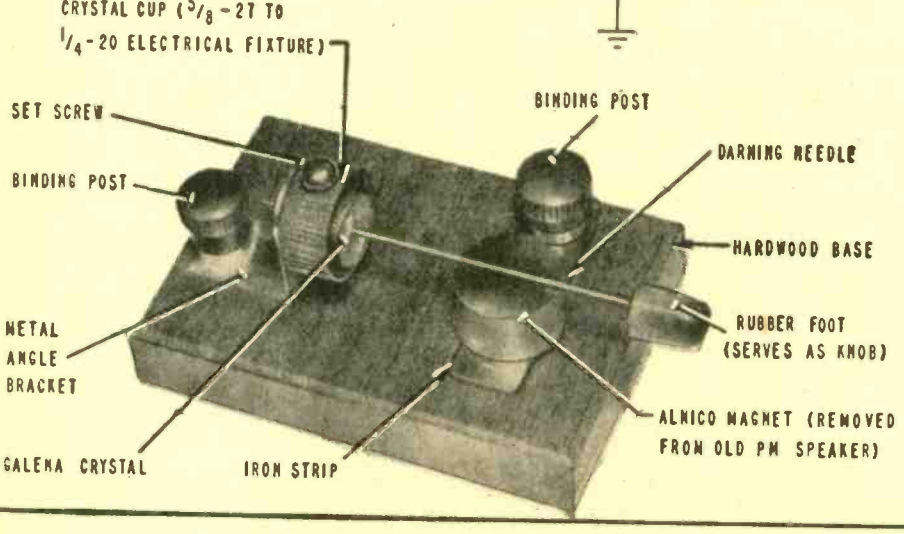
Note—The DC panel meter is available from Custom Components, Box 352, Alden Manor, Elmont, N.Y. 11003, for $4.95 plus 60¢ postage and handling. (Canadian orders, $1.00 for postage and handling. N.Y. State residents please add sales tax.)

RADIO GRANDPAPPY STYLE

☐ Crystal sets—what grandpap called a radio—still provide challenge aplenty for the man who likes to do things the way grandpap did: roll his own. Sure, it's possible to purchase a fully-wired, ready-to-go crystal set, but anyone who values authenticity isn't going to go that route. Instead, he's going to put together his own crystal set grandpap-fashion. This means buying a crystal, then mounting it, along with the necessary catwhisker and binding posts, on a suitable base. In the unit shown below, the base is a piece of solid black walnut, and the catwhisker consists of a steel needle held in place by a magnet. Since the magnet itself rests on an iron strip, adjustments can be made by moving either the needle or the magnet, or both. For those who wish to roll their own, mounted galena crystals are available for 50¢ postpaid from Modern Radio Laboratories, 12041 Sheridan La., Garden Grove, Calif. 92640. ■

Attractive and authentic, 1969 version of home-brew crystal detector can be built from parts found in most any junk box. Circuit at right is common hookup for crystal set, but devising improved versions is all part of crystal fun.





NO-TICKET RIG

Here's 4 bucks worth of transmitter that says you can get on the air, now!

By Steve Daniels, WB2GIF

☐ Are you just itching to key that rig? Most Novices are. Trouble is, most people who are dying to get on the air need a little bit more code practice before they can take the exam and grab their ticket.

The No-Ticket Rig is designed with precisely this in mind. And while you won't DX (legally) any further than your front porch, you will have an AM transmitter that can pop the *dihs* and *dahs* into your portable radio with no trouble at all. In fact, you will be amazed at how loud and clear the signals are. A more pleasant way to bone up on theory simply ain't to be found.

Circuit Operation. Transistor Q1, resistor R1, and audio transformer T1 comprise an oscillator circuit that produces a constant audio tone. The base of Q1 is forward biased through R1, while the emitter is forward biased through the secondary of T1; as a result, the transistor conducts heavily.

When the transformer's core is saturated, current flow stops, and the transistor is cut off when the magnetic field in the core reverses. This cycle repeats itself at a rate determined by T1, Q1, and R1.

The audio signal from T1 is injected into the RF stage through the emitter of Q2, and resistor R2 which also supplies the base bias for Q2. This RF oscillator is similar to the audio stage except that an autotransformer is used rather than a coil having two separate windings. The lower half of L1 augments the forward bias to Q2.

The modulated RF carrier appears at the collector of Q2 where it is coupled to a long-wire antenna. The signal can be picked up by any nearby AM radio.

Construction. A 1¾-in. square chip of perf board should provide enough space for

all components. The adjustable antenna coil (loopstick) is mounted on one side of the case. You can use a larger board should things be too cramped, but all leads must be kept as *short* as possible.

Wire the RF stage (Q2) first and bring out three leads for the loopstick. You will have to trim these to size later on. Then wire the audio oscillator, leaving an inch or so between L1's windings and T1. The core of the driver transformer may become over-saturated if these components are too close together.

Note that transistors Q1 and Q2 are not critical and that substitutes are available (see Parts List). Remember that the value of R2 (and perhaps R1) may require adjusting when a substitution is made.

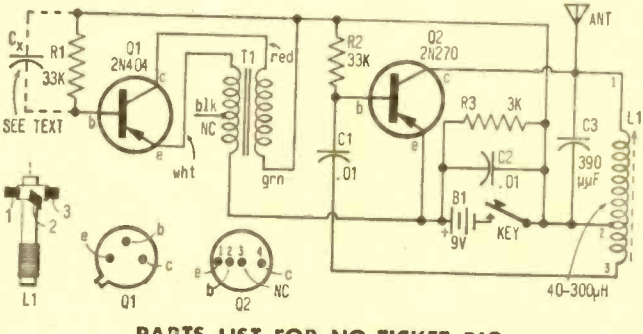
When all the parts are mounted and wired, your key should be connected in series with the battery connector; it operates as a switch to bring power into the circuit. That nice twisted pair of leads in the author's model was obtained by securing two hookup wires in a vise and attaching the remaining leads to an electric drill. Turn on the drill for a few seconds and you have a cable.

To mount the antenna coil, start by drilling a ¼-in. hole and then ream it out until the metal collar snaps snugly in place when the coil is pushed in. Make sure that the perf board, loopstick, and battery fit easily into the case. Connections should be as rugged as possible.

Few components make for lotsa fun.

Adjustment. With the battery connected (for better voltage regulation and longer life, a mercury battery can be used), attach a long-wire antenna (between 3 to 6 ft) to terminal 1 of the loopstick and close the case. Screw your key shut (for a constant tone) and tune across the BC band until you pick up your rig's signal. Adjust the slug of L1 to get the tone on a quiet part of the band. There's no point in trying to copy through QRM.

If the audio tone is too low, add C_x to the circuit as shown. Any value between .01 to .02 *u*F should do the trick. ■

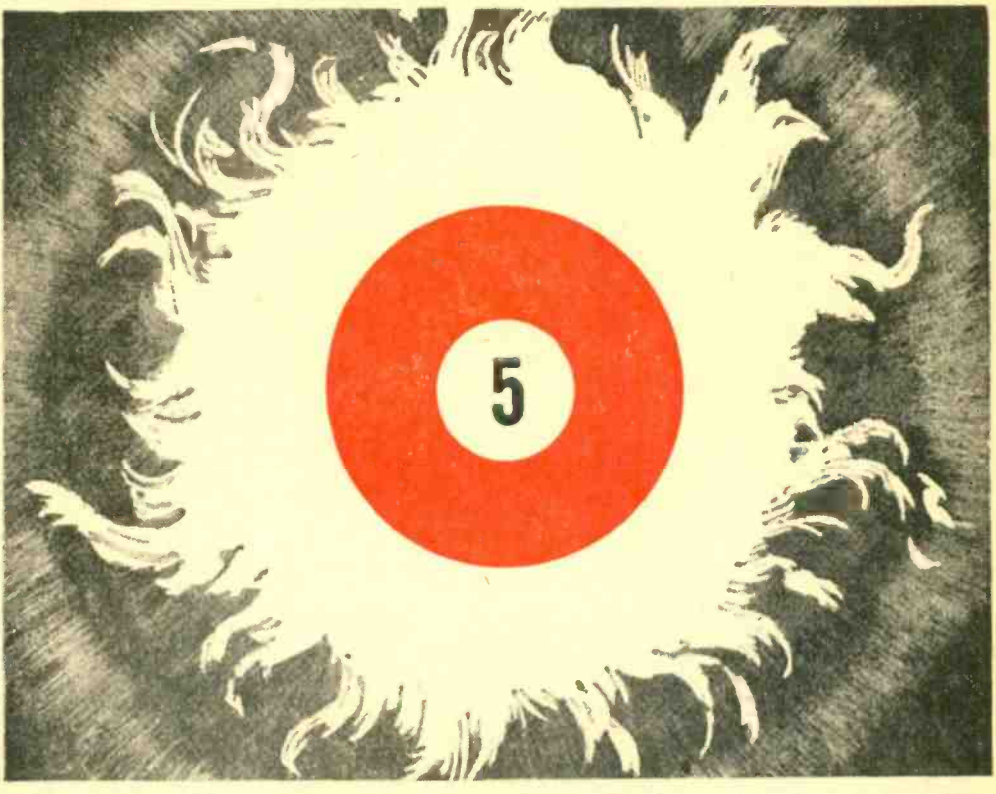


PARTS LIST FOR NO-TICKET RIG

B1—9-V battery (Burgess 2U6 or equiv.)—see text
C1, C2—.01-uF disc capacitor
C3—390-pF disc capacitor
Cx—See text
L1—40-300 uH, miniature BCB antenna coil (Lafayette 34T8749 or equiv.)
Q1—Pnp germanium transistor (RCA, GE 2N-404; HEP-739 or equiv.)
Q2—Pnp germanium transistor (RCA 2N270; HEP-632 or equiv.)
R1, R2—33,000-ohm, ½-watt 5% resistor
R3—3000-ohm, ¼-watt 5% resistor
T1—10,000-ohm pri., 2000-ohm (CT) sec., miniature audio transformer (Lafayette 99-T6126 or equiv.)
1—3¼ x 2⅛ x 1⅛-in. utility box (Lafayette 99T8077 or equiv.)

Misc.—Telegraph key (Lafayette 99T2554 or equiv.), battery connector (Cinch-Jones 5D, Allied 18C5184; Lafayette 99T6287 or equiv.), perf board, push-in terminals, knob, wire, hardware, solder, etc.

the amazing POOLROOM IN THE SKY



Hottest billiards game around is being played this instant in the center of the sun. To understand the trick shots, you have to know about next to nothing.

By Jorma Hyypia

☐ Nuclear reactions that occur in the core of the sun constitute a sort of super billiards game. How? Simple. Subatomic "balls" travelling at tremendous speeds collide with each other to liberate enormous amounts of energy. Astrophysicists, of course, have long dreamed of somehow refereeing this billiard game to learn what specific combination shots produce most of the sun's energy. The feat now appears to have been accomplished—by looking for the closest thing to nothing, and *not* finding it!

The closest thing to nothing that science has yet discovered is an infinitely tiny subatomic particle called the *neutrino*. Neutrinos have no mass or electric charge and travel at the speed of light. Practically nothing ever stops them. They speed unhindered through the seething sun where they are formed. Only about one in every ten billion that happen to strike the earth is actually stopped—all the rest keep right on going as though the planet weren't there.

(Continued overleaf)

POOLROOM IN THE SKY

These "space spooks" are the only known nuclear reaction products that can give us direct information about the solar fires burning deep inside the sun. They are products of these nuclear reactions and, most importantly, they reach us completely unchanged. The same cannot be said of electromagnetic radiations also created in the solar process. These radiations collide with solar particles billions upon billions of times before reaching the surface of the sun. In so doing, they are changed in character. Electromagnetic radiation can therefore provide only indirect information about the solar energy-producing processes.

Recently, a team of scientists headed by Raymond Davis Jr. of Brookhaven National Laboratory set out to trap some of the solar neutrinos. In their first two attempts they failed completely to catch neutrinos that could be attributed to solar rather than other galactic sources.

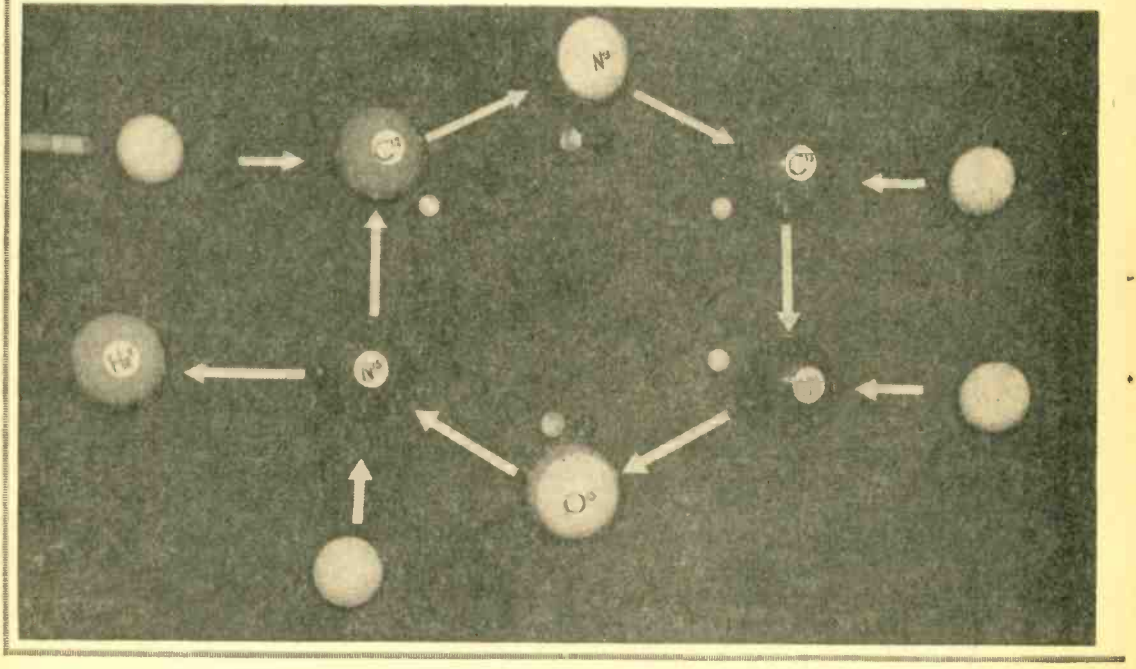
But even though no solar neutrinos were caught, the experiment was by no means a failure. The *negative* results were considered so significant by the astrophysical community that leading scientists in the field rushed to re-think and revise their long-held views about solar processes—even about the evolution of the universe as a whole!

Why this was so will become clear after we see just what sort of nuclear billiard games go on in the sun. Incidentally, note that we'll continue to speak about nuclear rather than atomic reactions. Reason: the intense heat of the sun strips all or most of the electrons off the atoms, so the processes are properly termed *nuclear*.

Solar Billiards. The nuclear reactions thought to occur in the core of the sun are like complicated billiards games involving "balls" of various sizes and energy potentials. There are two basic games going on at the same time. The game of lesser importance in terms of total energy production is called the *CNO cycle*. Reason is that it involves a series of nuclear changes that produce various isotopes of carbon, nitrogen, and oxygen. This cycle is a sort of trick shot that Old Sol uses now and then to add a little variety to an otherwise tedious and endless championship game.

The more important game is called the *proton-proton chain*. This game is believed to account for about 98 percent of the total energy produced by these two nuclear processes. It is a multi-step game consisting of an initial opening shot, followed by one or

Nuclear billiards trick shot (at left) accounts for only tiny amount



all of three possible terminal sequences.

If you're beginning to think that Old Sol is a sort of celestial Minnesota Fats, or a slick nuclear hustler in that Great Pool Room in the Sky, think again. It's just Mother Nature flubbing about in a most haphazard manner. Basically, she's a lousy pool player. It may take her thousands of years to make a single simple shot, or scores of billions of years to connect with a more difficult carom!

If Mother Nature is indeed such a mediocre player, how does she manage to create so much solar steam? The truth is that she keeps such an enormous number of nuclear balls in constant motion that a great many accidental hits are bound to happen. The probabilities are all in her favor that a certain percentage of the nuclear balls will fall into the right energy pockets to score energy releases.

Perhaps it's just as well that she isn't more adept. If she could make every shot count, the energy release would be so great that it would undoubtedly blow our entire planetary system into cosmic cue chalk dust.

Our nuclear billiards photos below provide simplified explanations of these two energy processes. The billiard balls represent various transmuted elemental isotopes; the golf balls represent protons (nuclei of light isotope hydrogen atoms); the white, black, variegated, and spotted marbles respectively represent gamma rays, neutrinos, positrons, and electrons. Pay particular attention to the black ball neutrinos in the explanation we're about to begin.

As the elements are transmuted from one to another, the attendant mass losses are translated into released energies. For example, when two protons fuse to form heavy hydrogen (H-2, or deutron) a little excessive proton mass is released in the form of energy. And when an additional proton fuses with the heavy hydrogen to form helium-3, still more energy is released.

While studying the billiards diagrams, note that two different types of nuclear transformations are indicated. Most of the transformations result from particle collisions. Any given particle may have to wander about in the seething solar core for a very long time before an accidental collision with just the right kind of reactive second particle occurs. Scientists have calculated these average wandering times with the use of probability mathematics. Remember that these times are the statistical averages of times that may in fact be much shorter or much longer.

The second type of transformation involves spontaneous decay of a particle formed by particulate collision. In our CNO

of sun's energy output—it's proton pool that really socks it to us!

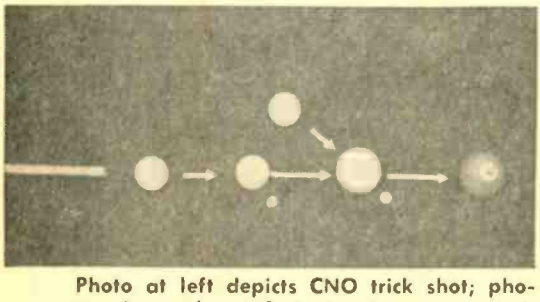
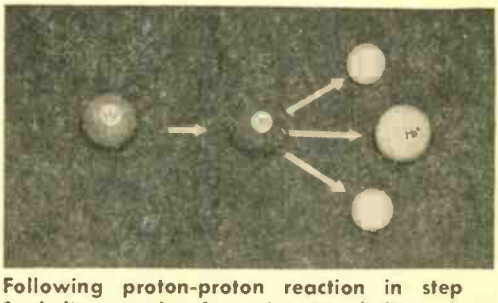
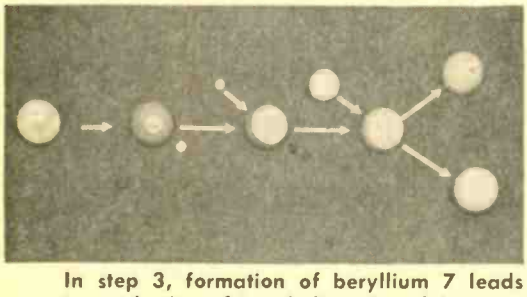


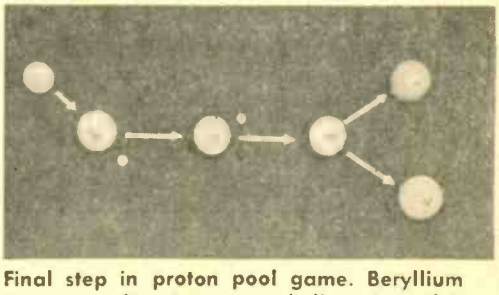
Photo at left depicts CNO trick shot; photo above shows first step in proton pool.



Following proton-proton reaction in step 1, helium nuclei fuse, forming helium 4.



In step 3, formation of beryllium 7 leads to production of two helium-4 nuclei.



Final step in proton pool game. Beryllium 4 now splits into two helium-4 nuclei.

POOLROOM IN THE SKY

mockup the two striped balls represent carbon-13 and oxygen-15 isotopes which decay into new products without interaction with other particles. These reaction times (half lives) are much shorter than the search-and-react times required in collision type transmutations.

CNO Trick Shot. Though this nuclear billiards game accounts for only about 2 percent of the sun's energy output, it deserves a brief play-by-play description. This is because it illustrates a catalytic process involving the two types of transformations just discussed.

The opening shot of the CNO game (indicated by the cue stick) is anything but a fast break. Any given carbon-12 nucleus may have to hang around for about 40,000 years before Mother Nature aims a proton just right to hit it. When the hit is at last made, a gamma ray is chipped off the carbon as it is converted to nitrogen-13.

The pace of the game now quickens. In about ten minutes the nitrogen-13 decays spontaneously into carbon-13, simultaneously releasing a positron and an electron-type neutrino.

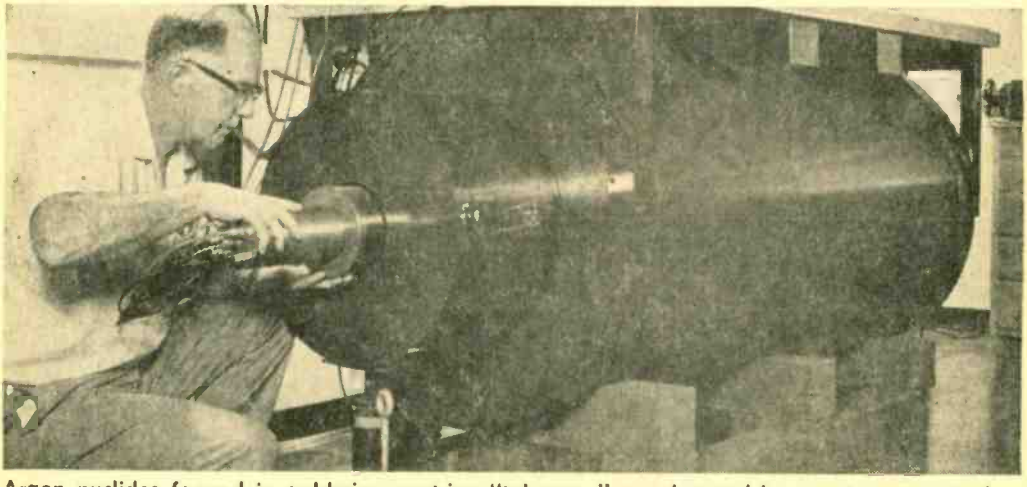
Then the game bogs down again. After some 6000 years the carbon-13 is hit by a second proton to form nitrogen-14 and a gamma ray. When a third proton strikes the nitrogen-14, oxygen-15 and another gamma ray are produced. You might just as well take a space-cruise around the Milky Way while waiting for this last shot to come off; there will be about a million years of near misses before it happens!

The game is now almost over. The oxygen-15 decays into nitrogen-15, a neutrino, and a positron in about two minutes. The final play comes 20 years later when a fourth proton smacks into the nitrogen-15 to form helium-4 and carbon-12.

Aside from the energy released, the net result is the formation of a helium-4 atom from four protons, and the complete recovery of a carbon-12 nucleus identical to the one used to start the game. The carbon-12 catalyst can now wait around for 40,000 years for another round of the same game which also may last more than a million years.

Proton Pool. Some 30 years ago physicist Hans Bethe theorized that the major part of the sun's energy is produced by a proton-proton chain fusion reaction. At that time there was no way to prove the theory. But in the following three decades supporting evidence grew to such proportions that the significance of Bethe's conjectures could no longer be doubted. In 1967 Bethe at last won a long-overdue Nobel Physics Prize for his work.

The proton-proton chain consists of an initial reaction (step 1) followed by three possible terminal reactions (see our photos). Initially, two protons collide to form hydrogen-2 (heavy hydrogen or deuteron), a positron, and a neutrino. The average time required to bring about such a collision with any given proton is 100 billion years! But after this reaction does occur, another proton is likely to be absorbed by the deuteron



Argon nuclides formed in goldmine neutrino "telescope" are detected by counters contained in 8-ft section of 12-in. naval rifle. Installation here is for Brookhaven National Laboratory.

in only two seconds to form helium-3 and a gamma ray.

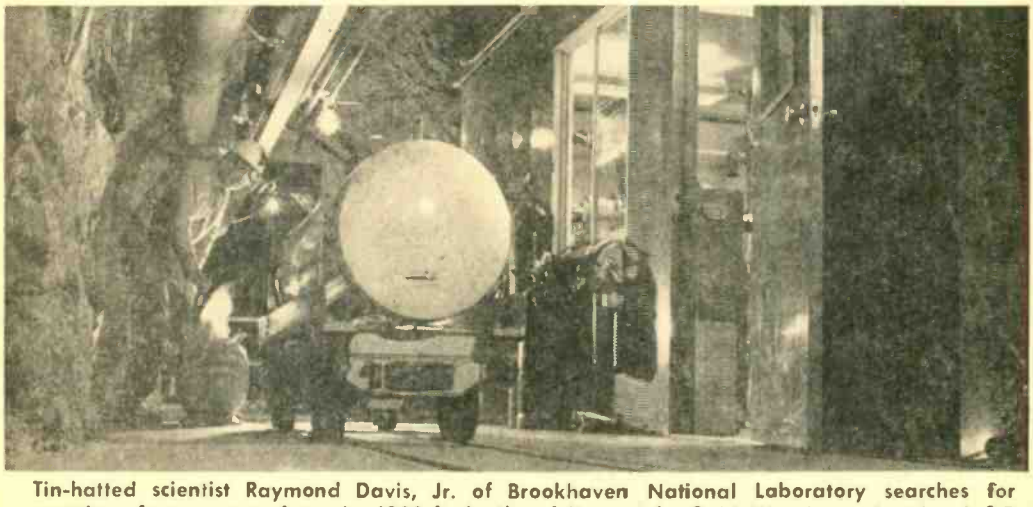
The first of the three possible terminal reactions consists of a simple fusion of two helium-3 nuclei to form helium-4 and two protons. As we'll see shortly, the *absence* of product neutrinos in this chain reaction is highly significant.

These first two reactions produce quantities of helium-3 and helium-4 which can now fuse to start off the second terminal sequence by forming beryllium-7 and a gamma ray (step 3). The average time needed to bring about this collision is 30 million years. In a year or so the beryllium-7 may capture an electron to produce lithium-7 while freeing two neutrinos. The lithium-7 grabs a passing proton almost immediately to produce two helium-4 nuclei. Note that in this terminal sequence helium-3 is in effect converted into helium-4 through a temporary fusion with a helium-4 nucleus already present at the start.

While the beryllium-7 in this reaction chain is wandering about looking for an electron, it may instead bump into a proton which converts the beryllium into boron-8 and a gamma ray (this is step 4). The unstable boron-8 soon decays into beryllium-8, a positron, and a neutrino. The beryllium-8 in turn splits apart into two helium-4 nuclei. Note that in each of the three possible terminal sequences the final product consists of one or more helium-4 nuclei.

Originator of proton-proton theory, Dr. Hans Bethe received belated Nobel Prize in 1967.

Neutrino Clue. Solar physicists will not be content until these highly convincing theoretical possibilities are proved and sorted out in terms of their relative importance by means of actual experiments. But how does one peer into the heart of the sun? Ordinary optical instruments are useless because they can detect only photons of light which have been bounced about and altered in various ways on their tortuous travels to the surface



Tin-hatted scientist Raymond Davis, Jr. of Brookhaven National Laboratory searches for neutrinos from center of sun in 4900-ft depths of Homestake Gold Mine located at Lead, S.D.

POOLROOM IN THE SKY

of the sun. The only hope is to work with next to nothing. As we said, the neutrino is so close to being nothing that it can zip out of the sun's core at the speed of light, unaffected by the seething and boiling mass around it.

Just as one baseball is like any other baseball of the same type, one neutrino is pretty much like any other neutrino. You can't tell one from another by color, size, or any other physical characteristic. But, like baseballs, neutrinos can and do have different kinetic energies depending on who or what puts them into motion. A low-energy neutrino is like a baseball hit into a pop fly, a high-energy neutrino is the same kind of baseball walloped into a home run. You can easily pick the infield hits from the pop flies and the single home run by running an eye down the energy column for neutrinos believed to be formed in solar processes:

Source (nuclear reaction)	Energy (million electron volts)
Proton-proton chain:	
Proton to deuteron (step 1)	0.420 MeV
Beryllium-7 to lithium-7 (step 3)	0.861 MeV and 3.383 MeV
Boron-8 to beryllium-8 (step 4)	14.06 MeV
CNO cycle:	
Nitrogen-13 to carbon-13	1.20 MeV
Oxygen-15 to nitrogen-15	1.74 MeV.

Experimentally, the problem facing physicists was to devise a scientific mitt to catch and count invisible neutrino "balls" travelling at the speed of light. They then had to extrapolate these rare catches into a reasonably accurate estimate of the total numbers and kinds of neutrinos pouring out of the sun.

This is a tough ball game, made even tougher by the need to weed out and discount those neutrino balls that originate from other celestial ballparks, i.e., stars other than our own sun. No one mitt could be expected to catch all types of neutrinos—the pop flies as well as the homers. Hence the equipment was designed to trap mainly high-energy neutrinos presumed to be created during the boron-8 decay process and the CNO cycle.

Clean Catch. The most suitable scientific fielder's mitt turned out to be 100,000 gallons of dry cleaning fluid contained in a huge

Solar-neutrino-hunting "telescope" in Homestake Gold Mine covers 20 x 48-ft area.

tank located almost a mile underground in the Homestake Gold Mine in South Dakota. The tank was placed in the mine so that the overlying earth would screen out all interfering particles except neutrinos. The tetrachlorethylene cleaning fluid was used because it provided an abundance of chlorine atoms (the heavy isotope, chlorine-37).

When a solar neutrino, passing through the liquid, happens to collide with a chlorine atom, the chlorine is converted into an atom of radioactive argon-37 having a half life of 35 days. Any argon-37 that is produced is later trapped in a special charcoal filter, from which it is removed and sent to Brookhaven National Laboratory. There, a special radioactivity counter mounted inside a 12-in. thick Navy gun barrel determines the amount of argon-37 present and, indirectly, the number of neutrinos that had been captured.

Every chlorine atom in the huge amount of liquid (enough to fill an Olympic swimming pool!) is in effect a potential "mitt" ready to grab a passing neutrino. There are two million trillion trillion such mitts in the tank (2 followed by 30 zeros), and it had been anticipated that ten billion billion neutrinos of various kinds would pass through the tank every day. Considering the enormous number of catchers and pitched balls, the actual number of catches predicted was astonishingly low—only one to four per day!

(Continued on page 116)

BCB booster

One FET fills up those empty holes on your dial with DX power aplenty!

By Bill Britton

☐ Come those long winter nights—if you think the broadcast band on your receiver is jammed from end to end, you ain't heard nothin' yet, baby! In between those powerhouse stations, nearly everyone can receive real DX. What you want are the 1000-, 500-, and even 100-watt regional stations that rarely get airborne during a snowstorm.

That's real DX! For there are few BCLs (broadcast listeners) outside their local turf who ever get to hear these signals, let alone know that the stations exist. If you dig deep enough you'll hear real Bluegrass music from a station in West Virginia, or some authentic French folk music from a flea-power station in Quebec. How about gutsy, bawdy logging songs from the Northwest?

Just add extra sensitivity to your BC receiver and the real DX is yours for the taking. No more bragging that you heard WWVA—just about everybody gets WWVA, man. What you should come up with is WKEE, WMTD, or WLEW. Try those out on SWL club members some night! They'll go blind looking through White's Radio Log.

Just about the easiest way to get the extra gain needed for real DX pickup is to build our BCB Booster. It's a battery-powered BC preamp with amplification provided by a field-effect transistor (FET). The Booster can be had for well under $10.00, takes about 2-hours' effort, and will provide a nominal 6- to 12-dB gain (1 to 2 S-units), depending on your receiver's antenna-input circuit. Fact is, tests with some rock-bottom BC receivers have indicated an overall improvement of 16 dB (almost 3 S-units), due to the combination of antenna matching by L1 and the amplification provided by Q1.

Construction. The BCB Booster is built into a 3 x 4 x 5-in. aluminum cabinet. We suggest you follow the layout shown, though you can substitute your own layout as long as input coil L1 and RF choke RFC1 are as far apart as possible (certainly no closer than 3 in.) and at right angles to one another.

We do suggest you use a 4-section, 5-mH RF choke for

BCB booster

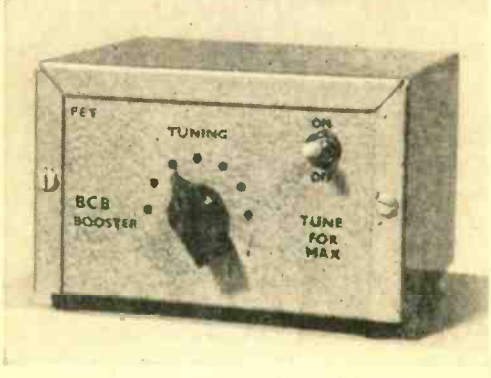
RFC1, though such a choke may be difficult to obtain (see Parts List).

Note that only one section of a 2-section tuning capacitor is used. The 2-section capacitor is pretty much standard stock at your electronics distributor. However, if you can obtain a single-section, 365-*uu*F tuning capacitor, substitute it by all means (again, see Parts List).

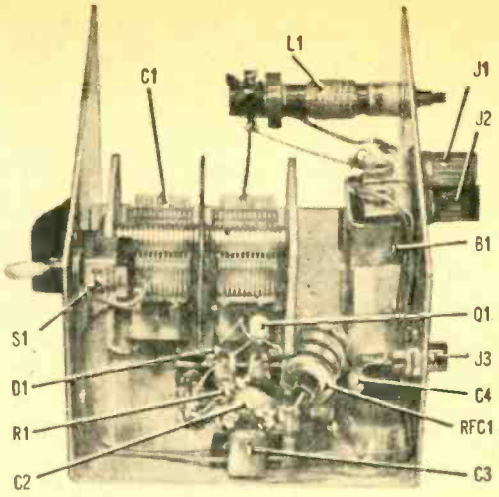
First step is to mount tuning capacitor C1 temporarily. Position it as close as possible to the left side of the cabinet and make certain it doesn't interfere with L1. Maximum chassis area should be on the right side to leave room for all the components mounted with Q1.

Mark the locations of all holes to be drilled, remove C1, and drill all cabinet holes. Make certain before you drill any holes that B1's holder (which is mounted on the rear apron) will not interfere with the antenna binding posts J1 and J2, or output jack J3.

Wiring Wizard. Install the components in this order: capacitor C1, the two terminal strips, battery holder, J1, J2, J3, S1, and finally, L1. Note that L1 has a green dot between two of its terminals. Orient L1 so that the dot points downward towards the bottom of the cabinet. Take extra care when wiring L1 and refer to both the schematic and outline of L1's terminals. Completely wire L1, then install D1. Mount Q1, then install R1, C2, C3, C4, and RFC1. Solder all connections except the negative lead of B1 (coming from the battery holder).



Booster covers entire BCB with single tuning capacitor. No calibration is necessary—you simply tune for maximum signal.



Author used miniature power switch for S1, but any spst toggle switch will work. Locate RFC1 as far as possible from coil L1.

Snap a 9-V battery (or a mercury equivalent) into the holder—observing polarity—and connect a DC milliammeter between B1's negative terminal and the chassis ground. The meter's negative lead goes to the negative battery terminal and the positive lead to the chassis. Set the meter's range so it will indicate between 5 and 20 mA full-scale.

Double check all connections to Q1 (you won't get a second chance if you've made a wiring error) and then turn S1 *on*. As soon as power is applied, the meter should indicate approximately 2 to 4 mA. If the meter indicates much less than 2 mA, Q1 probably has an open lead.

If the meter indicates between 5 and 10 mA, check the value of R1. If necessary, increase R1 to 1000 ohms until your meter indicates less than 5 mA. Should the meter indicate more than 10 mA, quickly turn off S1 and check carefully for a wiring error. You may also have to install a new FET! Once the meter indication checks out, remove the meter from the circuit and connect B1's negative terminal to the chassis.

Installation and Alignment. Output jack J3 should be connected to your receiver's antenna terminals with the shortest possible length of low-capacity *coaxial* cable—the type made for automobile antennas. If you use a long lead, or a standard coax such as RG-8/U or RG-58/U, the signal loss between the booster and receiver will be severe, perhaps approximating the total gain from the booster.

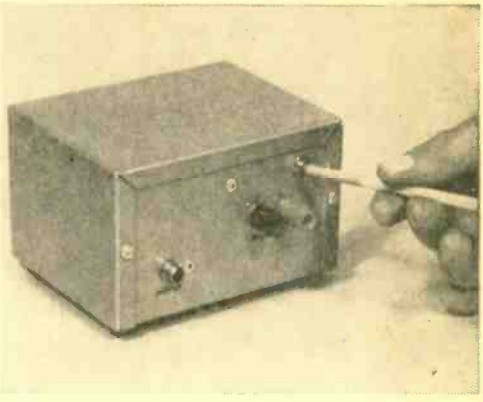
If you can't obtain a piece of low-capacity cable from your local auto-radio installer, you can substitute a standard, low-loss, foam-filled cable such as RG-58/U-Foam (see Parts List). You can even purchase one of the cheaper replacement auto antennas and use a section of the supplied cable.

Connect the booster to your receiver and the antenna to binding post J1. If possible, connect binding post J2 to a ground. Tune in a signal at the very high end of the BC band (near 1500 or 1600 kHz) by setting C1 so its plates are completely open; then adjust L1's slug for peak reception.

To avoid having your receiver's AVC *mask* the peaking, tune in the weakest possible signal, one just over the noise level. A more accurate alignment can be made by connecting an RF signal generator to J1 and using the weakest possible signal from the generator.

Using the Booster. Few signals, if any, will be strong enough to overload the FET, so no switch has been provided to cut the booster in and out of the transmission line. Note, however, that D1 will short out excessively high voltages picked up from transmitters, lightning discharges, etc.

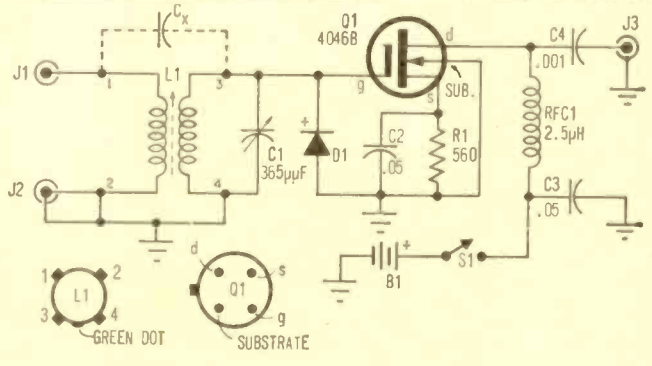
To tune in a station, simply set C1 to one of three positions: plates fully closed for low-end reception, plates half-open for mid-band reception, and plates fully open for high-end reception. Then tune in the desired signal on your receiver and peak the reception with C1—that's all there is to it!



Peaking L1's slug for maximum output is only alignment required. Slug is accessible at top rear of BCB Booster's cabinet.

Should you experience some instability as C1 is tuned, make certain the shield of the output lead from J3 is connected to both the booster's and the receiver's chassis (ground terminal). If you still experience

(Continued on page 118)

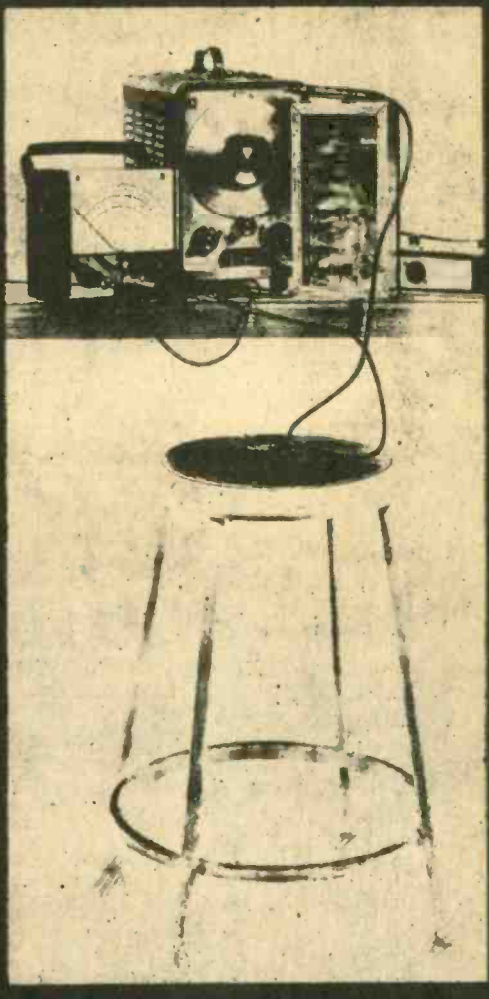


PARTS LIST FOR BCB BOOSTER

B1—9-V battery (Burgess 2U6 or equiv.)
C1—1- or 2-gang, 365-pF variable capacitor—see text (Lafayette 32T1103 or 32T1102; or equiv.)
C2, C3—.05-uF, 15-VDC ceramic capacitor
C4—.001-uF, 15-VDC disc capacitor
Cx—See text
D1—1N60 silicon rectifier
J1, J2—Insulated binding posts, red and black
J3—Phono jack
L1—Antenna coil (J.W. Miller A-5495-A, Lafayette 34T8710 or equiv.)
Q1—Field-effect transistor (RCA 40468, Allied 49F1 40468 RCA)
R1—560-ohm, ½-watt 10% resistor
RFC1—2.5- or 5-mH RF choke—see text (J.W. Miller 6302 or 6304, Lafayette 34T8792 or 34T8793, or equiv.)
S1—Spst toggle switch
1—3 x 4 x 5-in. aluminum chassis box (Bud CU-3005A, Allied 42B7639 or equiv.)

Misc.—Battery holder (Keystone 203P, Allied 18F5271 or equiv.), low-loss foam RG-58/U coaxial cable (Allied 55B9357 or equiv.), 3-lug terminal strip, 2-lug terminal strip, knob, solder lugs, decals, solder, wire, hardware, etc.

Someone should develop an easy way to learn electronics at home



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FCC License Preparation. For those who want to become TV Station Engineers, Communications Laboratory Technicians, or Field Engineers.

Automation Electronics. Gets you ready to be an Automation Electronics Technician; Manufacturer's Representative; Industrial Electronics Technician.

Automatic Controls. Prepares you to be an Automatic Controls Electronics Technician; Industrial Laboratory Technician; Maintenance Technician; Field Engineer.

Digital Techniques. For a career as a Digital Techniques Electronics Technician; Industrial Electronics Technician; Industrial Laboratory Technician.

Telecommunications. For a job as TV Station Engineer, Mobile Communications Technician, Marine Radio Technician.

Industrial Electronics. For jobs as Industrial Electronics Technicians; Field Engineers; Maintenance Technicians; Industrial Laboratory Technicians.

Nuclear Instrumentation. For those who want careers as Nuclear Instrumentation Electronics Technicians; Industrial Laboratory Technicians; Industrial Electronics Technicians.

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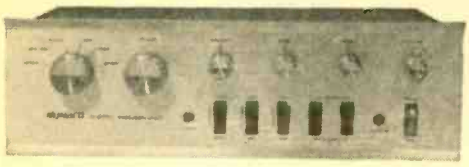


DYNACO
Model PAT-4
Stereo Preamplifier
and
Model 120
Stereo Power Amplifier

☐ Here's a stereo amplifier system which should settle, once and for all time, that hi-fi question of questions: "Which is better, components or integrated amplifier?" The hard facts: in terms of flexibility and convenience, the Dynaco PAT-4/Stereo 120 combination can walk all over any integrated amplifier we've put our hands on.

Think of just about any important sound-processing feature and you'll find it in the PAT-4 preamp. And with a solid 120 watts out of the Stereo 120 power amplifier (its sole reason for being *is* amplification), could anyone want for more?

The Combo. The PAT-4 is an all solid-state stereo preamplifier designed to handle virtually any combination of signal sources. The selector switch inputs are *tape head, phono, tape, tuner, spare,* and *special.* Naturally, the *tape head* input is NAB equalized; the so-called *tape* input is intended for the output of a tape preamp such as that contained in a tape deck. Both the *tuner* and *spare* inputs are for high-level signals.

As for the *phono* input, it accommodates up to three cartridges in jacks available on the rear apron: standard RIAA-equalized low-level magnetic pickup, ceramic pickup, or RIAA-equalized high-level magnetic pickup (if such is ever made). And the input designated *special* can be wired as a microphone preamplifier or as a second equalized input for a low-level device, such as a second magnetic pickup (instructions are provided).

There is also an "over-ride" jack on the front panel. Intended for high-level signal sources, it automatically disconnects the input selector switch whenever there is a plug inserted.

Three for Two. Three outputs are provided. The first is the standard tape output, connected before the preamp's tone and volume controls. The two remaining outputs are connected to the preamp's output. One of these is used for driving the power amplifier; it is connected to the amplifier through a stereo monitor jack on the front panel which automatically mutes the power-amplifier feed when the headset plug is inserted. The second is intended for a tape-recorder feed when it is desired to utilize the tone, volume, and filter circuits of the preamp. It is not muted when a headset is used.

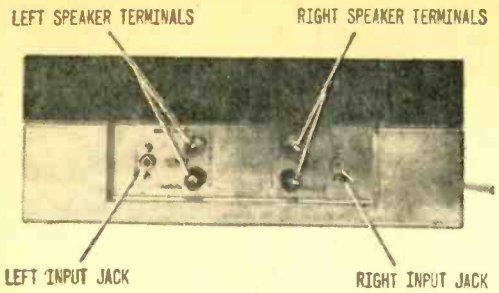
In addition to the *tape* input on the selector switch, there is a spring-return tape-monitor switch that allows monitoring from a three-head recorder (but only if the recorder is being fed through the standard tape output jacks).

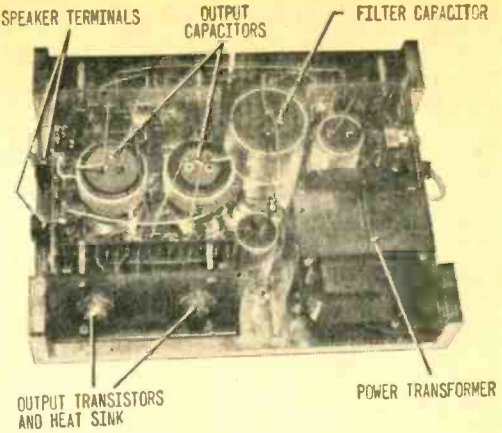
Controls Galore. The PAT-4 is equipped with the usual dual concentric bass and

Manufacturer's Specifications for Dynaco Model PAT-4 Preamplifier

Input level for 60 watts/8 ohms output:
Spare, Tuner, Tape—0.5+ V rms
Special—0.3 V rms (see text)
Tape Head—0.0025 V rms
Ceramic Phono—0.25 V rms
Magnetic Phono (low)—0.0045 V rms
Magnetic Phono (high)—0.3 V rms

Tone-control range:
Boost—13 dB, 20 Hz; 12 dB, 20 kHz
Cut—13 dB, 20 Hz; 16 dB, 20kHz





Straightforward as an amplifier can be, Stereo 120 is clean and uncrowded as they come. Business-end of amplifier has only input jacks and speaker terminals; line cord and power switch are on opposite side.

treble controls, of course, but there's much more: switch-selected, bass-boosted loudness compensation; a low-frequency filter; and a three-position high-frequency filter providing very sharp cutoff at 15, 10, or 7 kHz. Other controls and switches are volume, balance, and two unusual channel selectors.

The channel-selector switches allow any of the following combinations: stereo, L to both channels, R to both channels, 6-dB stereo mixing, or mono/mono. The 6-dB stereo mix provides a fixed 6 dB of stereo separation to avoid the extra-spacious ping-pong effect usually obtained with phones. The mono/mono circuit allows each channel to be used as a separate mono circuit. For example, using a 78-rpm phono on one *spare* input and a tape on the other, either input could be fed in mono to the speakers.

Four AC receptacles are provided; two are switched and two are unswitched. The switched receptacles can be used to control power to a tuner, say, and to the power amplifier. The unswitched receptacles will power most anything.

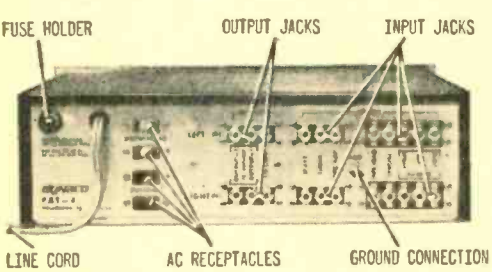
The Stereo 120 amplifier is a straight solid-state stereo amplifier rated for 60 watts rms per channel. It has no controls other than an *on/off* switch.

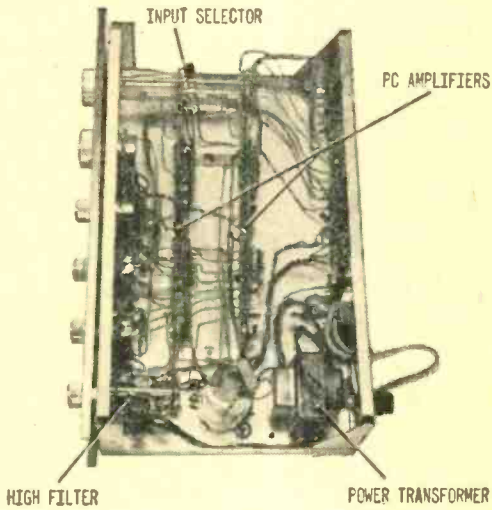
Performance. Since a user would most likely utilize both the preamp and the amplifier, we tested the combination as though it were a single integrated amplifier. In other words, our measured performance is for the complete PAT-4/Stereo 120 system.

Though the amplifier is rated for 60 watts at 0.5% THD (total harmonic distortion) with an 8-ohm load, the maximum THD at 60 watts with both channels driven measured 0.35% between 20 and 20,000 Hz. Maximum power output for 0.5% THD into 4 ohms was just short of 50 watts, and just short of 40 watts into 16 ohms. Input sensitivities are given in our table.

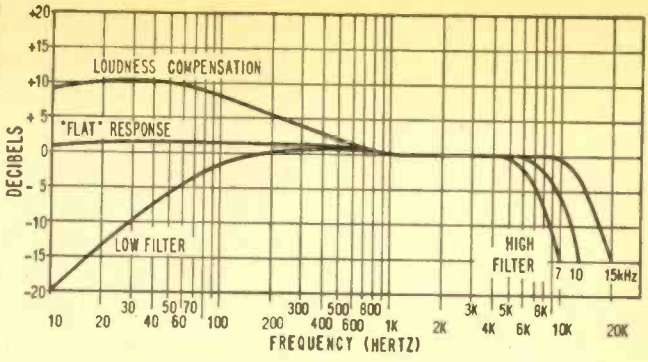
The preamp's output voltage at the rated input level(s) was approximately 2 V rms at

Left and right preamplifiers in PAT-4 are PC assemblies which mount vertically in center of chassis (photo at right). Note open space between components, even input selector switch, which makes kit assembly extra easy. Rear apron of PAT-4 is loaded with input and output jacks providing most any desired combination of functions. Unit accepts three different kinds of pickups.





LAB CHECK



Overall frequency response of combined PAT-4/Stereo 120 system. Curves at high end show rolloffs achieved with high filter; with filter out of circuit high-end response was flat to 40 kHz. As explained in text, low filter has minimal effect on program material, maximum effect on rumble.

the preamp outputs and 0.15 V rms at the tape output.

The low-pass filter proved sharp, being only 3 dB down at 70 Hz and 20 dB down at 10 Hz. In practical terms, this means the filter has little effect on the normal low-frequency program material but provides sharp attenuation of rumble frequencies. The high-pass filter, as shown in our curves, was also extremely sharp, with little attenuation below the rated frequency.

Even with all controls wide open there was almost complete silence from the system. The noise level measured better than 70 dB down on the magnetic phono input.

The Listening Test. Our ear test satisfied us that the Dynaco pair was the excellent system our instruments indicated, the overall sound being as good as can be expected from quality equipment. The big plus, of course, is the phenomenal flexibility of the PAT-4 preamplifier.

The PAT-4 is supplied complete with a metal cover (not particularly attractive, we might mention) for $129.95 factory-wired, $89.95 in kit form. The Stereo 120 amplifier, complete with cover, is priced at $199.95 factory-wired, $159.95 in kit form. Both kits go together rather easily, so the kits represent an even better buy than the wired versions.

For additional information write Dynaco, Inc., Dept. D, 3060 Jefferson St., Philadelphia, Pa. 19121. ■

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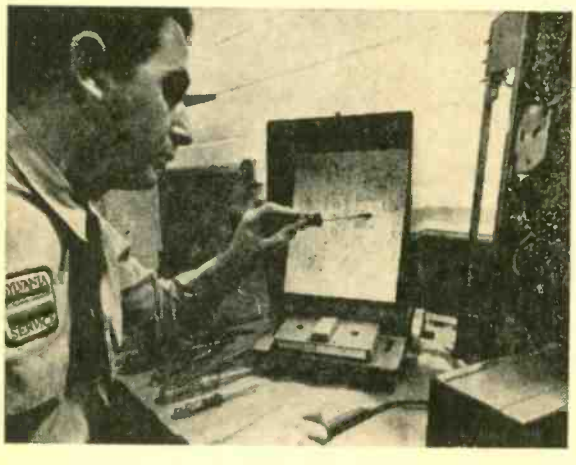
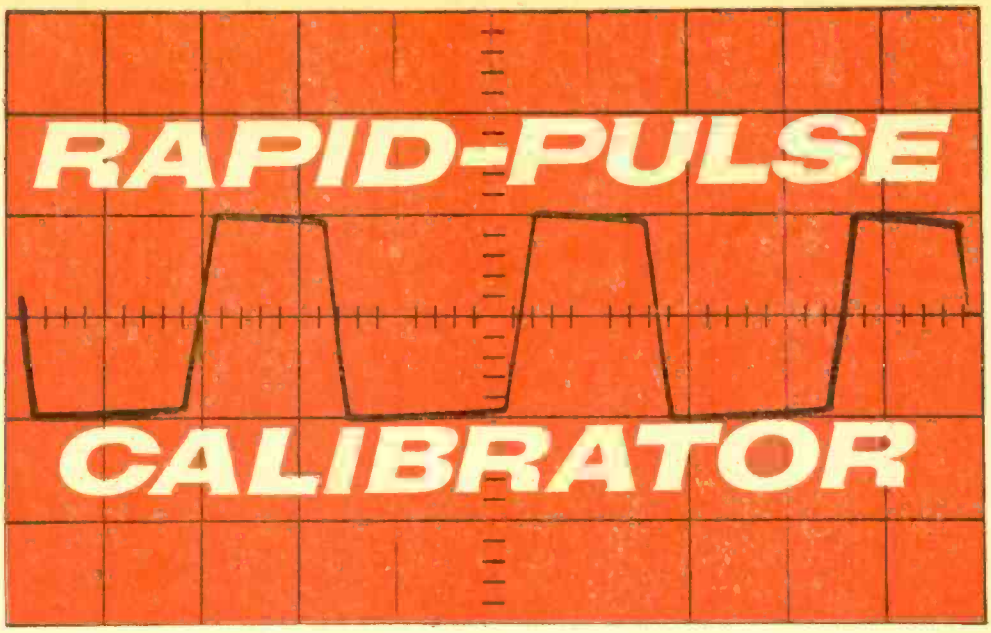
☐ Let's say you're a serviceman. And let's say your fifth repair job of the day turns out to be a TV set, black-and-white, no less, vintage 1954. Fully 24 minutes of testing, checking, probing have accomplished nothing, save to convince you that this set hails from tough-dog territory. Do you pound the bench in frustrated rage? Do you mouth words unfit for man or beast, let alone a TV set? Neither. You call on microfilm to lead you out of your quandary, and you come up with both cause and cure in 10 minutes flat! ■



Service industry's first microfilm system instantly locates technical and service info on all home-entertainment products ever produced by Sylvania Electric. Available to company's distributors, dealers, and servicing contractors on lease basis, system consists of two reel-to-reel microfilm cartridges and desk-top reader which projects material on to 8 x 10½-in. screen.



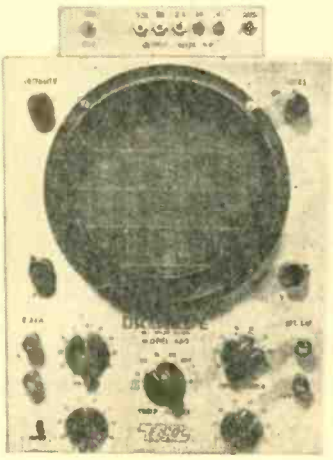
This scope calibrator has zener diode regulation to give you the accurate CRT traces you really need

By Thomas R. Sear, WA6HOR

☐ Precise measurements are in! As our article on the laboratory oscilloscope (see RADIO-TV EXPERIMENTER, October/November, 1968) pointed out, today's waveforms require the best calibrated equipment you can get your hands on. If you don't have the accuracy, you just haven't got it.

More and more sophistication *is* the answer. Thing is, hobbyists and experimenters often find that their ideas, ambitions, and knowledge are just too advanced for the limited equipment they can afford. Operating funds simply don't permit the kind of expenditures they would like to make. As a result, many experiments and tests go right down the drain due to a lack of hardware.

Our Rapid-Pulse Calibrator is one answer to your equipment problem. If you measure a lot of electrical phenomena with an oscilloscope and want the accuracy to do the job right, this pocket calibrator will put your scope's trace right on the ol' graticule division where it belongs.

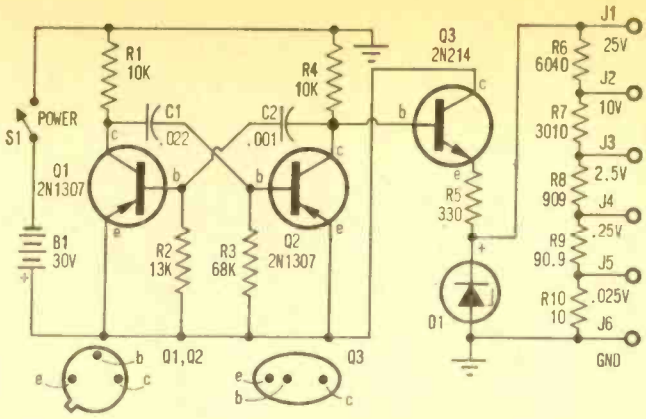


Our Rapid-Pulse Calibrator is a precision voltage source that effectively calibrates the vertical sensitivity of your scope so that your measurements will be uniform as well as accurate. You name it—square waves, sawtooths, pulses, time markers, modulation levels, power-supply ripple—all these waveforms and more can be measured with an accuracy that's limited only by the maximum frequency that your oscilloscope's vertical amplifier will pass.

Operation. This calibrated voltage source has a free-running multivibrator consisting of Q1 and Q2. A buffer stage (Q3) is followed by a precision voltage divider made up of R6 through R10. The unit is powered by a 30-V battery. The voltage applied across the divider network is regulated by D1, a zener diode that provides a constant reference voltage.

The multivibrator provides a square-wave output (Fig. 1) with a peak voltage equal to the value controlled and passed by D1 (i.e., 25 V). The oscillator

RAPID-PULSE CALIBRATOR



Multivibrator (flip-flop) circuit produces square-wave output at frequency of 1200 Hz. Buffer stage (Q3) prevents loading of oscillator by zener diode (D1) or external circuit.

circuit has two 2N1307 transistors operated as common-emitter amplifier stages, with regenerative feedback coupled (via C2/R2 and C1/R3), from the collector of one to the base of the other.

Each transistor is alternately cut off as the other conducts to saturation. The positive and negative half-cycles of the square-wave output have a time constant determined by the RC network, the overall frequency being 1200 Hz. Most oscilloscope manufacturers seem to like this frequency for a calibration voltage. It's great for amplifier troubleshooting.

The multivibrator output is coupled to the base of Q3. This buffer stage is used as an

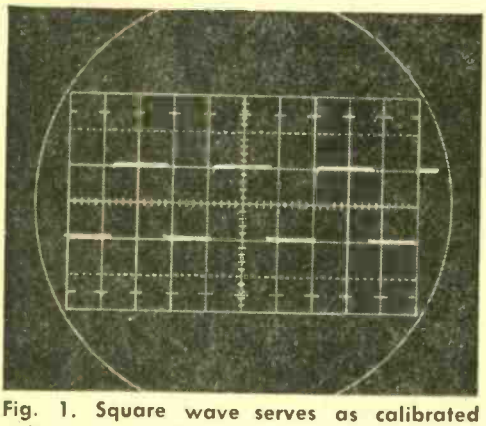


Fig. 1. Square wave serves as calibrated voltage source for accurate scope displays.

emitter-follower to prevent loading of the oscillator by either the zener diode or any external circuit driven by the unit (if it's used as a square-wave source). The zener diode connected to the emitter of Q3 serves as voltage source for the divider network.

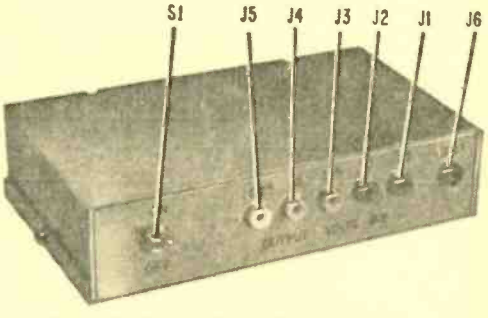
You have the choice of a 25-, 10-, 2.5-, 0.25-, and 0.025-V (peak-to-peak) output. Just select the output that is appropriate for the signal amplitude you want to measure, set your scope's vertical gain control for a convenient deflection on your graticule, and leave the gain control alone while you do your measuring.

Construction. The unit is housed in a 5½ x 3 x 1½-in. utility box that takes up so little space it's portable as a pill. Construction is straightforward and component layout isn't critical. Still, we suggest you follow the photos for best results.

Use a low-power iron if possible and be sure to apply some kind of heat sink to semiconductor leads when you solder them in place. Try long-nose pliers, alligator clips—anything that'll work. The author used a phenolic circuit board with standoff terminals as tie points, but the usual perf-board-and-flea-clip arrangement can also be used and will do just fine.

When your calibrator is assembled, simply clip the battery into its holder, flip power switch S1 *on*, and the desired square wave voltage will appear at the appropriate tip jack. No warmup is necessary.

Adjustment. To test the unit for the



Insulated jacks J1 through J6 provide separate output for divider network. Pin jacks were used, but you can use other types.

PARTS LIST FOR RAPID-PULSE CALIBRATOR

B1—30-V battery (Eveready 413, Burgess U20 or equiv.)
C1—.022-uF, 200-VDC tubular capacitor
C2—.001-uF, 200-VDC disc capacitor
D1—25-VDC, ¼-watt zener diode (Motorola ¼M252, Allied 49E26 ¼M252 or equiv.)
J1 thru J6—Insulated tip jacks (H.H. Smith 240, Allied 24B9156 or equiv.)
Q1, Q2—Pnp germanium transistor (GE, RCA 2N1307; HEP-2 or equiv.)
Q3—Npn germanium transistor (Sylvania 2N214; HEP-641 or equiv.)
R1, R4—10,000-ohm, ½-watt 5% resistor
R2—13,000-ohm, ½-watt 5% resistor
R3—68,000-ohm, ½-watt 5% resistor
R5—330-ohm, ½-watt 5% resistor
R6—6040-ohm, ½-watt 1% resistor
R7—3010-ohm, ½-watt 1% resistor
R8—909-ohm, ½-watt 1% resistor
R9—90.9-ohm, ½-watt 1% resistor
R10—10-ohm, ½-watt 1% resistor
Note—R6 thru R10 are precision, metal-film resistors (IRC type CECT-O or equiv.)

S1—Spst toggle switch
1—5½ x 3 x 1½-in. aluminum chassis box (LMB 139 or equiv.)

Misc.—Perf board, push-in terminals, ¼-in. spacers, battery holder (Keystone 183, Allied 18E5918 or equiv.), spaghetti, decals, wire, solder, hardware, etc.

first time, set your scope's controls for an AC input, a medium-speed trace, and a vertical sensitivity of about 15 V per major division. Connect the Rapid-Pulse Calibrator's 25-V output to the scope's vertical input. Again, refer to Fig. 1 and adjust the scope for a stable display. The trace should show very fast rise and fall times and a flat top and bottom.

If the waveform isn't symmetrical (see Fig. 2), the value of R2 should be adjusted until the correct trace is obtained. The waveform in Fig. 3 would indicate that the vertical amplifier of your oscilloscope is tending to oscillate and is distorting the input waveform. This peak (over-response) may be due to your overloading the amplifier, or a problem in the scope's circuitry. Some adjustment is necessary.

Test Traces. Calibration of your scope's vertical input is accomplished by the substitution method. A voltage of known amplitude (i.e., 25 V peak-to-peak) is applied to the input as a substitute for the signal about to be tested. The vertical gain control is adjusted for an exact (easily read) deflection on the CRT. If the deflection is exactly one division on the scope's graticule, every 25 V of signal will deflect the trace exactly one more division. Remember that all oscilloscope measurements are peak-to-peak. The signal voltage is measured from maximum positive to maximum negative portion of the waveform.

As long as the vertical gain control isn't disturbed, you have a visual voltmeter with a sensitivity of 25 V per division. (This assumes a deflection of one division for the 25-V input. However, the calibration voltage and scope display will actually depend on a specific situation.) Now, whatever test signal is fed into the scope, its amplitude can be compared with the calibration voltage.

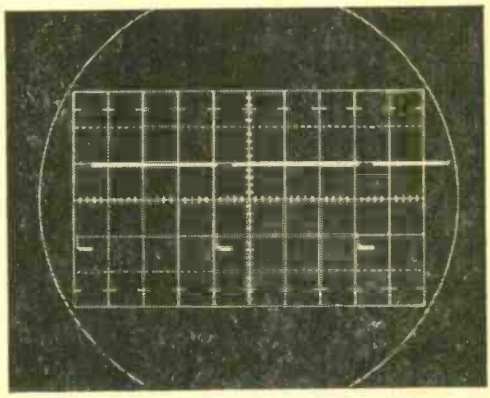
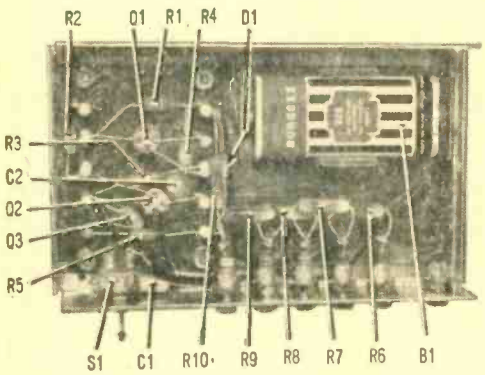


Fig. 2. An unsymmetrical waveshape can be corrected by adjusting the value of R2.



Author used phenolic circuit board and standoff terminals. However, perf board and flea clips will do just as well.

Looking at Figs. 4, 5, and 6, we see typical waveforms whose amplitude can now be measured accurately. Fig. 4 is a sine wave having an amplitude of 4 divisions. Since our calibrated sensitivity is 25 V peak-

RAPID-PULSE CALIBRATOR

to-peak, we have a signal voltage of 4 × 25 V, or 100 V peak-to-peak. The trace in Fig. 5 has an amplitude of 2.2 × 25 V, or

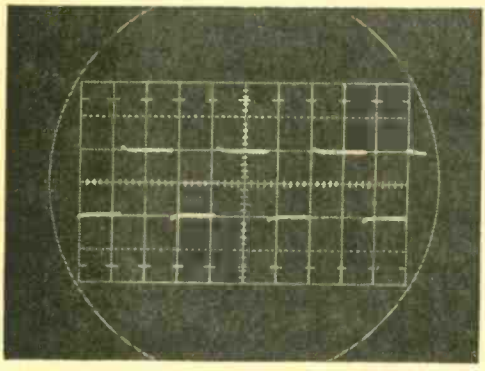


Fig. 3. Trace indicates that overshoot is starting to develop. Distortion is due to either excessive gain or scope circuitry.

55 V peak-to-peak, while Fig. 6 works out as 2.6 × 25 V, or 65 V peak-to-peak.

Undoubtedly you will use your oscilloscope as a supplement to your VTVM or VOM. While the scope measures only peak-to-peak voltages, most meters are calibrated to indicate rms (root-mean-square) values. To avoid confusion when working with these different instruments, you should know how to convert from one value to the other. Two formulas are all you need:

$$V_{rms} = \frac{V_{peak\ to\ peak}}{2.828} \qquad (1)$$

$$V_{peak\ to\ peak} = V_{rms} \times 2.828 \qquad (2)$$

Using the first formula for the 100-V signal of Fig. 4, we find the rms value to be 35.4 V. This is the effective value your VTVM would read if it had the required frequency response. You can work out the rms values for Figs. 5 and 6 using the same formula. Look at a book on AC theory and make sure you understand peak vs. rms values.

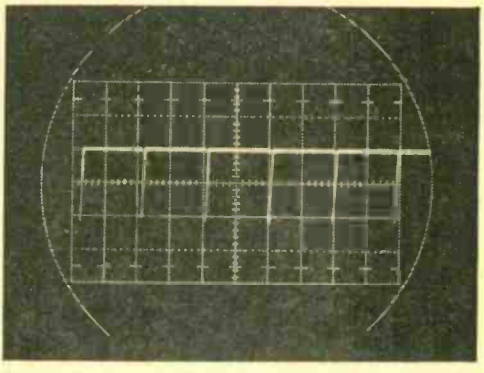


Fig. 5. These rapid timing pulses have amplitude of 2.2 divisions; multiplying this figure by 25 V gives us 55 V peak-to-peak.

If you switch to DC coupling and connect a DC signal to your scope's vertical input, the trace will shift in accordance with its amplitude. With the gain calibrated for 25 V per divison, a shift of 3 divisions will work out to 3 × 25 V, or 75 V. There is no need to convert from a peak-to-peak value when measuring DC; your scope acts like a direct-reading voltmeter.

The advantages of a calibrated scope over a VTVM or VOM are many. A meter simply cannot do justice to the various complex waveforms you'll want to measure. One picture is still worth a thousand meter indications. ■

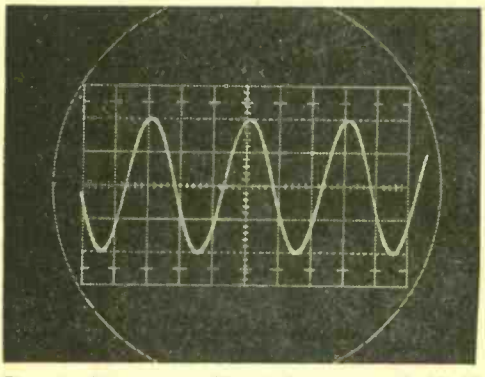


Fig. 4. Using a calibrated output of 25 V peak-to-peak, sine wave occupies four divisions on graticule. Input equals 100 V.

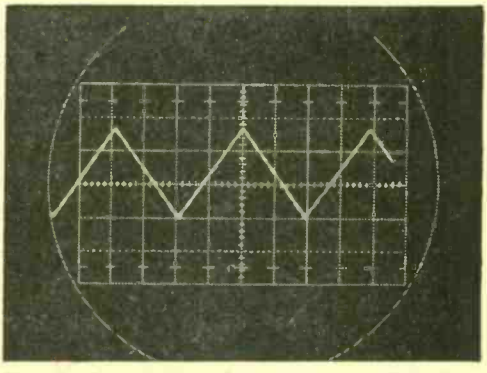
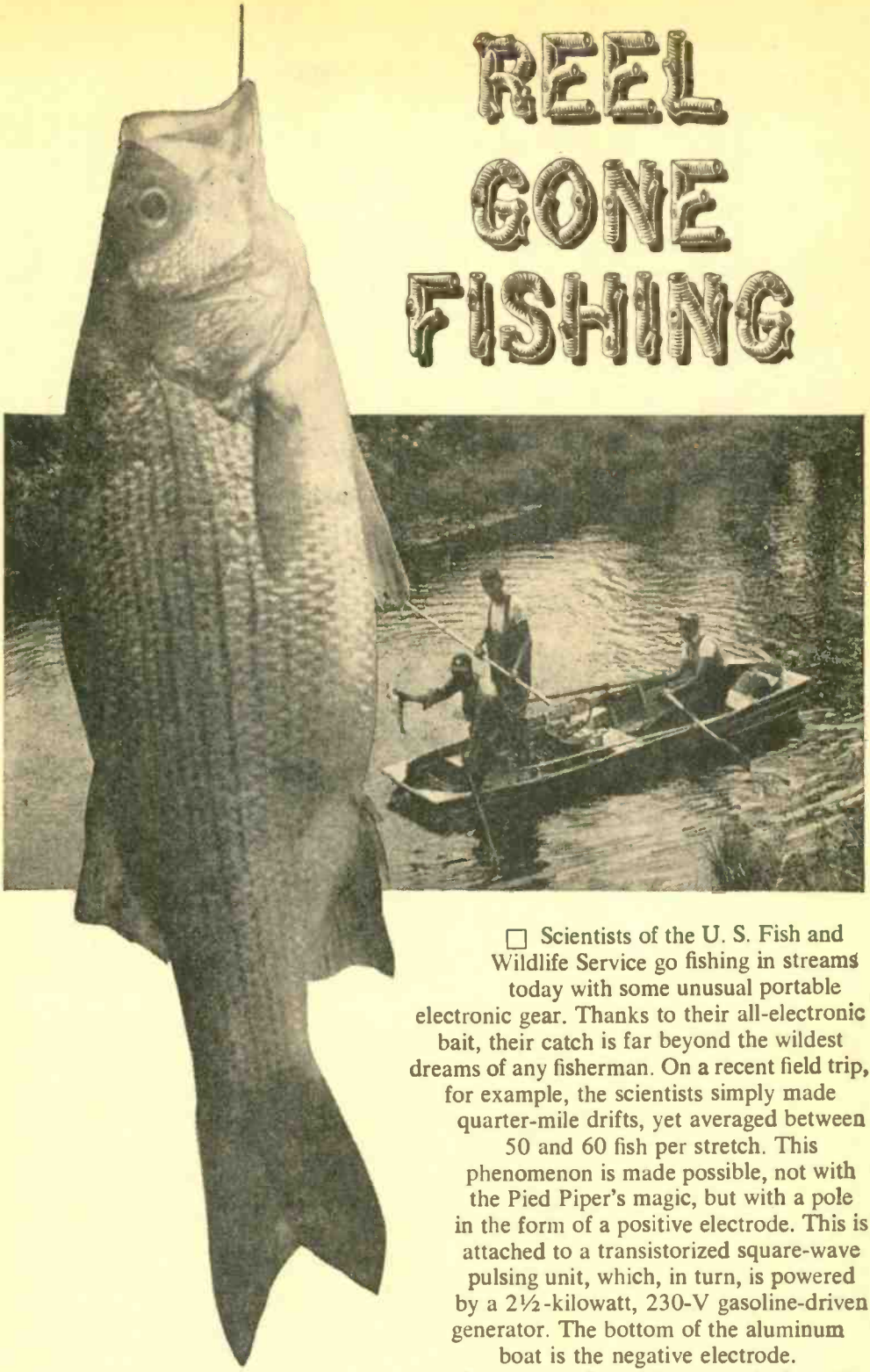


Fig. 6. Sawtooth voltage occupies 2.6 divisions, giving input of 65 V. Equation above can change this peak-to-peak value to rms.

REEL GONE FISHING



☐ Scientists of the U. S. Fish and Wildlife Service go fishing in streams today with some unusual portable electronic gear. Thanks to their all-electronic bait, their catch is far beyond the wildest dreams of any fisherman. On a recent field trip, for example, the scientists simply made quarter-mile drifts, yet averaged between 50 and 60 fish per stretch. This phenomenon is made possible, not with the Pied Piper's magic, but with a pole in the form of a positive electrode. This is attached to a transistorized square-wave pulsing unit, which, in turn, is powered by a 2½-kilowatt, 230-V gasoline-driven generator. The bottom of the aluminum boat is the negative electrode.

Accentuated Positive. In principle, the

Electronic fishing takes some paraphernalia (photo at left) but then most any kind of fishing does (ask any fisherman). Below, center, fishermen find both aluminum boat and gasoline generator light enough for loading on stream bank. In shallow water, approved technique for electronic fishing is to wade, pulling boat slowly along (photo at bottom).

system works like this: under average conditions there is an effective field radiating out about 12 feet from each electrode. The positively-charged pole is terminated in an expanded grid about 15 x 24 in. Fish that come into this field are captured by a force known as the electro-toxic effect which herds them around the positive electrode. As they approach the pole, the increased intensity of the current stuns them and the fish turn on their sides and float to the surface. Then the scientists scoop them up with a fine mesh net.

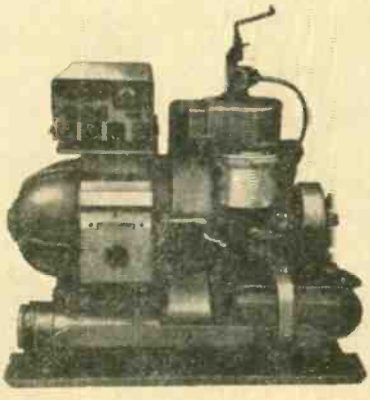
The electro-toxic effect is one of the most interesting features of the device. It is present only with DC current. And for reasons still unknown, the fish will immediately face toward the positive electrode

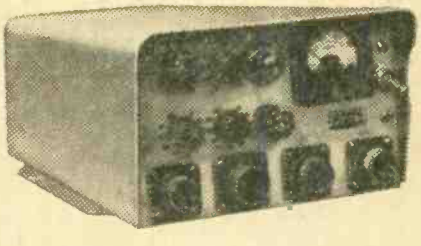
Drifting into deeper water, aide mans oars while biologists Richard Thompson (left) and Ben Patten (with net) reach for next specimen. In photos below, biologists examine specimens taken on drift with electronic fishing gear (at right); another displays 5½-lb. largemouth bass caught with electronic fishing pole he is holding.

when encountering this current. This electric pulse also causes the fishes' bodies to twitch, resulting in a swimming action in the direction of the pole. All the fish caught are as good as fish caught in the usual way.

Up With Hooks. At present, the electronic method of fishing is on debatable ground when it comes to commercial use. If everybody fished electronically, some cautious fishery scientists say it would disturb the ecological balance of the finny world.

In short, while the Feds' unusual method of fishing makes for an interesting fish story, it's not to be swallowed hook, line, and sinker. It's the hook us wee people will be catching *our* fish with for years to come. ■





Secret of reel-less fishing, pulsing unit (above) weighs less than 3 lb, can easily be mounted atop generator (photo at left).

The Temptress, The Towers, & The Gold

Sexiest thing on radio since Tokyo Rose, Titana drove me wild, wild, wild. Yet as the space ship landed, I had reason to wonder whether either she or that rarest of all QSLs would ever be mine.

By C. M. Stanbury II

☐ The first space vehicle successfully launched from Earth was Sputnik I back in 1957, right? Wrong! A private organization, name of Montalban Electronics, began a series of satellite launchings from a secret Antarctic base, year of 1950. Came 1959, and Washington and Moscow were still playing with their here-we-go-round-the-mulberry-globe satellites. Yet Montalban was already at the point of sending a *manned* expedition into deep space. That's when I got into the act.

Me, I'm Mike Tanner—radio technician by profession, soldier of fortune by temperament, and a fanatic DXer by choice. So when Montalban offered me this job at the South Pole, I grabbed it. After all, how many guys ever get a chance to DX from down there? Thing is, Montalban never did get around to briefing me on this space angle until I arrived.

In charge of Montalban's space facility was a fat character who used the code name Rinaldo. He also headed the expedition itself. Rinaldo, who always talked in a sort of nasal whine, wasted no time in explaining the mission and what was expected of yours truly.

"For the past nine years we at Montalban have been in radio contact with intelligent beings in the vicinity of Saturn."

At first I thought he was putting me on. The vicinity of Saturn? It sounded even wilder than when I set up a CIA 50-kw portable BCB station in Aden (like space vehicles, these existed long before the public knew anything about them). The unit included three giant towers which were air-transportable because of a revolutionary lightweight alloy developed by Montalban (the towers only *looked* heavy).

"Yes. While Saturn itself is uninhabitable, the planet's major moon, Titan, is 3500 miles in diameter—larger than Mercury and almost the size of Mars. Because of this and a hot gaseous emission from its interior, Titan has sufficient atmosphere and warmth to support life." Rinaldo went through this spiel perfectly deadpan.

"The space people told you all this?"

He pointed to a map of our solar system on the wall behind his desk. "And told Montalban how to build the space ship that will take us there." He paused a minute. "You can listen to these transmissions for yourself if you like, on 18 MHz. We'll provide you with a translating device."

"And why do we want to go to Titan?"

Rinaldo smiled ever so slightly. "*You* want to go to Titan for $50,000.00. Montalban, on the other hand, wants to negotiate a treaty with the Titans. Trade a certain rare substance found only on Earth for their cosmic knowledge."

Even for that kind of money the thing sounded too risky. "Suppose I decide not to go? There's nothing in my contract about Saturn, you know."

The fat man stood up. "That would delay the flight until we found another technician. You would not be paid, of course. And you'd be detained until that treaty with Titan was concluded."

It may have been Antarctica but I had begun to sweat a little.

"Montalban has spent a great deal of money on this project and wouldn't risk a disloyal employee divulging information on Titan before the deal is cinched. Whatever the Titans have to offer, Montalban intends to have exclusive rights to it on this planet."

"And if I go, what's my part in the mission?"

Rinaldo pressed a button on his desk. Instantly, the planetary chart projected on the wall behind him was replaced with a picture of the CIA's portable BCB station. "We picked you, Mr. Tanner, because of your previous experience with this unit." Rinaldo sat down again. "Titan's ionosphere is such that this station, obtained through one of our Washington contacts, would be best suited for communications purposes. On Titan medium-wave frequencies behave like short-wave channels do on this planet."

I had to admit, at least to myself, that Titan sounded like a BCB DXer's dream.

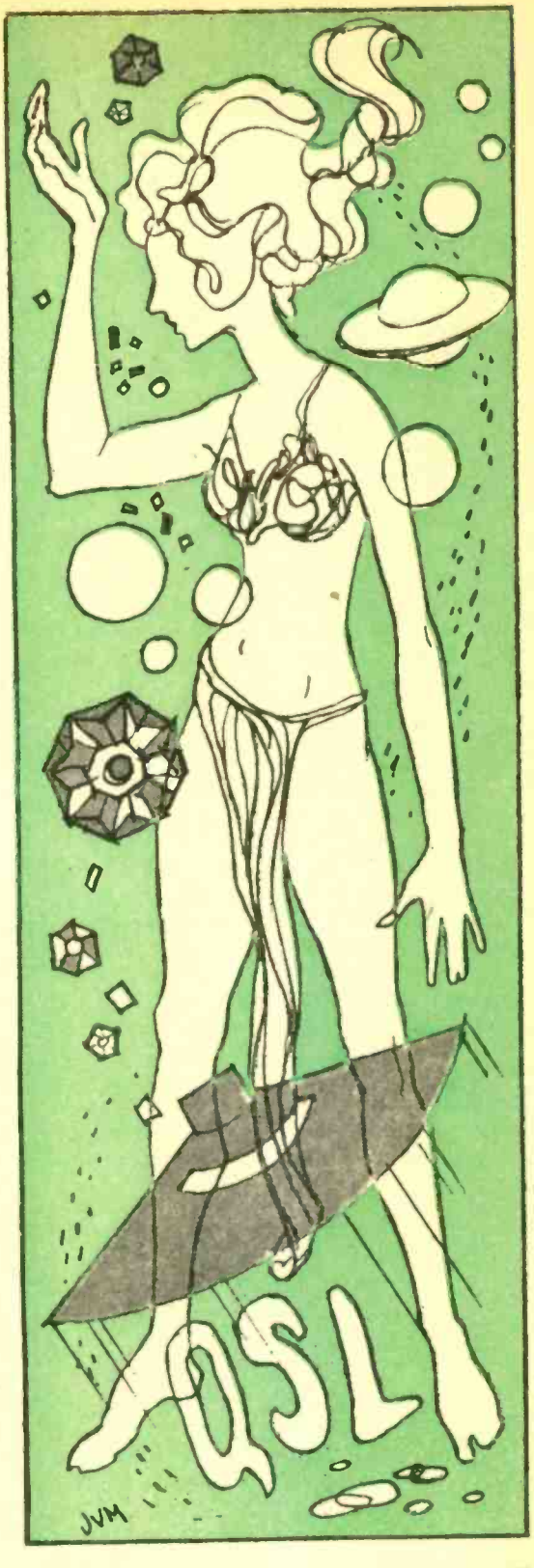
"But we'll give you time to think about it, Mr. Tanner." Rinaldo pressed another button on his desk and the office door slid open behind me. "Overnight."

"You're a real sport."

"And on your way to your quarters, do pick up one of those translating devices from the lab so that you can monitor Titan for yourself."

I did.

In order to monitor Titan signals, you first filter out all the modulation (which is just noise designed to discourage unauthorized listeners) and feed the carrier into an oscilloscope. The scope is then scanned by an appropriately programmed computer which decodes the message. When I tuned them in they were advertising their cosmic knowledge. *(Continued on page 113)*



Radio-TV EXPERIMENTER LAB CHECK

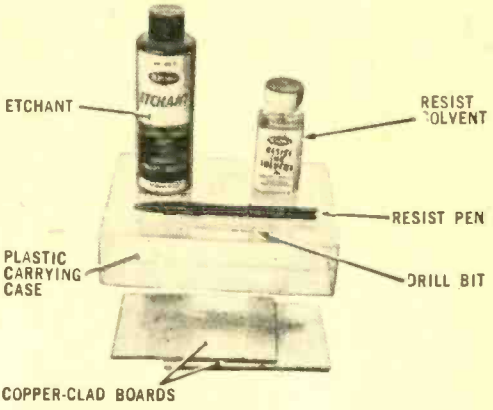
INJECTORALL
MODEL 500
7-in-1
Printed Circuit Kit

☐ If you've ever tried to duplicate the PC board used in a RADIO-TV EXPERIMENTER project, you know how difficult it can be to lay down the resist when the foil is very closely spaced. In fact, in some of the latest mini-size PC projects, the width of the tape resist is actually greater than the area between two foil connections!

But once you're equipped with an *Injectorall 500* PC kit you can tackle just about any PC job an editor can dream up. Reason is that the kit is specifically designed for fine-foil layout.

The Injectorall 500 kit consists of a resist pen, etchant, resist solvent, a 1/16-in. drill bit, two small copper-clad boards (useful for practice and small projects), and a plastic carrying case that doubles as the etching tray. The really big item is the resist pen—which appears to be a standard fiber-tip fine-line loaded with resists instead of ink. (With it, you can actually draw a fine accountant's line just as you would with a fine-line fiber pen.)

The Acid Test. To check the Injectorall 500 kit we tried making a board from a project that had appeared in our sister publication, ELEMENTARY ELECTRONICS. We first placed a piece of carbon paper between the copper-clad board and the PC layout, then traced the foil outline with a ballpoint pen. When we removed the carbon paper the layout was visible on the board. Next, we painted around the edges of the outlines with the resist pen. Finally, we tried filling in the outline with the pen.

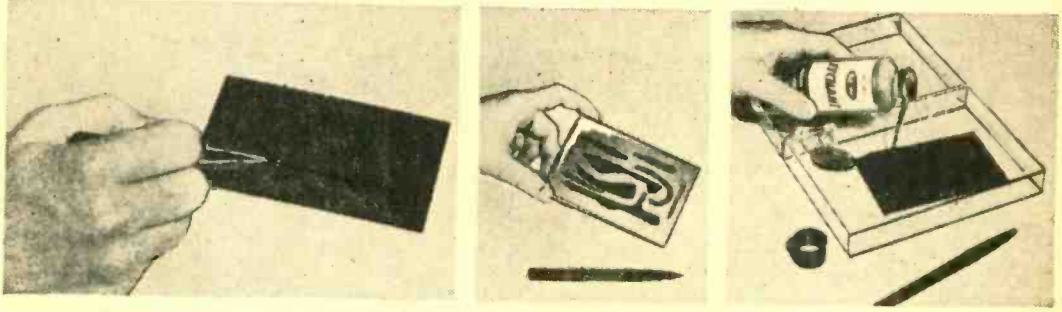


PC kit consists of resist pen, etchant, solvent, plastic case, and two copper-clad boards.

For small areas the pen did just fine, but larger areas required resist fill with a tube of resist or resist tape. Also, we used the resist pen to mark small circles at the drilling points.

The board was then placed in the plastic tray and covered with etchant. After about

(Continued on page 117)



To use 500 kit, you trace outline of PC foil layout on board, trace around outline with resist pen, then fill in larger areas with resist. Etchant takes approximately 20 minutes to do its job.

The CATV Caper

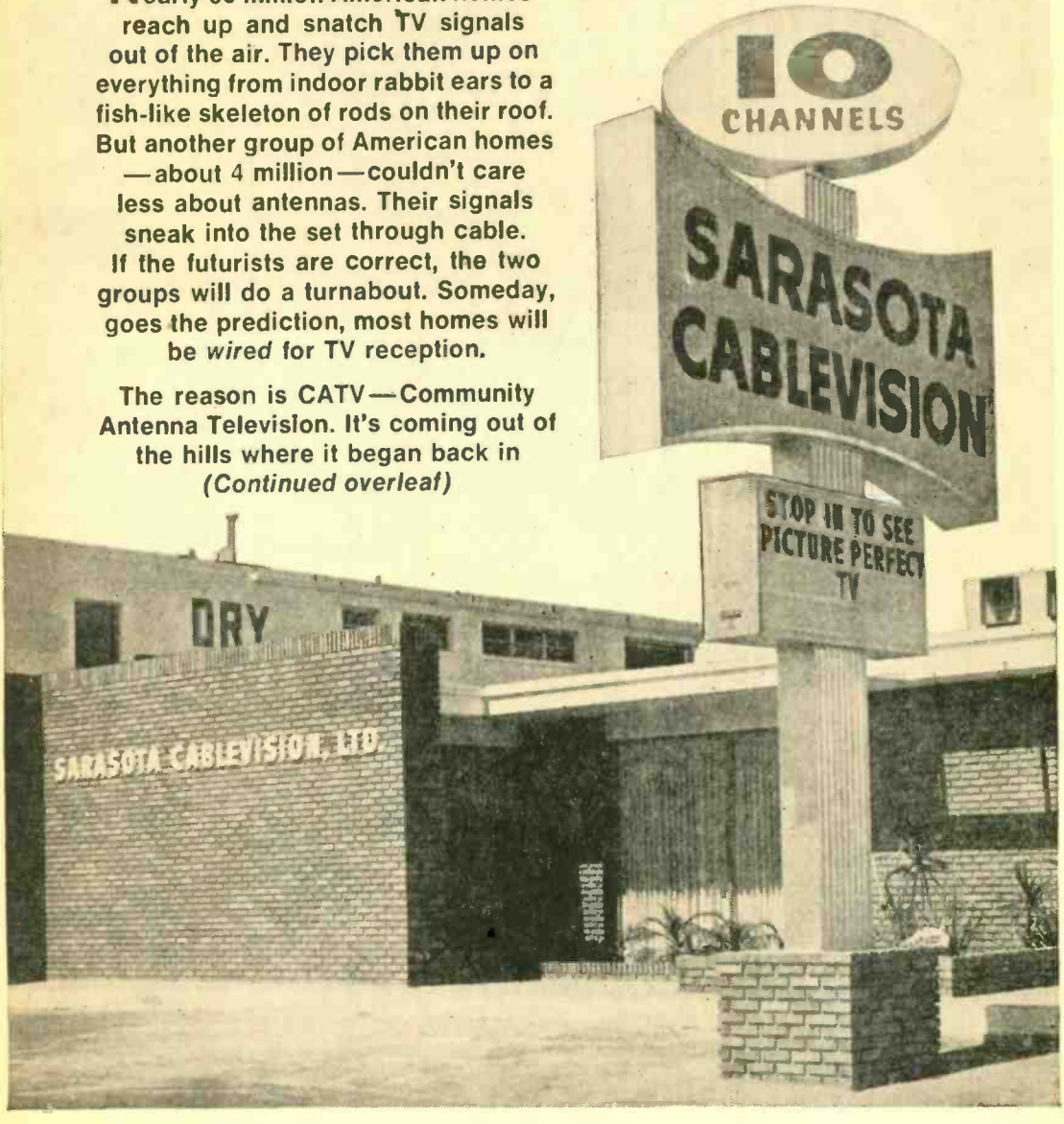
What's going on in community antenna land — and who's behind it all!

By Charles Simpson

Nearly 60 million American homes reach up and snatch TV signals out of the air. They pick them up on everything from indoor rabbit ears to a fish-like skeleton of rods on their roof. But another group of American homes —about 4 million—couldn't care less about antennas. Their signals sneak into the set through cable. If the futurists are correct, the two groups will do a turnabout. Someday, goes the prediction, most homes will be *wired* for TV reception.

The reason is CATV—Community Antenna Television. It's coming out of the hills where it began back in

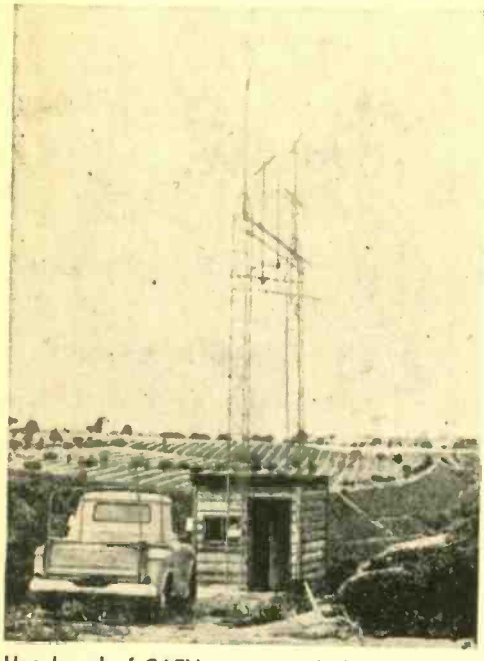
(Continued overleaf)



The CATV Caper

the days of 1949 to bring signals down the mountain to TV-starved backwoods areas. Public acceptance has been so strong, it's now invading big towns like New York, San Francisco, and Philadelphia. CATV is even trying on a new name. More and more insiders are calling it *Cable TV*—which foretells the day when entertainment won't be the only type of service fed down the line.

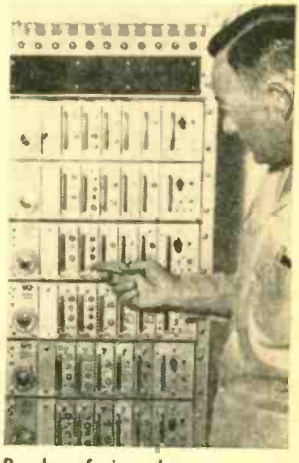
Whatever the name, the wired-TV industry is fulminating with new developments. The U.S. Supreme Court recently handed it several momentous legal decisions and engineers are dreaming up innovations to expand its technical possibilities. Since these developments nibble at the foundation of commercial TV broadcasting as we know it today, it's worth a closer look at CATV to see where it is and where it may be headed.



Head end of CATV system includes high-gain antennas for different channels and signal-processing equipment—is often unmanned.

Only No. 2. Since televiewing has turned out to be the nation's second biggest addiction (sleeping is first—measured in hours) CATV nearly begged to be born. The technical idea is easy. If TV signals are shaded from a town by rough terrain, or weakened by an obstructing horizon, one answer is *height*. So CATV technicians head for the hills to erect large antennas which snare signals at great distances. The signal is then routed via coaxial cable down the mountain and split among homes below. Some systems even use microwave relay to "import" signals picked up hundreds of miles away.

Early installations were crude. The cable might have been merely an open-wire line. Amplifiers to boost sagging signals were often simple types, actually intended for MATV, the Master Antenna systems for motels and other short-run applications. Nevertheless those early CATV systems tickled the hungry eye of the TV viewer. They often multiplied the number of channels he received from maybe one, to four or five. It wasn't long before technology could fill his dial with 12 channels. Today engineers talk about routing more than 30 programs through a single cable. Bringing in more viewable channels, though, is not the only reason for CATV's soaring success. Better reception, as we'll see, runs a close second.



Banks of signal processors are part of automatic head-end operation. Devices amplify signals and sometimes switch channel frequencies.

Hometown, U.S.A. What happened in Lafayette, Indiana, illustrates how CATV can grab a whole population. After cablemen came into town, they advertised the imminent CATV system to a potential 16,000 subscribers in the area. No less than 6000 homes, signed up for the service. The shocker is that the system wasn't even turned on yet! Existing reception in the area explains CATV's potent appeal.

Nestled in the Wabash Valley, Lafayette viewers had only one local TV station. It was Channel 18, a uhf outlet. Since the FCC law which requires uhf reception on all sets was barely on the books at the time, most sets couldn't even receive the lone local signal. So townspeople erected tall towers, elaborate antennas, and rotors to intercept tantalizing city signals passing over nearby hilltops. TV reception, though, was hardly better than poor.

The cable company solved the problem by finding the highest available antenna site just outside of town. On high terrain they raised a huge 250-ft. tower and topped it with separate high-gain antennas for each receivable channel. Signals were processed (see photo) and led down to town through miles of coaxial cable. Linemen strung wire on more than 6000 utility poles to reach every corner of town. Some 350 amplifiers along the way fortified the system against power loss. Each paying subscriber received a *house drop* to drive his TV set with studio-quality pictures.

Was it worth an installation fee ($18.50) and a monthly subscription charge ($4.50) for the service? To answer the question,

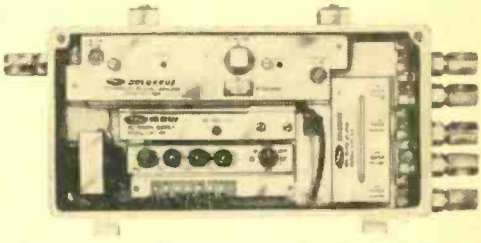
Signals from antennas feed trunk line which is main coax cable into town. Amplifiers are mounted on poles to boost distribution lines.

consider what the townspeople could now see on their screens: from Chicago came independent station WGN-TV, plus an educational outlet, WTTW-TV. From South Bend came Notre Dame's WNDU-TV. Indianapolis stations supplied two of the big networks via WFBM-TV (an NBC outlet) and WLWI-TV (ABC), as well as independent WTTV. A signal captured from Elkhart, Indiana, brought in WSJV. The CATV company also fed the local TV station through the cable, as well as Channels 72 and 76 of the Midwest Program on Airborne Television Instruction. (The uhf frequencies of the last three are translated down to regular vhf channels.)

That's not all. Subscribers on the cable also received a local music/weather program on an unused channel. It shows time, temperature, winds, and other convenient information. All the while, music from a local FM station plays when the viewer tunes this channel.

So this Indiana town received 10 channels where only one had existed before. When non-believers saw the quality and diversity of signals on neighbors' screens, many quickly became converts to CATV.

TV, Yes or No? The Lafayette phenomenon is easy to comprehend. There was a yawning gap to be filled and CATV did it. Up to now the youthful industry has con-



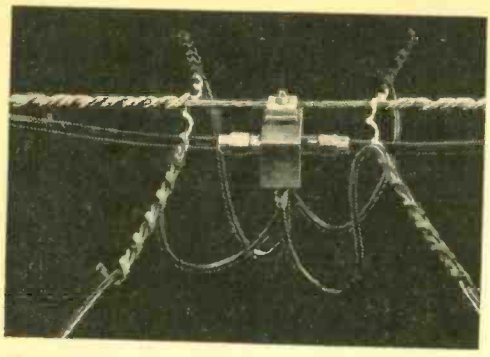
Bridging amplifier is used to tap signal from main cable and feed lines to individual homes. Circuitry consists mostly of ICs.

structed about 2000 systems around the country. Nearly 12 million people today willingly pay for programs they couldn't see before or received only at great expense because of difficult or impossible reception conditions. About 400 new systems are now under construction and nearly 2000 more communities have given the go-ahead to cable operators. Another 1700 communities are considering applications for new systems. (Since cables use city streets and utility poles, CATV operators must be awarded a franchise from each local government.)

The lure of CATV is seemingly endless. Not too long ago one operator installed a system in Greensboro, N.C. Success was hardly assured since the town is within 80 miles of 11 commercial TV stations. What's more, the FCC allowed this operator a maximum of four signals in the system. Despite such strictures, the company signed up 5000 subscribers in the first 10 months of operation and expects 10,000 by about now. The monthly fee to subscribers is $5 and few people drop the service once it's installed. Seems that anywhere CATV strings its wires, viewers respond with sock-it-to-me fervor.

Born Free? The medium's explosive growth was bound to attract attention. As coaxial tentacles spread and coffers filled, cablemen discovered they'd touched off con-

The CATV Caper



Main coax cable (on utility pole) runs from left to right under support cable. Splitter (center) provides four separate house drops.

siderable controversy. Broadcasters (TV station owners), the telephone company, and other interests viewed CATV as a renegade poacher that could grow to threatening proportions.

The broadcasters saw the specter of competition. If CATV could relay air signals into the home, it could also insert its *own channels* on the line. This simply requires an unused channel on the TV dial. A CATV operator could originate his own programs and embark on what's called "cablecasting." Next step would be to sell time and commercials, like the regular stations do. Broadcasters were also horrified by their special *poltergeist*—pay TV. A cable can feed homes via a closed-circuit with movies, plays, and sports, and bill the viewer.

So broadcasters also saw increased competition for the viewer's eye. The local TV stations were now joined by distant "imports" which might prove economically disastrous, especially to many shaky independent uhf-TV stations.

Another antagonist (at least from the CATV point of view) is the telephone company. Although the total amount of cable TV business is piddling by phone company standards, mention *communications* and the giant stirs. CATV, after all, rides alongside phone lines into the home and could grow to formidable proportions.

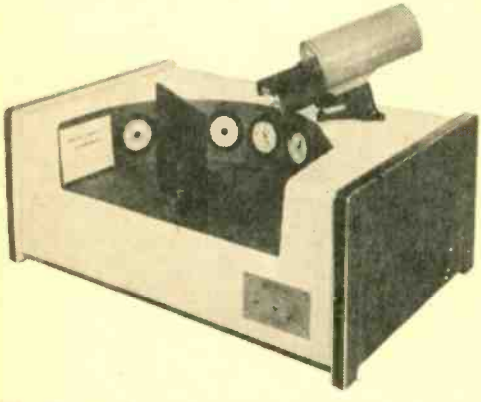
At the heart of the issue is data transmission. Today's phone lines operate at low bandwidth to carry a narrow range of voice tones. The CATV coaxial cable, on the other hand, can carry thousands of voices or other messages simultaneously, since frequency response rises to hundreds of megacycles. This could provide pathways for linking, say, a centralized computer to homes for doing income tax returns, or even supplying Mom with a recipe for braised pheasant. That brand of data transmission is, of course, the province of the phone company. So Ma Bell is interested in CATV.

It explains why she has increasingly expanded her influence in the medium. About one in four cable systems today is either owned or leased by a telephone company. The broadcasters haven't been sitting still, either. They now own about one in three CATV systems and their piece of the pie is rapidly increasing as new systems are built.

Trade and Mark. Copyright has triggered another lively issue. Obviously a CATV operator picks up copyrighted programs and merchandises them for profit. Fairness, you might say, dictates that a cableman should pay a royalty for enticing subscribers with such protected items as Bonanza and Roger Ramjet. But there's another side to the argument.

CATV operators see it this way: every set needs an antenna, and cable TV merely supplies it as a service to the viewer. It's in the same category as a viewer's own antenna, or the master antenna which feeds many sets in one building or location. Copyright, therefore, doesn't apply.

The argument failed to convince a U.S. District judge who ruled that CATV was, in fact, liable to pay a royalty on copyrighted programs. (In the test case at hand, programs were motion pictures produced by United Artists.) Though it was generally agreed within the CATV industry that royalty fees were inevitable, events then took a surprising twist.



Weather information is typical of program CATV puts on unused channel for subscribers. Rotating mirror reflects image into lens.

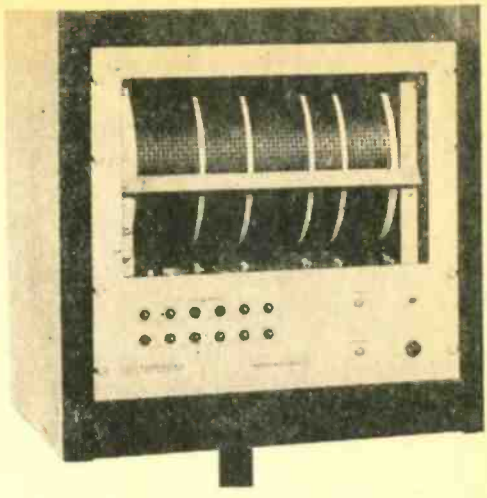
The case reached the U.S. Supreme Court in 1968. The Court echoed the cable operators' argument in saying: "It is true that a CATV system plays an 'active' role in making reception possible in a given area, but so do ordinary television sets and antennas. CATV equipment is powerful and sophisticated, but the basic function the equipment performs is little different from that performed by the equipment generally furnished by a television viewer."

Thus the high court tossed out the earlier decision and CATV did joyous handsprings. It was now cleared of copyright obligations. The Supreme Court had found CATV "on the viewers side of the line"—not the "performer's" side, like a TV broadcaster (who must pay copyright fees). Despite the ruling, there is still feeling within the CATV industry that copyright fees may yet be required at some future date, probably after new legislation is passed by Congress.

The 1968 copyright victory was one of two important Supreme Court rulings affecting the industry. At about the same time, the Court clearly *affirmed* FCC authority to control CATV. Although the Commission had assumed such authority back in 1966, it took a court decision to clinch it. The test case concerned a cable company importing a Los Angeles TV signal into San Diego. The rub was that the operator also wanted to send his own commercials over the line. This was contrary to an FCC ruling which forbade the operator from "originating advertising materials." The case ultimately reached the Supreme Court with the victory going to the FCC.

Though there is no blanket restriction on CATV commercials today, the FCC has the power to decide each case. Another cable operator, for example, was not ordered to stop originating commercials because it couldn't be proved that he was hurting TV broadcasters.

With FCC jurisdiction firmly established, the Commission's other regulations over CATV take on renewed force. For example, each system must carry on the cable all local channels, in addition to



Since distant channels may not duplicate local stations, operators use programmed switchers to prevent reception of these signals.

distant signals. A CATV system may not bring in programs from a distant station when they duplicate programs carried by local stations. (This only applies on a same-day basis. Programmed switchers at the CATV head-end automatically prevent such duplication.) Further, if a CATV operator wishes to build a system in one of the nation's top 100 TV markets, he must obtain FCC approval. The Commission then decides whether the system will hurt existing TV stations.

The liveliest action in CATV today is in those 100 top markets, the big cities that contain a vast proportion of TV viewers. Why a cable where channels are usually numerous and close at hand? One operator neatly answers the question. Viewers in Astoria, Oregon, he says, get a clearer pic-

Officials of Newport Beach watch installation of underground cable. Trench is dug quickly with special equipment and no poles need be used.

The CATV Caper

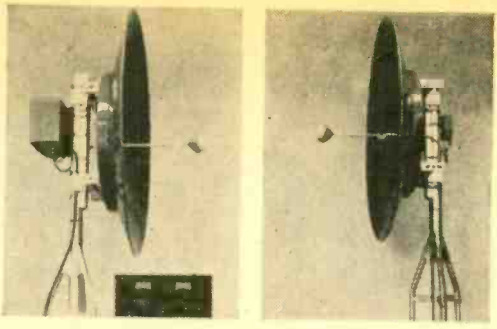
ture of Johnny Carson than New Yorkers located a few blocks from the studio where he originates. Manhattanites often suffer horrendous TV reception. Ghosts, rollovers, herringbones, jitters, overloads, and other distortions are common as signals careen and collide through concrete canyons. Buyers of color sets get Excedrin headaches (in blue) after spending $599 to see psychedelic confetti. But the cable is coming to the rescue. As in several other large cities, CATV operators in New York are laying cable and signing up subscribers.

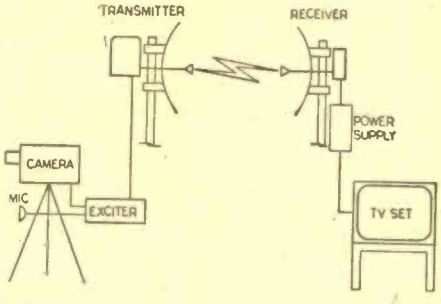
Big-city operation is no easy matter of stringing cable along utility poles. The cable must often run through underground ducts at a phenomenal cost (as high as $100,000 per mile.) Operators hit another snag at the threshold of large multiple dwellings—the landlord, who usually wants part of the take for admitting the cable.

It's the high cost of cable-running in the city that's caused CATV men to look skyward. Like the broadcasters, cable companies want a free ride through the atmosphere. The quest for cheap signal distribution has led to two new proposals.

First is microwave relay. Microwave transmissions have long been used by CATV operators to import distant TV signals that couldn't be picked up by mountaintop antennas. A recent trial approval by the FCC also allows microwave transmissions on a *local* basis to hop over underground ducts.

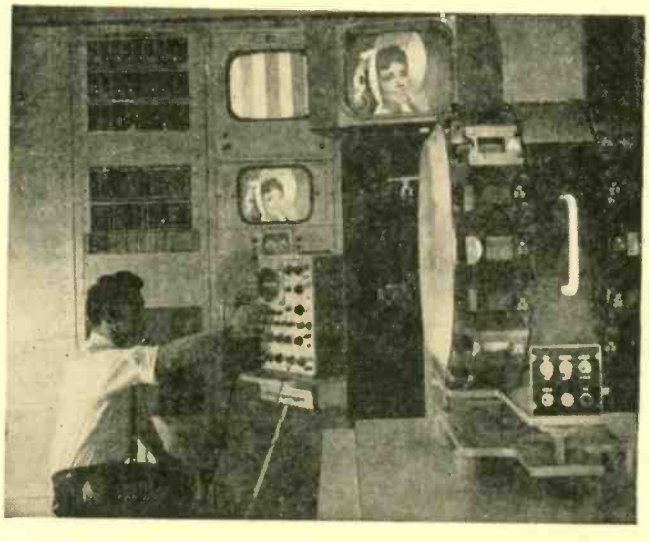
For instance, an 18-GHz signal is beamed



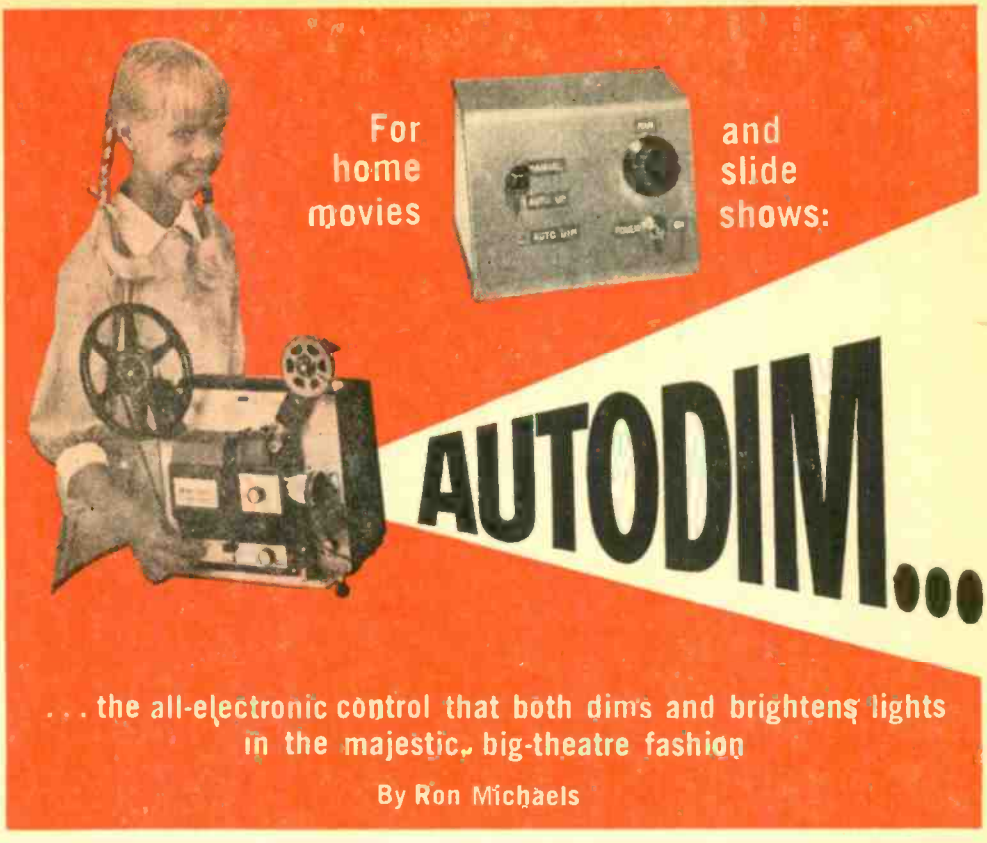


Typical microwave relay link for closed-circuit TV. Parabolic dishes, 4 miles apart, handle line-of-sight 2.5-GHz transmission.

toward apartment houses. A small receiver atop the building converts the microwave signal (which can carry several dozen channels simultaneously), and programs are fed through the building's cable network. The range of the microwave signal is now about 12 miles. Though microwave relay is usually considered a point-to-point medium, one CATV operator believes the beam can spread over a large arc to cover many buildings at once. *(Continued on page 118)*



Is cable really best for good TV reception? The professionals ought to know. Here, best possible signal is generated by studio in color-TV picture tube manufacturing plant run by Philco-Ford. Almost 6½ miles of coax cable is used to transmit studio pictures for required quality control.



☐ The audience fidgets in their seats for a few moments, then the house lights slowly and majestically dim to a gentle glow. The curtain rises and the show begins.

Once upon a time, scenes like this happened only in movie theatres. Happily, the the very same thing can now take place in your own living room before a slide or home-movie show. You provide the fidgety audience, and this unusual device—which we call the *Autodim*—will provide the smoothly dimming house lights.

All you need do is plug a floor or table lamp (up to 300 watts) into its socket. At the downward flip of a switch, the lamp slowly slides from normal brightness down to whatever level you preselect—anywhere from just under full brightness to a just-visible golden glow or even total darkness. When the show's over, you flip the switch upwards and the light level rises back to normal (smoothly, but about twice as fast as the dip down).

Actually, the *Autodim* is more than just a gadget. By bringing room lights down slowly—the downwards trip takes about 8 seconds—rather than turning them off all at once, viewers' eyes have time to become accustomed to the change. You and the members of your audience will applaud the lack of visual blackout.

How It Works. Heart of the circuit is a conventional full-wave SCR light-dimmer circuit (shown within dotted lines on the schematic diagram). In usual applications, this circuit is controlled by a variable resistor in the emitter circuit of the unijunction transistor (Q2). The degree of dimming depends on the amount of resistance present in the emitter circuit.

In the *Autodim* circuit, the usual variable resistor is replaced by a field-effect transistor or FET. This device (Q3) functions as a voltage-controlled resistor; the more negative the voltage applied between the gate and source electrodes, the greater the resistance between the drain and source electrodes. Thus, the FET's gate/source voltage in effect controls the light dimmer circuit.

The smooth downwards and upwards sliding operation of the dimmer is achieved by feeding a smoothly decreasing or increasing voltage sweep to the FET. How this is done is best explained by considering what the

AUTODIM

different front and side panel controls do.

Function switch S2 is a three-position lever switch. In its uppermost position (MANUAL), the FET input terminals are connected directly across manual light-lever control R5. This means that the device will function much like an ordinary dimmer circuit—varying R5 will change the light level. Prime function of R5 is to permit you to set the "normal" light level in your living room (this will be the "up" or "high brightness" setting).

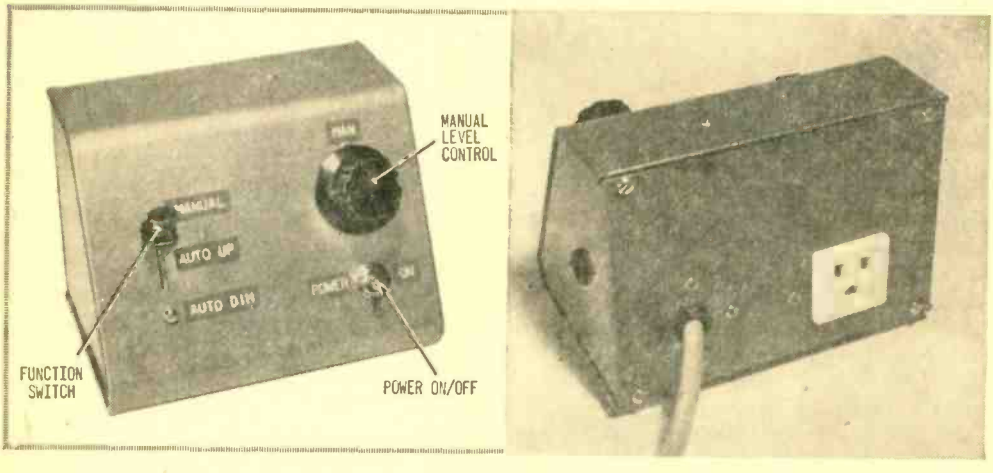
When you flip switch S2 to its center position (AUTO UP), capacitor C3 is placed across the FET's gate/source circuit. This is a time delay capacitor, and you may find that it now takes several seconds for the light level to reach the NORMAL level you specified by setting R5. This delay corresponds to the time required for C3 to charge.

When you flip the switch to its bottommost position (AUTO DIM), the FET input circuit, complete with capacitor C3, is switched from control R5 to control R4 (the low limit set control). As the capacitor discharges to the more negative voltage represented by R4's setting, it smoothly carries the FET's input along with it. As a result, the room lights slowly dim until they reach the low point you specified by setting control R4. There they remain until you flip the function switch back to AUTO UP. R5's high-limit setting then takes over, and the capacitor charges again, carrying the FET input voltage and the room light level up with it.

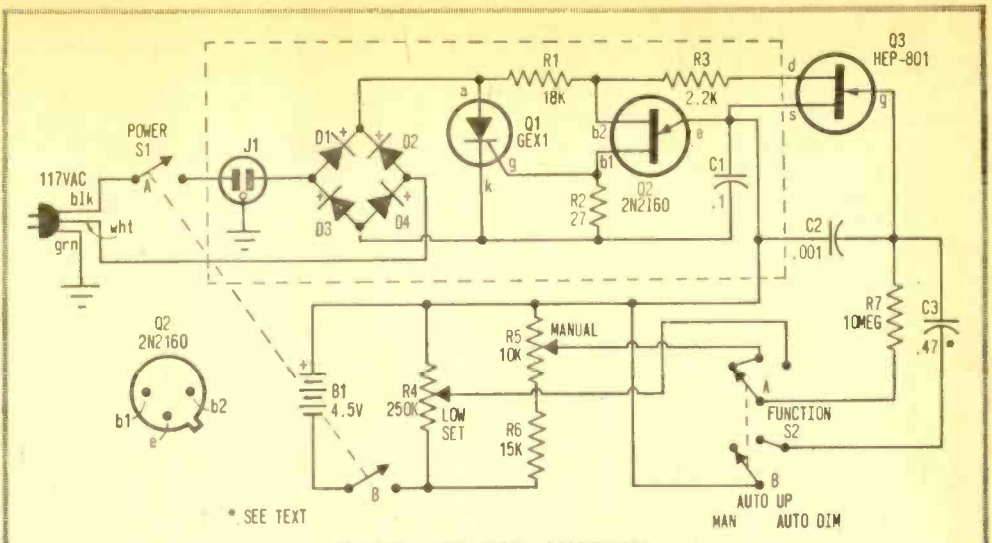
Building it. The cabinet used for our model is a 4-in. wide sloping panel aluminum utility box (Bud AC-1612-A or equiv.). However, there's nothing critical about the layout, so don't hesitate to custom-mount the AUTODIM most anywhere you wish. All of the components except the switches, manual control R4, and output socket J1 (which are all cabinet mounted) are mounted on a piece of perforated phenolic chassis board. Using epoxy, cement a small heat sink for the SCR onto the chassis; then wire the other components on the chassis board using push-in terminals as soldering points.

Double-check the polarity of the diodes and transistors before you solder them in place. Note that the "case" lead on the FET (see the diagram supplied with the transistor) should be cut off before you mount the unit. Also, use considerable care when you solder the small solid-state components, since both the unijunction and FET can be easily damaged by excess heat.

The wiring to the "left" of R1 on the diagram (including the SCR and the diode bridge composed of D1 through D4) will handle high AC or DC voltage (117 VAC and approximately 100 VDC, at different circuit points), so keep leads well spaced, and be especially watchful for short circuits. The circuit itself is not grounded to the case. However, since an improbable combination of component failure and short circuit could, conceivably, make the case electrically hot,



Front and rear views of completed Autodim. Unit is plugged into AC outlet; slide projector plugs into socket at rear of Autodim. Because of this arrangement, switch S1 must be on for projector to operate. Note position of grounded, three-prong socket (J1) at rear of unit.



PARTS LIST FOR AUTODIM

C1—0.1-uF, 200-VDC tubular capacitor
C2—.001-uF, 200-VDC tubular capacitor
C3—.47-uF, 200-VDC tubular capacitor
D1, D2, D3, D4—200-PIV, 3-A silicon rectifier (Motorola HEP-162 or equiv.)
J1—Panel-mounting, grounded three-prong socket
Q1—Silicon-controlled rectifier (GE X-1, Allied 49B3 GE-X1)
Q2—2N2160 unijunction transistor (GE, Allied 49E3 2N2160)
Q3—Field-effect transistor (Motorola HEP-801)
R1—18,000-ohm, 1-watt resistor
R2—27-ohm, ½-watt resistor
R3—2200-ohm, ½-watt resistor
R4—250,000-ohm, ½-watt, linear taper potentiometer
R5—10,000-ohm, ½-watt linear taper potentiometer
R6—15,000-ohm, ½-watt resistor
R7—10,000,000-ohm, ½-watt resistor
S1—Dpst toggle switch
S2—Dp3t lever switch (shorting contacts)

Misc.—Aluminum chassis box (see text), metal bracket, perforated chassis board, push-in terminals, heat sink (Lafayette 19H1526 or equiv.) 4.5-V battery (Eveready 333 or equiv.), battery holder, knobs, 3-wire grounded line cord, terminal strips, ¼-in. spacers, zip cord, solder, wire, hardware, etc.

a three-wire, grounded line cord *must* be used. Connect the green ground lead to the case.

Bias battery B1 is mounted in a battery holder inside the top of the case; current drain from this battery is miniscule, and it should last for well over a year of normal dimmer use. When no setting of R4 will dim room lights completely it's time to replace the battery.

Note that screwdriver-adjust pot R4 is mounted on a small metal bracket bolted to the chassis board. Cut a small access hole in the side of the case so that you can reach R4's slotted shaft with a small-blade screwdriver.

Adjustment and Use. Setting R4 can be tricky because of the time delay effect of capacitor C3. To adjust it, plug a lamp into the unit and set the function switch to the AUTO DIM position. Turn R4's shaft fully counterclockwise to produce a fully lit lamp (if you've wired the pot's lug's backwards, you may have to turn the shaft full clockwise). The lamp will require several seconds to reach full brightness.

Next, turn the shaft in the opposite direction, in small steps. After some movement you'll note that the lamp brightness will decrease. Allow at least 10 seconds between each step to give the circuit time to stabilize. Stop the procedure when you reach a low-brightness setting you consider pleasing.

Before each use of the AUTODIM, flip the function switch to MANUAL and use R5 to set the normal room light level. Bear in mind that R5 will be effective only over about 30-percent of its rotation; at the far clockwise and counterclockwise settings the room lights will be either full *off* or full *on*.

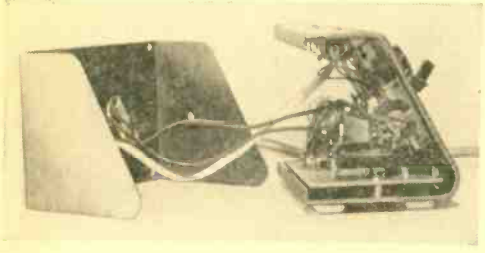
You may also find that setting R5 to its maximum lights on full-on position introduces occasional slight flickering. This is caused by the ultra-sensitive FET unijunc-

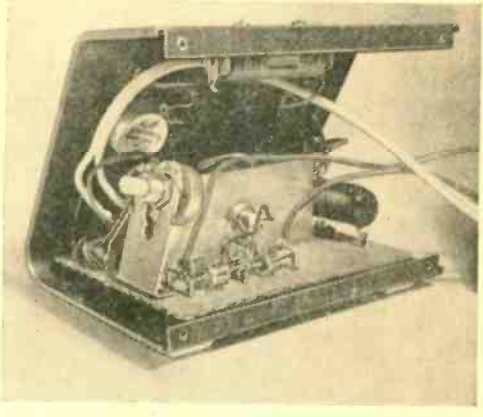
AUTODIM

tion circuit responding to slight voltage transients. To remove them, simply back off on R5's rotation slightly; maximum room brightness level will be unaffected.

One final point: whenever you turn the device *on*, cycle the lamp brightness down and up once or twice. This will permit capacitor C2 to build up a proper charge. You'll probably observe that on the first downward dip, the light level will follow a kind of roller-coaster path, as C2 charges.

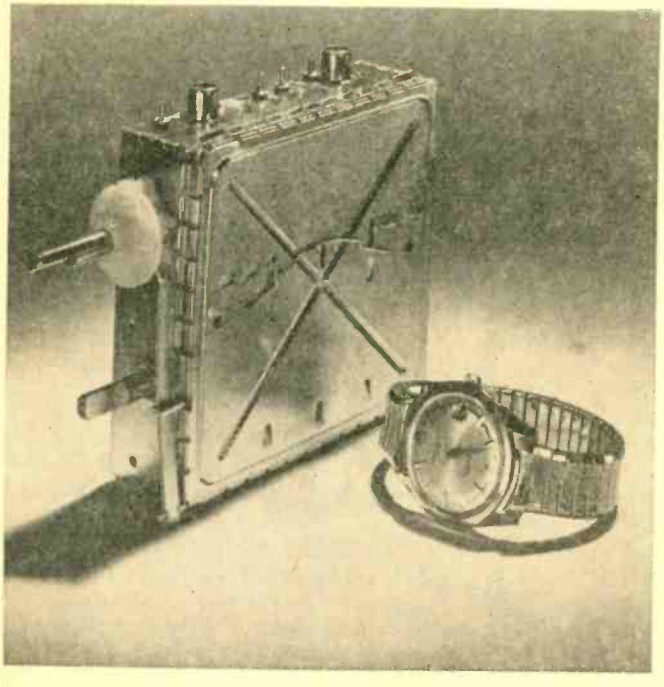
Timing Modification. If you wish to lengthen the time of the downward light level dip, increase the value of C3. As a rule of thumb, doubling its value (to 1.0 *u*F) will double the down and up times. ■





Two views of Autodim with cover removed. As explained in text, heatsink for Q1 is first cemented to chassis board, then other components are wired in place using flea clips as soldering points. Hole drilled in side of cover permits screwdriver adjustment of R4.

TWO-BAND TUNER IN A ONE-BAND CASE



As any TV technician well knows, frequencies of TV channels have a habit of hop, skip, jumping across the spectrum. (Channel one, now defunct, once fell between 44 and 50 MHz, yet channel two opens up on 54 MHz and channel seven way up on 174 MHz.) Worse yet, the fact that there are two distinct FM bands in use has meant that most TV sets have actually incorporated two distinct tuners—one for VHF channels, the other for UHF. Now, a new tuner developed by Oak Mfg. Co. puts UHF and VHF tuning circuits in a single housing. Dubbed the Mark IV, the tuner owes its success to two factors: invention of a new switching scheme and some unusual, three-transistor circuitry.

Propagation Forecast

By C. M. Stanbury II

December 1968/January 1969

☐ One change that doesn't show up on the propagation chart this time of year is a subtle shift which will take place in reception from Africa and Latin America. As spring approaches, the emphasis will gradually shift from equatorial stations to those further south into the southern hemisphere. This especially applies to DX below 9 MHz.

On 49 meters you can start looking for stations in Argentina, Chile, Uruguay, and of course southern Brazil (where Portuguese is the language). On 60 Meters you'll see gradually improving reception from potential hot spots like Rhodesia, Angola, South Africa and Zambia. With the exception of Angolans, a particularly favorable time for this area is between 2200 and 2330 EST, when many broadcast voices in lower Africa S/on.

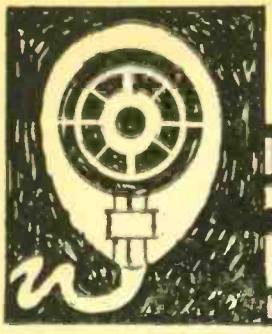
Shortwave listeners can expect regular reception from R. Hanoi on 15015 kHz (just one kiloHertz below our Apollo man-on-the-moon program's prime SW channel) during afternoon hours. Prior to this current phase in the sunspot cycle, afternoon hours have been the poorest time for Asian reception in most of North America. Incidentally, North Vietnam's menu includes English at 1500 EST, so don't mistake their announcer for one of our men on his way to the moon.

RADIO-TV EXPERIMENTER PROPAGATION FORECAST

Feb./March 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	(31), 41, 49	49, 60e, (90e)	31	49, 60
0300-0600	41, 49, 60	31	31	41, 60, (90)	49, 60
0600-0900	19, (31), 49w	16, 19	19, (60w)	25, 31	31, 49
0900-1200	19, 25	(13), 16, 19	19, 25	25	31
1200-1500	16, 19	(13), 16, 19	(19), 25	(25-poor)	19
1500-1800	19, 31	(19), 25, 31, (49)	31, (49e), 60e	(19-poor)	31
1800-2100	16, 19	25, 31	31, 60w, (90w)	16, 19	49, 60, 90
2100-2400	16, 19	25, 31	60, (90)	19, 25	49, 60, 90

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.

By MARSHALL LINCOLN



HAM TRAFFIC DE W7DQS

What Price Ham Radio?

□ "Psst! Hey, buddy! You want a ham license? You do? Good. Just step back here in this dark doorway where nobody can see us and I'll fix you up. You say you don't know the code? Aw, c'mon, Clyde, don't be a dummy—you don't need that stuff any more! And you're not so hot on theory? Forget it! Just step back here in the shadows and I'll show you how to get a genuine ham ticket real easy. By this time tomorrow, you'll be on the air, having a ball!"

An imaginary conversation? Right now fortunately, it is. But there are forces at work trying to make our little back-street melodrama for real.

All sorts of individuals and organizations have been taking stabs at making it easier to get a ham ticket. Any of those stabs could be a stab in the back for ham radio if they succeeded.

"We're just trying to inject more new blood into ham radio," they proclaim innocently. "Ham radio is not growing proportionately to the rest of our society, so we're just trying to encourage more people to take up this fascinating hobby."

And I say "Hogwash."

Ham radio does not need *quantity* to thrive, it needs *quality*. Increasing the number of hams will do nothing to make our hobby healthier if those hams get their licenses through easy exams that fail to weed out incompetents.

Not one of the proposals for easier licenses and expanded privileges will stand this test: will the proposal improve the *ability* of the new licensee to understand the operation of his equipment or to carry on *useful, meaningful communications.*

Some of the nutty proposals call for abolishing the code test, or for a slower code speed than the present 5 wpm required of Novices and Technicians. Some of the proposals seek to put Novices or Techs on 10 Meters, or Novices on 6 Meters, or Novices back on fone on 2 Meters. Others seek to make the Novice ticket renewable, thus missing the whole point of having the Novice Class in the first place: purely as a means of obtaining on-the-air experience in working toward a higher-class ticket.

Every now and then, someone who pretends to be of sound mind proposes creation of a new type of license, which might be called a "hobby" license or a "communicators" license, with little or no examination of applicants. Idle talking has become such a big part of our easy-come, easy-go society that some misguided souls think filling the air with meaningless chatter should be extended to all ham bands.

None of these proposals hold water when you ask how they would make ham radio *better*. What is clear is that they would water down our ranks tremendously by bringing in a lot of warm bodies, many devoid of brains.

A while back, we finally got back on the right track toward upgrading the Amateur Radio Service with a return to incentive licensing. Let's keep that plan in operation by junking all these silly requests for giveaway licenses. If we don't, we'll be giving away ham radio. And we'll never get it back.

New DX Challenge. For several years, the future of the DXCC award has been in doubt. For the ham who has everything, DXCC became a hollow victory. After all, once you have it, what can you do for an encore?

Now, there is an encore possible, and it's a dilly! A new *five-band* DXCC award has

been created by the ARRL. To receive it, a ham must have confirmation of at least 100 countries *on each of five separate bands*. Some of the hard workers probably have the QSL cards stashed away right now to get this award, but there's a hooker: *all* contacts must have been made after January 1, 1969!

That'll separate the men from the boys for quite a while, and breathe some new life into what had become a "so what?" type of award. With the current sunspot cycle starting downhill and a slice of 40-Meter DX frequencies now taken away from all but the Extra and Advanced Class operators, this award is going to be the object of some feverish activity.

High-Priced Hamming. "Never mind the bruises—collect, collect, and make a speech now and then about restraint and holding the line."

That's Ernie Welling, VE2YU, complaining, and he has plenty to complain about. Ernie is editor of *electron* (a Canadian electronics magazine), and he writes a regular column in the magazine dealing with ham radio.

Lately he's been taking editorial pot shots at the high taxes, duties, and fees which Canadian hams must pay, and he appears to have a sharp aim. When you consider what our neighbors north of the border must pay for licenses and taxes on their equipment, it's remarkable there is any ham radio in Canada at all.

The latest oppressive indignity to be dumped on the VE/VO hams is a fantastic increase in license fees: from $2.50 to $10.00! That's a 400% increase, and they have to pay it every year! Amendments to an existing license now cost $6.00!

Ernie's reaction to this dumbfounding development is concise and to the point:

"The increase in the amateur license fee is an outrage. It has been forced on the licensees without consultation; it is visited upon a group who are not using radio for profit or reward; it penalizes a large number of non-wage earners; it will seriously affect the growth of the hobby among the young, where the country needs it most; and it does not correspond to any increase in services by the Department of Transport. We will obviously have to stop thinking of this as a license fee because what we now have on our hands is a tax—'a contribution levied for support of the government.'"

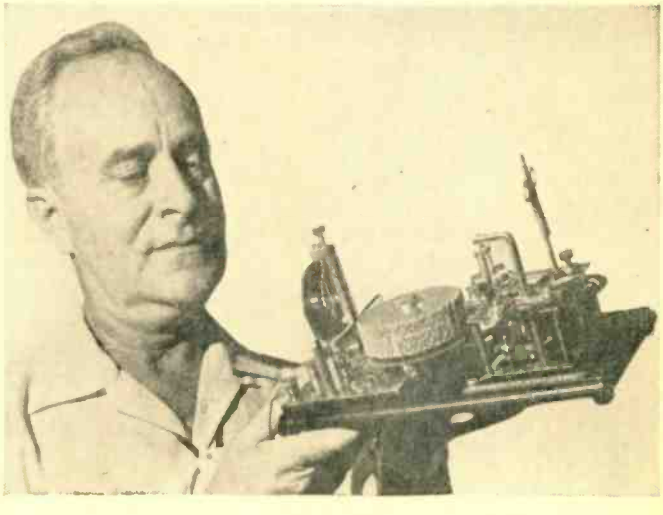
Those words could well be taken to heart by U.S. hams, who have rather blithly accepted our license "fees" without questioning where the money really goes or what it's spent for. (For the record, license fees which U.S. hams pay do *not* go into the FCC budget, and they are *not* proportional to the amount of service which hams receive from the FCC.) I've insisted since the beginning that these are not fees we pay—they are taxes in the true sense of the word. What's more, they are unfair, discriminatory, and illegally-levied taxes at that.

Our Canadian comrades have the same problem, save that they must cough up more than we do. We could be next in this mad mania of modern governments to tax everything in sight and then keep raising the price.

Ernie reports there has been quite a ruckus raised over the license-fee increase, with several petitions filed opposing it.

But the license tax isn't the only price of being a ham in Canada. For all store-bought equipment, there's also the not-so-little matter of the 15% Federal excise tax. Then there's the 11% Federal sales tax. In some cases, there's a provincial sales tax. And if

(Continued on page 114)



Omnigraph, patented in 1904, once struck terror into the hearts of would-be hams. Held by Forest Arden, W7IJP, spring-driven instrument furnished code for tests in license exams.

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* was founded in Providence, R. I. by Charles De Witt White as an extension of his earlier publishing activities. Interestingly enough, these, in turn, were a continuation of the business established by his father: the publication of city directories, street guides, and municipal tax guides.

In the early days of broadcasting, compiling a list of operating stations and their frequencies was no simple task. Reason was that prior to the Dill-White Radio Act of 1927, any feed merchant, auto dealer, barber, or undertaker who wanted to advertise his wares or services had only to select a frequency and go on the air. A great many experimenters and businessmen did just that.

Nevertheless, Mr. White's directory publishing experience had convinced him that he could successfully assemble a radio log. In 1924 he justified this conviction with *The Rhode Island Radio Call Book*, following this shortly after with *White's Triple List of Radio Broadcasting Stations*.

In 1927 the two publications were merged and nation-wide distribution established. In ensuing years related publications, such as *Sponsored Radio Programs, Radio Announcer's Guide, Short-Wave Schedule Guide*, and a special Canadian edition of the *Log* (which had had its title shortened to the one it bears today), were also issued.

The *Log* itself eventually reached a combined circulation of well over a million copies. It also came up with some rather unusual bedfellows. In 1929-31 it was distributed as the *Enna Jettick Radio Log* (to promote the sale of shoes); in 1938-9 as the *General Electric Radio Log* to promote General Electric's "sensational 1939 receivers with pushbutton tuning."

The Fall-Winter number of the 1927 *Log* listed 701 U.S. stations. Most powerful were WEAF (now WRCA), New York, with 50,000 watts; KDKA, Pittsburgh; WGY, Schenectady; and WJZ (now WABC), New York, each with 30,000 watts; WGN-WLIB, Chicago, with 15,000 watts; and Boston's WBZ, also with 15,000. Five stations listed (one a Junior High School in Norfolk, Va.) operated on a mighty 5 watts; more than 100 stations had outputs of less than 100 watts.

The current *Log* cross-indexes over 4244 U.S. standard-broadcast (AM) stations, over 2247 U.S. frequency-modulation (FM) and over 810 television stations, has a complete compilation of Canadian broadcasters, and, in addition, has a comprehensive world-wide roster of shortwave stations.

With the success of his *Log*, Charles De Witt White (a direct descendant of Peregrine White, the first child born on the *Mayflower's* historic crossing and bearer of the name of another illustrious ancestor, De Witt Clinton) disposed of his city directory and street guide interests. In time, he transferred his editorial operations to Bronxville, N. Y., a suburb of New York City, where he could remain in close touch with the

broadcasting industry. On April 6, 1957, having only recently completed revising and updating material for the 34th consecutive year of his *Log*, Mr. White died in his sleep. He was 76 years old.

Charles De Witt White's daughter and heir, Mrs. W. R. Washburn, sold all rights in and to the *Log* to Science & Mechanics Publishing Co., and entrusted us with continuing her father's work. This we were proud to do back in 1958 in the fifth issue of RADIO-TV EXPERIMENTER—then an annual publication.

Beginning with our first bimonthly issue in 1964, *White's Radio Log* was divided into three parts (it had grown to 60 pages in size and was much too large to incorporate in any one issue). From 1964 until the present, we published the *Log* in three parts, updating each part right up to press time.

Now, in 1969, the size of the *Log* again necessitates a change. Therefore, *White's Radio Log* will be published in six parts during 1969. In each issue we will include a major listing for either AM Broadcasting Stations, FM Broadcasting Stations or Television Stations; plus the expanded World-Wide Shortwave Section (brand new for each issue); plus the all-new Emergency Radio Listing for major U.S. cities (a different major city will appear in every issue).

In this issue of RADIO-TV EXPERIMENTER, *White's Radio Log* contains *U.S. AM Stations by Frequency, World-Wide Shortwave Stations*, and *Emergency Radio Listings for Chicago, Ill. and Surrounding Communities.*

As always, as we go to press on each issue of *White's Radio Log*, station additions, changes, and deletions are made by the U.S. and Canadian governments. The same holds true for the world-wide shortwave broadcasters. Therefore, the Editor cordially invites all readers to inform him of any changes that must be made to keep the *Log* up to date. (In some instances our readers discover and notify us of changes *before* the FCC or DOT officially inform us.) Keep your cards and letters coming—they are most sincerely appreciated, and it's the one way you can help us make a better *Log*.

WHITE'S RADIO LOG CONTENTS FOR 1969

WHITE'S

RADIO LOG

U.S. AM Stations by Frequency

U. S. stations listed alphabetically by states within groups. Abbreviations: kHz, frequency in kilocycles; W.P., power in watts; d, operates daytime only; n, operates nighttime only. Wave length is given in meters.

Listing indicates stations on the air up to October 14, 1968.

kHz	Wave Length	W.P.
540—555.5		
KVIP	Redding, Calif.	1000
WGTO	Cypress Gardens, Fla.	50000d
WDAK	Columbus, Ga.	5000
KWMT	Ft. Dodge, Iowa	5000d
KNOE	Monroe, La.	5000
WDMV	Pocomoke City, Md.	500d
WLIX	Islip, N.Y.	250d
WETC	Wendell-Zebulon, N.C.	250d
WARO	Canonsburg, Pa.	250d
WYNN	Florence, S.C.	250d
WDXN	Clarksville, Tenn.	1000d
WRIC	Richlands, Va.	1000d
WYLO	Jackson, Wisc.	250d
550—545.1		
KENI	Anchorage, Alaska	5000
KOY	Phoenix, Ariz.	5000
KAFY	Bakersfield, Calif.	1000
KRAI	Craig, Colo.	5000
WAYR	Orange Park, Fla.	1000d
WGGA	Gainesville, Ga.	5000
KMVI	Wailuku, Hawaii	5000
KFRM	Salina, Kans.	5000d
WCBI	Columbus, Miss.	1000
KSD	St. Louis, Mo.	5000
KBOW	Butte, Mont.	1000
WGR	Buffalo, N.Y.	5000
WDBM	Statesville, N.C.	500d
KFYR	Bismarck, N.Dak.	5000
WKRC	Cincinnati, Ohio	5000
KOAC	Corvallis, Oreg.	5000
WHLM	Bloomsburg, Pa.	1000
WPAB	Ponce, P.R.	5000
WXTR	Pawtucket, R.I.	1000
KCRS	Midland, Tex.	5000
KTSA	San Antonio, Tex.	5000
WDEV	Waterbury, Vt.	5000
WSVA	Harrisonburg, Va.	5000
KARI	Blaine, Wash.	5000
WSAU	Wausau, Wis.	5000
560—535.4		
WOOF	Dothan, Ala.	5000d
KYUM	Yuma, Ariz.	1000
KSFO	San Fran., Calif.	5000
KLZ	Denver, Colo.	5000
WQAM	Miami, Fla.	5000
WIND	Chicago, Ill.	5000
WMIK	Middlesboro, Ky.	500d
WGAN	Portland, Maine	5000
WFRB	Frostburg, Md.	1000d
WHYN	Springfield, Mass.	5000
WQTE	Monroe, Mich.	500d
WEBC	Duluth, Minn.	5000
KWTO	Springfield, Mo.	5000
KMON	Great Falls, Mont.	5000
WGAI	Elizabeth City, N.C.	1000
WFIL	Philadelphia, Pa.	5000
WIS	Columbia, S.C.	5000
WHBQ	Memphis, Tenn.	5000
KLVI	Beaumont, Tex.	5000
KPQ	Wenatchee, Wash.	5000
WJLS	Beckley, W.Va.	5000
570—526.0		
WAAX	Gadsden, Ala.	5000
KCNO	Alturas, Cal.	5000d
WFSO	Pinellas Park, Fla.	500d
WACL	Waycross, Ga.	5000
WKYX	Paducah, Ky.	1000
WGMS	Bethesda, Md.	5000
WVMI	Biloxi, Miss.	1000d
KGRT	Las Cruces, N.Mex.	5000d
WMCA	New York, N.Y.	5000
WSYR	Syracuse, N.Y.	5000
WWNC	Asheville, N.C.	5000
WLLE	Raleigh, N.C.	500d
WKBN	Youngstown, Ohio	5000
WNAX	Yankton, S.Dak.	5000
WFAA	Dallas, Tex.	5000
WBAP	Ft. Worth, Tex.	5000
KLUB	Salt Lake City, Utah	5000
KVI	Seattle, Wash.	5000
WMAM	Marinette, Wis.	250
580—516.9		
WABT	Tuskegee, Ala.	500d
KIKX	Tucson, Ariz.	5000
KMJ	Fresno, Calif.	5000
KUBC	Montrose, Colo.	5000
WDBO	Orlando, Fla.	5000
WGAC	Augusta, Ga.	5000
KFXO	Nampa, Idaho	5000
WILL	Urbana, Ill.	5000d
KSAC	Manhattan, Kans.	5000
WIBW	Topeka, Kans.	5000
KALB	Alexandria, La.	5000
WTAG	Worcester, Mass.	5000
WELO	Tupelo, Miss.	1000
KANA	Anaconda, Mont.	1000d
WAGR	Lumberton, N.C.	500d
KWIN	Ashland, Oreg.	1000
WHP	Harrisburg, Pa.	5000
WKAQ	San Juan, P.R.	5000
KOBH	Hot Springs, S.Dak.	500d
WRKH	Rockwood, Tenn.	1000d
KDAV	Lubbock, Tex.	500d
WLES	Lawrenceville, Va.	500d
WCHS	Charleston, W.Va.	5000
WKTY	LaCrosse, Wis.	5000
590—508.2		
KHAR	Anchorage, Alaska	5000
WRAG	Carrollton, Ala.	1000d
KBHS	Hot Springs, Ark.	5000d
KFXM	San Bernardino, Cal.	1000
KTHO	S. Lake Tahoe, Cal.	1000d
KCSJ	Pueblo, Colo.	1000
WDLP	Panama City, Fla.	1000
WPLO	Atlanta, Ga.	5000
KGMB	Honolulu, Hawaii	5000
KID	Idaho Falls, Idaho	5000
WRTH	Wood River, Ill.	1000
WVLK	Lexington, Ky.	5000
WEEI	Boston, Mass.	5000
WJMS	Ironwood, Mich.	5000
WKZO	Kalamazoo, Mich.	5000
KGLE	Glendive, Mont.	500d
WOW	Omaha, Nebr.	5000
WROW	Albany, N.Y.	5000
WCAB	Rutherfordton, N.C.	500d
WGTM	Wilson, N.C.	5000
KUGN	Eugene, Oreg.	5000
WARM	Scranton, Pa.	5000
WMBS	Uniontown, Pa.	1000
KTBC	Austin, Tex.	5000
KSUB	Cedar City, Utah	1000
WLVA	Lynchburg, Va.	1000
KHQ	Spokane, Wash.	5000
600—499.7		
WIRB	Enterprise, Ala.	1000d
KCLS	Flagstaff, Ariz.	5000
KVCV	Redding, Calif.	1000
KOGO	San Diego, Calif.	5000
KZIX	Ft. Collins, Colo.	1000d
WICC	Bridgeport, Conn.	5000
WPDQ	Jacksonville, Fla.	5000
WMT	Cedar Rapids, Iowa	5000
WWOM	New Orleans, La.	1000d
WFST	Caribou, Maine	5000d
WCAO	Baltimore, Md.	5000
WLST	Escanaba, Mich.	1000d
WTAC	Flint, Mich.	1000
KGEZ	Kalispell, Mont.	1000
WCVP	Murphy, N.C.	1000d
WSJS	Winston-Salem, N.C.	5000
KSJB	Jamestown, N.D.	5000
WSOM	Salem, Ohio	500d
WFRM	Coudersport, Pa.	1000d
WAEL	Mayaguez, P.R.	1000
WREC	Memphis, Tenn.	5000
KROD	El Paso, Tex.	5000
KERB	Kermit, Tex.	1000d
KTBB	Tyler, Tex.	1000
WVAR	Richwood, W.Va.	1000d
610—491.5		
WSGN	Birmingham, Ala.	5000
KAVL	Lancaster, Calif.	1000
KFRC	San Francisco, Calif.	5000
WTOR	Torrington, Conn.	1000
WIOD	Miami, Fla.	5000
WMEL	Pensacola, Fla.	500d
WCEH	Hawkinsville, Ga.	500d
KNAH	Agana, Guam	1000
WRUS	Russellville, Ky.	500d
KDAL	Duluth, Minn.	5000
WOAF	Kansas City, Mo.	5000
KOJM	Havre, Mont.	1000
KCSR	Chadron, Nebr.	1000d
WGIR	Manchester, N.H.	5000
KGGM	Albuquerque, N.Mex.	5000
WAYS	Charlotte, N.C.	5000
WTVN	Columbus, Ohio	5000
WIP	Philadelphia, Pa.	5000
KILT	Houston, Tex.	5000
KVNU	Logan, Utah	5000
WSLS	Roanoke, Va.	5000
WHPL	Winchester, Va.	500
KEPR	Kennewick-Richmond-Pasco, Wash.	5000
620—483.6		
KTAR	Phoenix, Ariz.	5000
KNGS	Hanford, Calif.	1000
KWSD	Mt. Shasta, Calif.	1000d
KSTR	Grand Junction, Colo.	5000d
WSUN	St. Petersburg, Fla.	5000
WTRP	LaGrange, Ga.	1000d
KWAL	Wallace, Idaho	1000
KMNS	Sioux City, Iowa	1000
WTMT	Louisville, Ky.	500d
WLBZ	Bangor, Maine	5000
WJDX	Jackson, Miss.	5000
WVNJ	Newark, N.J.	5000
WHEN	Syracuse, N.Y.	5000
WDNC	Durham, N.C.	5000
KGW	Portland, Oreg.	5000
WHJB	Greensburg, Pa.	1000
WCAY	Cayce, S.C.	500d
WATE	Knoxville, Tenn.	5000
KWFT	Wichita Falls, Tex.	5000
WVMT	Burlington, Vt.	5000
WWNR	Beckley, W.Va.	1000
WTMJ	Milwaukee, Wis.	5000
630—475.9		
WAVU	Albertville, Ala.	1000d
WJDB	Thomasville, Ala.	1000d
KYAK	Anchorage, Alaska	5000d
KJNO	Juneau, Alaska	1000
KVMA	Magnolia, Ark.	1000d
KIDD	Monterey, Calif.	1000
KHOW	Denver, Colo.	5000
WMAL	Washington, D.C.	5000
WSAV	Savannah, Ga.	5000
WNEG	Toccoa, Ga.	500d
KIDO	Boise, Idaho	5000
WLAP	Lexington, Ky.	5000
KTIB	Thibodaux, La.	500d
KDWB	So. St. Paul, Minn.	5000
KXOK	St. Louis, Mo.	5000
KGVW	Belgrade, Mont.	1000d
KOH	Reno, Nev.	5000
KLEA	Lovington, N.Mex.	500d
WIRC	Hickory, N.C.	1000d
WMFD	Wilmington, N.C.	1000
KWRO	Coquille, Oreg.	5000d
WEJL	Scranton, Pa.	500d
WKYN	San Juan, P.R.	5000
WPRO	Providence, R.I.	5000
KMAC	San Antonio, Tex.	5000
KSXX	Salt Lake City, Utah	1000d
KGDN	Edmonds, Wash.	5000d
KZUN	Opportunity, Wash.	500d
640—468.5		
KFI	Los Angeles, Calif.	50000
WOI	Ames, Iowa	5000d
WHLO	Akron, O.	1000d
WNAD	Norman, Okla.	1000d
650—461.3		
KORL	Honolulu, Hawaii	10000
WSM	Nashville, Tenn.	50000
KIKK	Pasadena, Texas	250d
660—454.3		
KFAR	Fairbanks, Alaska	10000
KOZN	Omaha, Neb.	1000d
WNBC	New York, N.Y.	50000
WESC	Greenville, S.C.	10000d
KSKY	Dallas, Tex	10000d
670—447.5		
KBOI	Boise, Idaho	50000
WMAQ	Chicago, Ill.	50000
680—440.9		
KNBR	San Francisco, Cal.	50000
WWBA	St. Petersburg, Fla.	1000d
WRNG	N. Atlanta, Ga.	5000d
WCTT	Corbin, Ky.	1000
WCBM	Baltimore, Md.	10000
WRKO	Boston, Mass.	50000
WDBC	Escanaba, Mich.	10000
KFEQ	St. Joseph, Mo.	5000
WINR	Binghamton, N.Y.	1000
WNYR	Rochester, N.Y.	250d
WPTF	Raleigh, N.C.	50000
WISR	Butler, Pa.	250d
WAPA	San Juan, P.Rico.	10000
WMPS	Memphis, Tenn.	10000
KBAT	San Antonio, Tex.	50000
KOMW	Omak, Wash.	1000d
WCAW	Charleston, W.Va.	10000
690—434.5		
WVOK	Birmingham, Ala.	50000d
KEOS	Flagstaff, Ariz.	1000
KEVT	Tucson, Ariz.	250d
KBBA	Benton, Ark.	250d
KAPI	Pueblo, Colo.	250d
WADS	Ansonia, Conn.	500d
WAPE	Jacksonville, Fla.	50000
KKUA	Honolulu, Hawaii	10000
KBLI	Blackfoot, Idaho	1000d
KGGF	Coffeyville, Kans.	10000
WTIX	New Orleans, La.	10000
KTCR	Minneapolis, Minn.	500d
KSTL	St. Louis, Mo.	1000d
KEYR	Terrytown, Nebr.	1000d
KRCO	Prineville, Oreg.	1000d
WXUR	Media, Pa.	500d
KUSD	Vermillion, S.Dak.	1000d
KHEY	El Paso, Tex.	10000
KPET	Lamesa, Tex.	250
KZEY	Tyler, Tex.	5000d
WCYB	Bristol, Va.	10000d
WNNT	Warsaw, Va.	250d
WELD	Fisher, W. Va.	500d
WAGO	Oshkosh, Wis.	
700—428.3		
WLW	Cincinnati, Ohio	50000
710—422.3		
WKRG	Mobile, Ala.	1000
KMPC	Los Angeles, Calif.	50000
KBTR	Denver, Colo.	5000
WGBS	Miami, Fla.	50000
WUFF	Eastman, Ga.	1000d
WROM	Rome, Ga.	1000d
KEEL	Shreveport, La.	50000
WHB	Kansas City, Mo.	10000
WOR	New York, N.Y.	50000
DZRH	Manila, P.I.	10000
WKJB	Mayaguez, P.Rico	1000
WTPR	Paris, Tenn.	250d
KGNC	Amarillo, Tex.	10000
KURV	Edinburg, Tex.	250
KIRO	Seattle, Wash.	50000
WDSM	Superior, Wis.	5000
720—416.4		
KUAI	Eleele, Hawaii	5000
WGN	Chicago, Ill.	50000
730—410.7		
WJMW	Athens, Ga.	1000d
KSUD	W. Memphis, Ark.	250d
WLOR	Thomasville, Ga.	5000d
KLDE	Goodland, Kans.	1000d
WFMW	Madisonville, Ky.	500d
WMTC	Vanclave, Ky.	1000d
KTRY	Bastrop, La.	250d
WARB	Covington, La.	250d
WJTO	Bath, Maine	1000d
WACE	Chicopee, Mass.	5000d
WVIC	E. Lansing, Mich.	500d
KWRE	Warrenton, Mo.	1000d
KWOA	Worthington, Minn.	1000d
KURL	Billings, Mont.	500d
KVOD	Albuquerque, N. Mex.	1000d
WDOS	Oneonta, N.Y.	1000d
WFMC	Goldsboro, N.C.	1000d
WOHS	Shelby, N.C.	1000d
WMGS	Bowling Green, Ohio	1000d
KBOY	Medford, Oreg.	1000d
WNAK	Nanticoke, Pa.	1000d
WPIT	Pittsburgh, Pa.	5000d
WPAL	Charleston, S.C.	1000d
WLIL	Lenoir, Tenn.	1000d
KPCN	Grand Prairie, Tex.	500d
KSVN	Ogden, Utah	1000d
WPIK	Alexandria, Va.	5000d
WMNA	Gretna, Va.	1000d
KULE	Ephrata, Wash.	1000d
WXMT	Merrill, Wis.	1000d
740—405.2		
WBAM	Montgomery, Ala.	50000d
KMEO	Phoenix, Ariz.	1000d
KBIG	Avalon, Cal.	10000d
KCBS	San Francisco, Calif.	50000
KSSS	Colorado Springs, Colo.	1000
KVFC	Cortez, Colo.	1000
WSBR	Boca Raton, Fla.	1000
WKMK	Blountston, Fla.	1000d
WKIS	Orlando, Fla.	5000
KYME	Boise, Idaho	500d
WVLN	Olney, Ill.	1000d
KBOE	Oskaloosa, Iowa	250d
WNOP	Newport, Ky.	1000d
WCAS	Cambridge, Mass	250d
KPBM	Carlsbad, N.Mex.	1000d

kHz	Wave Length	W.P.
WGSM	Huntington, N.Y.	5000d
WMBL	Morehead City, N.C.	1000d
WPAQ	Mount Airy, N.C.	10000d
KRMG	Tulsa, Okla.	50000
WVCH	Chester, Pa.	1000d
WIAC	San Juan, P.Rico	10000
WBAW	Barnwell, S.C.	1000d
WIRJ	Humboldt, Tenn.	250d
WJIG	Tullahoma, Tenn.	250d
KTRH	Houston, Tex.	50000
KCMC	Texarkana, Tex.	1000
WBCI	Williamsburg, Va.	500d
WBOO	Baraboo, Wis.	

750—399.8

KFQD	Anchorage, Alaska	10000
WSB	Atlanta, Ga.	50000
WBMD	Baltimore, Md.	1000d
KMMJ	Grand Island, Neb.	1000d
WHEB	Portsmouth, N.H.	1000d
KSEO	Durant, Okla.	250d
KXL	Portland, Oreg.	50000d
WPDX	Clarksburg, W.Va.	1000d

760—394.5

KFMB	San Diego, Cal.	5000
KGU	Honolulu, Hawaii	10000
WJR	Detroit, Mich.	50000
WCPS	Tarboro, N.C.	1000d
WORA	Mayaguez, P.R.	5000

770—389.4

KUOM	Minneapolis, Minn.	5000d
WCAL	Northfield, Minn.	5000d
WEW	St. Louis, Mo.	1000d
KOB	Albuquerque, N.Mex.	50000
WABC	New York, N.Y.	50000
KXA	Seattle, Wash.	1000d

780—384.4

WBBM	Chicago, Ill.	50000
WJAG	Norfolk, Neb.	1000d
WCKB	Dunn, N.C.	1000d
WBBO	Forest City, N.C.	1000d
KSPI	Stillwater, Okla.	250d
WAVA	Arlington, Va.	1000d

790—379.5

WTUG	Tuscaloosa, Ala.	1000d
KCAM	Glennallen, Alaska	5000
KCEE	Tucson, Ariz.	5000
KOSY	Texarkana, Ark.	1000
KABC	Los Angeles, Calif.	5000
WLBE	Leesburg, Fla.	5000
WFUN	Miami, Fla.	5000
WPFA	Pensacola, Fla.	1000d
WQXI	Atlanta, Ga.	5000
WYNR	Brunswick, Ga.	500d
WGRA	Cairo, Ga.	1000d
KONA	Kealakekua, Hawaii	1000
KEST	Boise, Idaho	1000d
KSRV	Soda Springs, Ida.	5000d
WRMS	Beardstown, Ill.	500d
KXXX	Colby, Kans.	5000d
WAKY	Louisville, Ky.	5000
WRUM	Rumford, Me.	1000d
WSGW	Saginaw, Mich.	5000
KGHL	Billings, Mont.	5000
WWNY	Watertown, N.Y.	1000
WLSV	Wellsville, N.Y.	1000d
WTNC	Thomasville, N.C.	1000d
KFGO	Fargo, N.D.	5000
KWIL	Albany, Oreg.	1000
WAEB	Allentown, Pa.	1000
WPIC	Sharon, Pa.	1000d
WEAN	Providence, R.I.	5000
WWBD	Bamberg-Denmark, S.C.	1000d
WETB	Johnson City, Tenn.	1000d
WMC	Memphis, Tenn.	5000
KTHT	Houston, Tex.	5000
KFYD	Lubbock, Tex.	5000
KUTA	Blanding, Utah	1000d
WSIG	Mount Jackson, Va.	1000d
WTAR	Norfolk, Va.	5000
KGMI	Bellingham, Wash.	5000
KJRB	Spokane, Wash	5000
WEAQ	Eau Claire, Wis.	5000

800—374.8

WHDS	Decatur, Ala.	1000d
WMGY	Montgomery, Ala.	1000d
KINY	Juneau, Alaska	5000
KAGH	Crossett, Ark.	250d
KVDM	Morrilton, Ark.	250d
KUZZ	Bakersfield, Calif.	250d
KBRN	Brighton, Colo.	500d
WLAD	Danbury, Conn.	1000d
WRKV	Rockville, Conn.	
WSUZ	Palatka, Fla.	1000d
WJAT	Swainsboro, Ga.	1000d
WKZI	Casey, Ill.	250d
KXIC	Iowa City, Iowa	1000d
WCCM	Lawrence, Mass.	1000d
WVAL	Sauk Rapids, Minn.	250d
KREI	Farmington, Mo.	1000d
WTMR	Camden, N.J.	5000d
KJEM	Okla. City, Okla.	250d
KPDQ	Portland, Ore.	1000d
WCHA	Chambersburg, Pa.	1000d
WDSC	Dillon, S.C.	1000d
WEAB	Greer, S.C.	250d
WDEH	Sweetwater, Tenn.	1000d
KDDD	Dumas, Tex.	250d
KBUH	Brigham City, Utah	250d
WSVS	Crewe, Va.	5000d
WKEE	Huntington, W.Va.	5000d
WDUX	Waupaca, Wis.	5000d

810—370.2

KGD	San Francisco, Calif.	50000
KWSR	Rifle, Colo.	1000d
WATI	Indianapolis, Ind.	250d
WEKG	Jackson, Ky.	
WYRE	Annapolis, Md.	250d
WJPW	Rockford, Mich.	500d
WSJC	Magee, Miss.	50000
KCMO	Kansas City, Mo.	50000
KAFE	Santa Fe, N.M.	
WGY	Schenectady, N.Y.	50000
WKBC	N.Wilkesboro, N.C.	1000d
WCEC	Rocky Mount, N.C.	1000d
WEDO	McKeesport, Pa.	1000d
WKVM	San Juan, P.R.	25000
WQIZ	St. George, S.C.	5000d
KBHB	Sturgis, S.D.	5000d
WMTS	Murfreesboro, Tenn.	5000d
KWDR	Del Rio, Tex.	
WDMP	Dodgeville, Wis.	
WELF	Tomahawk, Wis.	500d

820—365.6

WAIT	Chicago, Ill.	5000d
WIKY	Evansville, Ind.	250d
WOSU	Columbus, Ohio	5000d
WFAA	Dallas, Tex.	50000
WBAP	Ft. Worth, Tex.	50000

830—361.2

KIKI	Honolulu, Hawaii	10000
WCCO	Minneapolis-St. Paul, Minn.	50000
KBOA	Kennett, Mo.	1000d
WNYC	New York, N.Y.	1000d

840—356.9

WTUF	Mobile, Ala.	1000d
WRYM	New Britain, Conn.	1000d
WHAS	Louisville, Ky.	50000
WVPO	Stroudsburg, Pa.	250d

850—352.7

WYDE	Birmingham, Ala.	10000
KICY	Nome, Alaska	5000
KGKO	Benton, Ark.	1000d
KOA	Denver, Colo.	50000
WRUF	Gainesville, Fla.	5000
WEAT	W. Palm Beach, Fla.	1000
KIMO	Hilo, Hawaii	1000
WCLR	Crystal Lake, Ill.	500d
WHDH	Boston, Mass.	50000
WKBZ	Muskegon, Mich.	1000
KFUO	Clayton, Mo.	5000d
WKIX	Raleigh, N.C.	10000
WJW	Cleveland, Ohio	10000
WJAC	Johnstown, Pa.	10000
WEEU	Reading, Pa.	1000
WABA	Aguadilla, P.R.	500
WIVK	Knoxville, Tenn.	50000d
WRAP	Norfolk, Va.	5000
KTAC	Tacoma, Wash.	10000

860—348.6

WHRT	Hartselle, Ala.	250d
WAMI	Dpp, Ala.	1000d
KIFN	Phoenix, Ariz.	1000d
KOSE	Osceola, Ark.	1000d
KWRF	Warren, Ark.	250d
KTRB	Modesto, Calif.	10000
WAZE	Clearwater, Fla.	500d
WKKD	Cocoa, Fla.	1000d
WERD	Atlanta, Ga.	1000d
WDMG	Douglas, Ga.	5000d
WMRI	Marion, Ind.	250d
KWPC	Muscatine, Iowa	250d
KDAM	Pittsburg, Kan.	10000
WSON	Henderson, Ky.	500d
WAYE	Baltimore, Md.	1000d
WSBS	Gt. Barrington, Mass.	250d
KNUJ	New Ulm, Minn.	1000d
WMAG	Forest, Miss.	500d
KARS	Belen, N. Mex.	250d
WFMD	Fairmont, N.C.	1000d
WSTH	Taylorsville, N. C.	250d
KSHA	Medford, Oreg.	1000d
WAMO	Pittsburgh, Pa.	1000d
WTEL	Philadelphia, Pa.	10000d
WLBG	Laurens, S.C.	1000d
KFST	Ft. Stockton, Tex.	250d
KPAN	Hereford, Tex.	250d
KSFA	Nacogdoches, Tex.	1000d
KOND	San Antonio, Tex.	5000
KWHD	Salt Lake City, Utah	1000d
WEVA	Emporia, Va.	1000d
WOAY	Oak Hill, W.Va.	10000d
WNOV	Milwaukee, Wis.	250d

870—344.6

KIEV	Glendale, Calif.	500d
KAIM	Honolulu, Hawaii	5000
WWL	New Orleans, La.	50000
WKAR	E. Lansing, Mich.	10000d
WCHU	Ithaca, N.Y.	5000d
WGTL	Kannapolis, N.C.	1000d
WHOA	San Juan, P.R.	5000
KJIM	Ft. Worth, Tex.	250d
WFLO	Farmville, Va.	1000d

880—340.7

KRVN	Lexington, Neb.	50000
WCBS	New York, N.Y.	50000
WRRZ	Clinton, N.C.	1000d
WRFD	Worthington, Ohio	5000d

890—336.9

WLS	Chicago, Ill.	50000
WHNC	Henderson, N.C.	1000d
KBYE	Okla. City, Okla.	1000d

900—333.1

WATV	Birmingham, Ala.	1000d
WGOK	Mobile, Ala.	1000d
WOZK	Ozark, Ala.	1000d
KPRB	Fairbanks, Alaska	10000
KHOZ	Harrison, Ark.	1000d
KBIF	Fresno, Calif.	1000d
KGRB	West Covina, Cal.	250d
WJWL	Georgetown, Del.	1000d
WSWN	Belle Glade, Fla.	1000d
WMOP	Ocala, Fla.	1000d
WCGA	Calhoun, Ga.	1000d
WCRY	Macon, Ga.	250d
WEAS	Savannah, Ga.	5000d
KTEE	Idaho Falls, Ida.	1000d
KEYN	Wichita, Kan.	250d
WFIA	Louisville, Ky.	1000d
WLSI	Pikeville, Ky.	5000d
KREH	Oakdale, La.	250d
WCME	Brunswick, Maine	1000d
WLMD	Laurel, Md.	1000d
WATC	Gaylord, Mich.	1000d
KTIS	Minneapolis, Minn.	1000d
WDDT	Greenville, Miss.	1000d
KFAL	Fulton, Mo.	1000d
KJSK	Columbus, Nebr.	1000d
WOTW	Nashua, N.H.	1000d
WBRV	Boonville, N.Y.	1000d
WKAJ	Saratoga Springs, N.Y.	250d
WKJK	Granite Falls, N.C.	500d
WAYN	Rockingham, N.C.	1000d
WIAM	Williamston, N.C.	1000d
KFNW	Fargo, N.Dak.	1000d
WNYN	Canton, O.	5000d
WFRO	Fremont, Ohio	500d
WCPA	Clearfield, Pa.	1000d
WFLN	Philadelphia, Pa.	1000d
WKXV	Knoxville, Tenn.	1000d
WCOR	Lebanon, Tenn.	500d
KALT	Atlanta, Tex.	1000d
KMCO	Conroe, Tex.	500d
KFLD	Floydada, Tex.	250d
KCLW	Hamilton, Tex.	250d
WODY	Bassett, Va.	500d
WAFC	Staunton, Va.	1000d
KUEN	Wenatchee, Wash.	1000d
WATK	Antigo, Wis.	250d

910—329.5

WDVC	Dadeville, Ala.	500d
KPHO	Phoenix, Ariz.	5000
KLCN	Blytheville, Ark.	5000d
KAMD	Camden, Ark.	5000
KDED	El Cajon, Calif.	1000d
KNEW	Oakland, Calif.	5000
KOXR	Oxnard, Cal.	5000
KPOF	Denver, Colo.	5000
WRCH	New Britain, Conn.	5000
WPLA	Plant City, Fla.	1000d
WGAF	Valdosta, Ga.	5000
KBGN	Caldwell, Ida.	1000d
WAKO	Lawrenceville, Ill.	500d
WSUI	Iowa City, Iowa	5000
KISI	Salina, Kan.	500d
WLCS	Baton Rouge, La.	1000
WABI	Bangor, Maine	5000
WFDF	Flint, Mich.	5000
WCOC	Meridian, Miss.	5000
KOYN	Billings, Mont.	1000d
KBIM	Roswell, N. M.	5000
WRKL	New City, N.Y.	1000d
WLAS	Jacksonville, N.C.	5000d
KCJB	Minot, N.Dak.	1000
WBRJ	Marietta, O.	5000d
WPFB	Middletown, Ohio	1000
KGLC	Miami, Okla.	1000
KURY	Brookings, Oreg.	1000d
WAVL	Apollo, Pa.	1000d
WGBI	Scranton, Pa.	1000
WSBA	York, Pa.	5000
WPRP	Ponce, P.R.	5000
WNCG	North Charleston, S.C.	500d
WORD	Spartanburg, S.C.	5000
WJCW	Johnson City, Tenn.	5000
WEPG	S. Pittsburgh, Tenn.	500d
KNAF	Fredericksburg, Tex.	1000d
KRIO	McAllen, Tex.	5000
KRRV	Sherman, Tex.	1000
KALL	Salt Lake City, Utah	5000
WNHV	White River Jct., Vt.	1000d
WRNL	Richmond, Va.	5000
WPXI	Roanoke, Va.	1000d
KORD	Pasco, Wash.	1000d
KIXI	Seattle, Wash.	1000
KISN	Vancouver, Wash.	5000
WHSM	Hayward, Wis.	5000d
WDOR	Sturgeon Bay, Wis.	1000d

920—325.9

WCTA	Andalusia, Ala.	5000
WWWR	Russellville, Ala.	1000d
KSRM	Soldotna, Alaska	5000
KARK	Little Rock, Ark.	5000
KLOC	Ceres, Calif.	500d
KDES	Palm Springs, Cal.	5000
KVEC	San Luis Obispo, Cal.	1000
KLMR	Lamar, Colo.	5000
WMEG	Eau Gallie, Fla.	1000d
WGST	Atlanta, Ga.	5000
WVOH	Hazelhurst, Ga.	500d
WGNU	Granite City, Ill.	500d
WMDK	Metropolis, Ill.	1000d
WBAA	W. Lafayette, Ind.	5000
KFNF	Shenandoah, Ia.	1000
WTCW	Whitesburg, Ky.	5000d
WBOX	Bogalusa, La.	1000d
KTOC	Jonesboro, La.	1000d
WPTX	Lexington Park, Md.	5000
WMPL	Hancock, Mich.	1000d
KDHL	Fairbault, Minn.	5000
KWAD	Wadena, Minn.	1000
KWYS	W. Yellowstone, Mont.	1000
KRAM	Las Vegas, Nev.	1000
KOLO	Reno, Nev.	1000
KQEO	Albuquerque, N.Mex.	1000
WTTM	Trenton, N.J.	1000
WKRT	Cortland, N.Y.	1000
WGHQ	Kingston, N.Y.	5000d
WIRD	Lake Placid, N.Y.	1000
WBBB	Burlington, N.C.	5000d
WMNI	Columbus, Ohio	1000
KGAL	Lebanon, Oreg.	1000
WKVA	Lewistown, Pa.	1000
WJAR	Providence, R.I.	5000
WTND	Orangeburg, S.C.	1000d
KEZU	Rapid City, S.Dak.	1000d
WLIV	Livingston, Tenn.	1000d
KELP	El Paso, Tex.	1000
WBZB	Odessa, Tex.	1000
KTLW	Texas City, Tex.	1000d
KVEL	Vernal, Utah	5000d
KITN	Olympia, Wash.	1000d
KXLY	Spokane, Wash.	5000
WMMN	Fairmont, W.Va.	5000
WOKY	Milwaukee, Wis.	5000

930—322.4

WETD	Gadsden, Ala.	1000d
KTKN	Ketchikan, Alaska	5000
KAPR	Douglas, Ariz.	1000d
KAFF	Flagstaff, Ariz.	5000d
KHJ	Los Angeles, Calif.	5000
KEWQ	Paradise, Cal.	5000d
KIUP	Durango, Colo.	5000
WTHD	Milford, Del.	500d
WHAN	Haines City, Fla.	1000d
WJAX	Jacksonville, Fla.	5000
WKXY	Sarasota, Fla.	1000
WMGR	Bainbridge, Ga.	5000
KSEI	Pocatello, Idaho	5000
WTAD	Quincy, Ill.	5000
WHON	Centerville, Ind.	500d
WKCT	Bowling Green, Ky.	1000
WFMD	Frederick, Md.	5000
WREB	Holyoke, Mass.	500d
WBCK	Battle Creek, Mich.	5000
KKIN	Aitkin, Minn.	1000d
WSLI	Jackson, Miss.	5000
KWDC	Poplar Bluff, Mo.	5000
KYSS	Missoula, Mont.	5000d
KDGA	Ogallala, Nebr.	500d
KCCC	Carlsbad, N.M.	
WSOC	Charlotte, N.C.	5000
WITN	Washington, N.C.	5000
WWNH	Rochester, N.H.	5000
WPAT	Paterson, N.J.	5000
WBEN	Buffalo, N.Y.	5000
WIZR	Johnstown, N.Y.	1000d
WEOL	Elyria, Ohio	1000
WKY	Oklahoma City, Okla.	5000
KAGI	Grants Pass, Oreg.	5000
KSWB	Seaside, Ore.	1000
WCNR	Bloomsburg, Pa.	1000d
KSDN	Aberdeen, S.D.	1000
WSEV	Sevierville, Tenn.	5000d
KOET	Center, Tex.	1000d
KITE	San Antonio, Tex.	5000
WLLL	Lynchburg, Va.	5000d
KENY	Bellingham-Ferndale, Wash.	1000d
KQOT	Yakima, Wash.	1000d
WSAZ	Huntington, W.Va.	5000
KROE	Sheridan, Wyo.	1000d
WLBL	Auburndale, Wis.	5000d

940—319.0

KHOS	Tucson, Ariz.	1000
KFRE	Fresno, Calif.	50000
WINE	Brookfield, Conn.	1000d
WLQH	Chiefland, Fla.	

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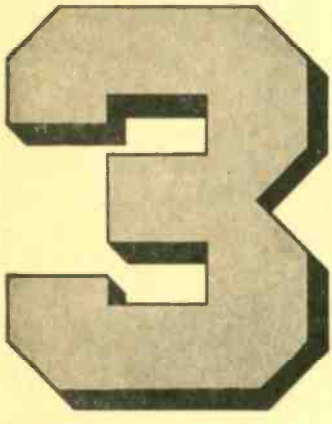

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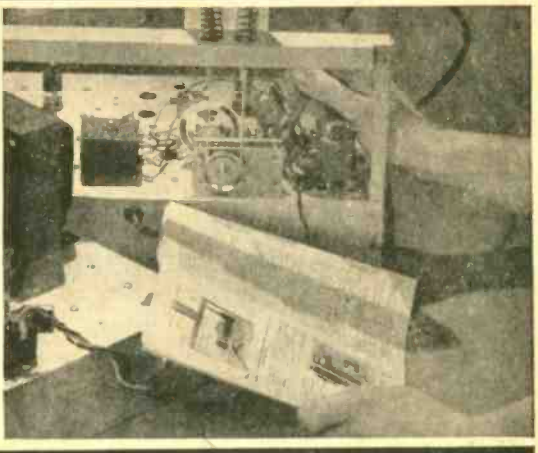

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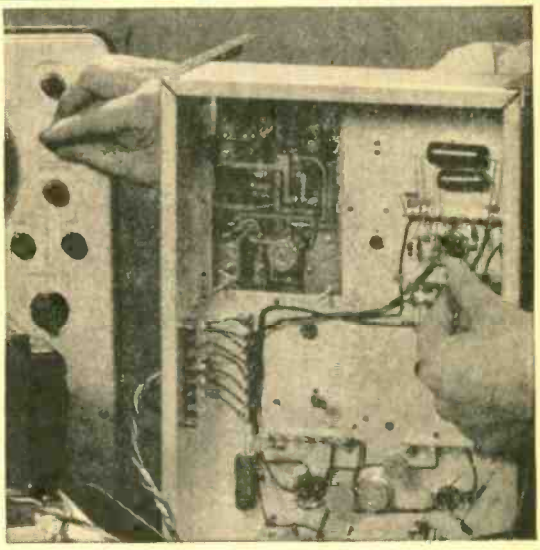

WHITE'S RADIO LOG

kHz	Wave Length	W.P.
WINZ	Miami, Fla.	50000
WMAZ	Macon, Ga.	50000
KAHU	Waipahu, Hawaii	10000
WMIX	Mt. Vernon, Ill.	5000d
KIOA	Des Moines, Iowa	10000
WCND	Shelbyville, Ky.	250d
WYLD	New Orleans, La.	10000
WIDG	St. Ignace, Mich.	5000d
WJOR	South Haven, Mich.	1000d
WCPC	Houston, Miss.	50000d
KSWM	Aurora, Mo.	500d
KVSH	Valentine, Nebr.	5000d
WFNC	Fayetteville, N.C.	50000
WCIT	Lima, Ohio	250d
WNAL	Nelsonville, O.	
KGRL	Bend, Oreg.	1000d
KWRC	Woodburn, Ore.	1000d
WESA	Charlerol, Pa.	250d
WGRP	Greenville, Pa.	1000d
WIPR	San Juan, P.R.	10000
KIXZ	Amarillo, Tex.	5000
KTON	Belton, Tex.	1000d
KATQ	Texarkana, Tex.	1000d
WNRG	Grundy, Va.	5000d
WFAW	Ft. Atkinson, Wis.	500d
WCSW	Shell Lake, Wis.	

950—315.6

WRMA	Montgomery, Ala.	1000d
KIBH	Seward, Alaska	1000
KXJK	Forrest City, Ark.	5000d
KFSA	Ft. Smith, Ark.	1000
KAHI	Auburn, Calif.	5000d
KIMN	Denver, Colo.	5000
WLOF	Orlando, Fla.	5000
WGTA	Summerville, Ga.	5000d
WGOV	Valdosta, Ga.	5000
KATN	Boise, Ida.	5000d
KLER	Orofino, Idaho	1000d
WGRT	Chicago, Ill.	1000d
WXLW	Indianapolis, Ind.	5000d
KOEL	Oelwein, Ia.	5000
KJRG	Newton, Kans.	500d
WYWY	Barbourville, Ky.	
WAGM	Presque Isle, Maine	5000
WXLN	Potomac-Cabin John, Md.	1000d
WRYT	Boston, Mass.	5000d
WWJ	Detroit, Mich.	5000
KRSI	St. Louis Park, Minn.	1000
WBKH	Hattiesburg, Miss.	5000d
KLIK	Jefferson City, Mo.	5000d
KNFT	Bayard, N. M.	
WHVW	Hyde Park, N.Y.	500d
WBBF	Rochester, N.Y.	1000
WIBX	Utica, N.Y.	5000
WPET	Greensboro, N.C.	5000d
KYES	Roseburg, Oreg.	1000d
WNCC	Barnesboro, Pa.	500d
WPEN	Philadelphia, Pa.	5000
WBER	Moncks Corner, S. C.	500d
WSPA	Spartanburg, S.C.	5000
KWAT	Watertown, S.Dak.	1000
WAGG	Franklin, Tenn.	1000d
KDSX	Denison-Sherman, Tex.	500
KPRC	Houston, Tex.	5000
KSEL	Lubbock, Tex.	5000
WXGI	Richmond, Va.	5000d
KJR	Seattle, Wash.	5000
WERL	Eagle River, Wis.	1000d
WKAZ	Charleston, W.Va.	5000d
WKTS	Sheboygan, Wis.	500d
KMER	Kemmerer, Wyo.	5000d

960—312.3

WBRC	Birmingham, Ala.	5000
WMOZ	Mobile, Ala.	1000d
KOOL	Phoenix, Ariz.	5000
KAVR	Apple Valley, Calif.	5000d
KNEZ	Lompoc, Calif.	500
KABL	Oakland, Calif.	5000
WELI	New Haven, Conn.	5000
WGRO	Lake City, Fla.	500d
WJCM	Sebring, Fla.	1000d
WJAZ	Albany, Ga.	5000d
WRFC	Athens, Ga.	5000
KSRA	Salmon, Idaho	1000d
WDLM	E. Moline, Ill.	1000d
WSBT	South Bend, Ind.	5000
KMA	Shenandoah, Iowa	5000
WPRT	Prestonsburg, Ky.	5000d
KROF	Abbeville, La.	1000d
WBOC	Salisbury, Md.	5000
WFGL	Fitchburg, Mass.	1000
WHAK	Rogers City, Mich.	5000d
KLTF	Little Falls, Minn.	500d
WABG	Greenwood, Miss.	1000
KFVS	Cape Girardeau, Mo.	5000
KFLN	Baker, Mont.	5000d
KNEB	Scottsbluff, Nebr.	1000
KWYK	Farmington, N.Mex.	1000d
KRIK	Roswell, N. Mex.	1000d
WEAV	Plattsburg, N.Y.	5000
WAAK	Dallas, N.C.	1000d
WFTC	Kinston, N.C.	5000
WWST	Wooster, Ohio	1000d
KGWA	Enid, Okla.	1000
KLAD	Klamath Falls, Ore.	5000d
WHYL	Carlisle, Pa.	5000d
WKZA	Kane, Pa.	1000d
WATS	Sayre, Pa.	1000d
WBEU	Beaufort, S.C.	1000d
WBMC	McMinnville, Tenn.	500d
KIMP	Mt. Pleasant, Tex.	1000d
KGKL	San Angelo, Tex.	5000
KOVO	Provo, Utah	5000
WDBJ	Roanoke, Va.	5000
KALE	Richland, Wash.	1000
WTCH	Shawano, Wis.	1000

970—309.1

WERH	Hamilton, Ala.	5000d
WTBF	Troy, Ala.	5000
KVWM	Show Low, Ariz.	5000d
KNEA	Jonesboro, Ark.	1000d
KBIS	Bakersfield, Calif.	1000
KCHV	Coachella, Calif.	5000
KBEE	Modesto, Calif.	1000
KFEL	Pueblo, Colo.	1000d
WBOM	Jacksonville, Fla.	
WFLA	Tampa, Fla.	5000
WIIN	Atlanta, Ga.	5000d
WVOP	Vidalia, Ga.	5000d
KPUA	Hilo, Hawaii	5000
KAYT	Rupert, Idaho	1000d
WMAY	Springfield, Ill.	1000
WAVE	Louisville, Ky.	5000
KSYL	Alexandria, La.	1000
WCSH	Portland, Maine	5000
WAMD	Aberdeen, Md.	500
WESO	Southbridge, Mass.	1000d
WCKD	Ishpeming, Mich.	5000d
WKHM	Jackson, Mich.	1000
KQAQ	Austin, Minn.	5000
WRKN	Brandon, Miss.	
KOOK	Billings, Mont.	5000
KJLT	No. Platte, Nebr.	5000d
KVEG	Las Vegas, Nev.	500d
WJRZ	Hackensack, N.J.	5000
KDCE	Espanola, N. M.	1000d
WEBR	Buffalo, N.Y.	5000
WCHN	Norwich, N.Y.	500d
WRCS	Aheskie, N.C.	1000d
WWIT	Canton, N.C.	1000d
WDAY	Fargo, N.Dak.	5000
WREO	Ashtabula, Ohio	5000
WATH	Athens, Ohio	1000d
KAKC	Tulsa, Okla.	1000
KOIN	Portland, Oreg.	5000
WWSW	Pittsburgh, Pa.	5000
WJMX	Florence, S.C.	5000
KHFI	Austin, Tex.	1000d
KBSN	Crane, Tex.	1000d
KNOK	Ft. Worth, Tex.	1000d
WIVI	Christiansted, V. I.	5000
WYPR	Oanville, Va.	1000d
WANV	Waynesboro, Va.	5000
KREM	Spokane, Wash.	5000
WWYO	Pineville, W.Va.	1000d
WHA	Madison, Wis.	5000d

980—305.9

WKLF	Clanton, Ala.	1000d
WXLL	Big Delta, Alaska	100
KCAB	Dardanelle, Ark.	1000d
KINS	Eureka, Calif.	5000
KEAP	Fresno, Calif.	500d
KFWB	Los Angeles, Calif.	5000
KCTY	Salinas, Calif.	1000d
KGLN	Glennwood Springs, Colo.	1000d
WSUB	Groton, Conn.	1000d
WRC	Washington, D.C.	5000
WDVH	Gainesville, Fla.	5000d
WTOT	Marianna, Fla.	1000d
WBOP	Pensacola, Fla.	1000d
WLOD	Pompano Beach, Fla.	1000d
WKLY	Hartwell, Ga.	1000d
WPGA	Perry, Ga.	1000d
KUPI	Idaho Falls, Idaho	1000d
KSGM	Chester, Ill.	1000
WITY	Danville, Ill.	1000
KCIJ	Shreveport, La.	250d
WCAP	Lowell, Mass.	1000d
WAOP	Otsego, Mich.	1000d
WPBC	Richfield, Minn.	5000
WAPF	McComb, Miss.	5000d
WKOR	Starkville, Miss.	
KMBZ	Kansas City, Mo.	5000
KLYQ	Hamilton, Mont.	1000d
KVLV	Fallon, Nev.	5000d
KICA	Clovis, N. Mex.	1000
KMIN	Grants, N. Mex.	1000d
WTRY	Troy, N.Y.	5000
WKLM	Wilmington, N.C.	5000d
WAAA	Win.-Salem, N.C.	1000d
WONE	Dayton, Ohio	5000
WILK	Wilkes-Barre, Pa.	5000
WAZS	Summerville, S.C.	1000d
WYCL	York, S. C.	1000d
KDSJ	Deadwood, S.Dak.	1000
WSIX	Nashville, Tenn.	5000
KFRD	Rosenberg-Richmond, Tex.	1000d
KSVC	Richfield, Utah	5000d
WFHG	Bristol, Va.	5000
WMEK	Chase City, Va.	500d
KUTI	Yakima, Wash.	5000d
WHAW	Weston, W.Va.	1000d
WCUB	Manitowoc, Wis.	1000d
WNBI	Park Falls, Wis.	1000d
WPRE	Prairie du Chien, Wis.	1000

990—302.8

WEIS	Center, Ala.	250d
WWWF	Fayette, Ala.	1000d
WTCB	Flomaton, Ala.	500d
KTKT	Tucson, Ariz.	10000
KKIS	Pittsburg, Calif.	5000
KGUO	Santa Barbara, Calif.	1000d
KLIR	Denver, Colo.	1000d
WFCS	Southington, Conn.	
WFAB	Miami, Fla.	5000
WHOO	Orlando, Fla.	50000
WDWD	Dawson, Ga.	1000d
WGML	Hinesville, Ga.	250d
KTRG	Honolulu, Hawaii	5000
WCAZ	Carthage, Ill.	1000d
WITZ	Jasper, Ind.	1000d
WERK	Muncie, Ind.	250d
KAYL	Storm Lake, Iowa	250d
KRSL	Russell, Kans.	250d
WNNR	New Orleans, La.	250d
KRIH	Rayville, La.	250d
WCRM	Clare, Mich.	250d
WABO	Waynesboro, Miss.	250d
KRMO	Monett, Mo.	250d
KSVP	Artesia, N.Mex.	1000
WEEB	Southern Pines, N.C.	5000d
WJEH	Gallipolis, Ohio	1000d
WTIG	Massillon, Ohio	250d
KRKT	Albany, Oreg.	250d
WIBG	Philadelphia, Pa.	50000
WVSC	Somerset, Pa.	5000d
WPRA	Mayaguez, P.R.	10000
WLKW	Providence, R.I.	50000d
WAKN	Aiken, S.C.	1000d
WNOX	Knoxville, Tenn.	10000
KWAM	Memphis, Tenn.	10000d
KTRM	Beaumont, Tex.	1000
KAML	Kenedy-Karnes City, Tex.	250d
KNIN	Wichita Falls, Tex.	10000
KDYL	Tooele, Utah	1000d
WNRV	Narrows-Pearisburg, Va.	5000d
WANT	Richmond, Va.	1000d

1000—299.8

WVOV	Huntsville, Ala.	
WFMI	Montgomery, Ala.	5000d
KMLO	Vista, Cal.	1000d
WKMK	Blountstown, Fla.	1000d
WJTS	Jupiter, Fla.	
WCFL	Chicago, Ill.	50000
WLMS	Leominster, Mass.	
WXTN	Lexington, Miss.	5000d
WIQT	Horseheads, N.Y.	
WKBQ	Garner, N. C.	
WSPF	Hickory, N.C.	5000
KTOK	Okla. City, Okla.	5000
WIOO	Carlisle, Pa.	1000
WKYB	Hemingway, S.C.	
WGOG	Wahalla, S. C.	1000d
KXRB	Sioux Falls, S.D.	
KSTA	Coleman, Tex.	250d
KGRI	Henderson, Tex.	250d
WKDE	Altavista, Va.	1000d
WHWB	Rutland, Vt.	1000d
WBNB	Charlotte Amalie, Virgin Islands	1000
KOMO	Seattle, Wash.	50000

1010—296.9

KCAC	Phoenix, Ariz.	500d
KVNC	Winslow, Ariz.	1000
KLRA	Little Rock, Ark.	10000
KCHJ	Delano, Calif.	5000
KCMJ	Palm Sprgs., Calif.	1000
KSAY	San Fran., Calif.	10000d
WCNU	Crestview, Fla.	1000d
WBIX	Jacksonville Beach, Fla.	10000d
WINQ	Tampa, Fla.	50000d
WGUN	Atlanta-Decatur, Ga.	50000d
WCSI	Columbus, Ind.	500d
KSMN	Mason City, Iowa	1000d
KIND	Independence, Kans.	250d
KDLA	DeRidder, La.	1000d
WSID	Baltimore, Md.	1000d
WITL	Lansing, Mich.	5000d
WJSW	Maplewood, Minn.	250d
WMOX	Meridian, Miss.	10000
KCHI	Chillicothe, Mo.	250d
KXEN	Festus-St. Louis, Mo.	50000d
WCNL	Newport, N.H.	250d
WINS	New York, N.Y.	50000
WABZ	Albermarle, N.C.	1000d
WFGW	Black Mountain, N.C.	50000d
WELS	Kinston, N.C.	1000d
WIOI	New Boston, Ohio	1000d
WUDO	Lewisburg, Pa.	250d
WHIN	Gallatin, Tenn.	1000d
WORM	Savannah, Tenn.	250d
KDJW	Amarillo, Tex.	5000
KODA	Houston, Tex.	5000d
KAWA	Waco-Marlin, Tex.	10000d
WELK	Charlottesville, Va.	1000d
WMEV	Marion, Va.	1000d
WPMH	Portsmouth, Va.	5000d
WCST	Berkeley Sprgs., W.Va.	250d
WSPT	Stevens Pt., Wis.	1000d

1020—293.9

KGBS	Los Angeles, Calif.	50000d
WCIL	Carbondale, Ill.	1000d
WPEO	Peoria, Ill.	10000d
KSWS	Roswell, N. M.	50000
KDKA	Pittsburgh, Pa.	50000

1030—291.1

WBZ	Boston, Mass.	50000
KCTA	Corpus Christi, Tex.	50000d
KTWO	Casper, Wyo.	10000

1040—288.3

KHVH	Honolulu, Hawaii	5000
WHO	Des Moines, Iowa	50000
KIXL	Dallas, Tex.	1000d

1050—285.5

WRFS	Alexander City, Ala.	1000d
WCRI	Scottsboro, Ala.	250d
KVLC	Little Rock, Ark.	1000d
KTOT	Big Bear Lake, Cal.	250d
KOFY	San Mateo, Calif.	1000d
KWSO	Wasco, Calif.	1000d
WJSB	Crestview, Fla.	1000d
WIVY	Jacksonville, Fla.	1000d
WHBO	Tampa, Fla.	250d
WRMF	Titusville, Fla.	500d
WAUG	Augusta, Ga.	5000d
WMNZ	Montezuma, Ga.	250d
WDZ	Decatur, Ill.	1000d
WTCA	Plymouth, Ind.	250d
KUPK	Garden City, Kan.	5000d
WNES	Central City, Ky.	500d
KLPL	Lake Providence, La.	250d
KREB	Shreveport, La.	250d
KVPI	Villa Platte, La.	250d
WMSG	Oakland, Md.	500d
WQMR	Silver Sprg., Md.	1000d
WPAG	Ann Arbor, Mich.	5000d
KLOH	Pipestone, Minn.	1000d
WACR	Columbus, Miss.	1000d
KMIS	Portageville, Mo.	1000d
KSIS	Sedalia, Mo.	1000d
WBNC	Conway, N.H.	1000d
WSCV	Peterborough, N.H.	
WSEN	Baldwinsville, N.Y.	250d
WYBG	Massena, N.Y.	1000d
WHN	New York, N.Y.	50000
WFSC	Franklin, N.C.	1000d
WLON	Lincolnton, N.C.	1000d
WWGP	Sanford, N.C.	1000d
WZIP	Cincinnati, Ohio	1000d
KCCO	Lawton, Okla.	250d
KFMJ	Tulsa, Okla.	1000d
KORE	Eugene, Ore.	1000d
WBUT	Butler, Pa.	1000d
WSKE	Everett, Pa.	250d
WLYC	Williamsport, Pa.	1000d
WCGB	Pastillo, P. R.	1000d
WSMT	Sparta, Tenn.	1000d
KLEN	Killeen, Tex.	250d
KPXE	Liberty, Tex.	250d
KCAS	Slaton, Tex.	250d
WGAT	Gate City, Va.	1000d
WBRG	Lynchburg, Va.	1000d
WCMS	Norfolk, Va.	5000d
KBLE	Seattle, Wash.	5000d
WCEF	Parkersburg, W. Va.	5000d
WECL	Eau Claire, Wis.	1000d
WKAU	Kaukauna, Wis.	1000d
WLIP	Kenosha, Wis.	250d
KWIV	Douglas, Wyo.	250d

1060—282.8

KUPD	Tempe, Ariz.	500
KPAY	Chico, Calif.	10000
KLMO	Longmont, Colo.	10000d
WMCL	McLeansboro, Ill.	250d
WRHL	Rochelle, Ill.	250d
WJKY	Jamestown, Ky.	1000d
WNOE	New Orleans, La.	50000
WGTR	Natick, Mass.	1000d
WHFB	Benton Harbor-St. Joseph, Mich.	5000d
KFIL	Preston, Miss.	1000d
KNLY	Ord, Neb.	1000d
WMAP	Monroe, N.C.	1000d
WBYB	St. Pauls, N.C.	250d
WCOK	Sparta, N.C.	250d
WOIO	Canton, O.	5000d
KYW	Philadelphia, Pa.	50000
WRJS	San German, P. R.	250
WALD	Walterboro, S. C.	1000d
KGFX	Pierre, S. D.	10000d
WPHC	Waverly, Tenn.	1000d

kHz	Wave Length	W.P.
WCIR	Beckley, W.Va.	10000d
KHRB	Lockhart, Tex.	
KRSP	Salt Lake City, Utah	10000d

1070—280.2

WAPI	Birmingham, Ala.	50000
KNX	Los Angeles, Calif.	50000
WIBC	Indianapolis, Ind.	50000
KILR	Estherville, Iowa	250d
KFDI	Wichita, Kans.	10000
KHMO	Hannibal, Mo.	5000
WKDR	Plattsburgh, N. Y.	
WNCT	Greenville, N.C.	10000
WHPE	High Point, N.C.	1000d
WKOK	Sunbury, Penn.	10000
WMIA	Arecibo, P. R.	5000
WHYZ	Greenville, S.C.	50000d
WFLI	Lookout Mtn., Tenn.	50000
WDIA	Memphis, Tenn.	50000
KOPY	Alice, Tex.	1000
KNNN	Friona, Tex.	
KENR	Houston, Tex.	50000d
WINA	Charlottesville, Va.	5000
WKOW	Madison, Wis.	10000

1080—277.6

WKAC	Athens, Ala.	1000d
KSCO	Santa Cruz, Calif.	10000
WTIC	Hartford, Conn.	50000
WVCG	Coral Gables, Fla.	10000
WFIV	Kissimmee, Fla.	5000d
WJOE	Port St. Joe, Fla.	1000d
WBIE	Marietta, Ga.	10000d
WPOK	Pontiac, Ill.	1000d
WNWI	Valparaiso, Ind.	5000d
KOAK	Red Oak, Ia.	
WKLO	Louisville, Ky.	10000
WOAP	Owosso, Mich.	1000d
KYMN	Northfield, Minn.	1000d
KGCL	East Prairie, Mo.	
WUFO	Amherst, N.Y.	1000d
WEWO	Laurinburg, N.C.	5000d
WWDR	Murfreesboro, N.C.	1000d
KNDK	Langdon, N.D.	1000d
KMVR	Sidney, O.	250d
KWJJ	Portland, Oreg.	50000
WEEP	Pittsburgh, Pa.	50000d
WLEY	Cayey, P.R.	250
KRLD	Dallas, Tex.	50000
WKBY	Chatham, Va.	1000d

1090—275.1

KAAY	Little Rock, Ark.	50000
WQIK	Jacksonville, Fla.	50000d
WWSD	Monticello, Fla.	1000d
WBAF	Barnesville, Ga.	
WCRA	Effingham, Ill.	1000d
WGLC	Mendota, Ill.	250d
KHAI	Honolulu, Hawaii	5000
WFWR	Ft. Wayne, Ind.	
KNWS	Waterloo, Iowa	1000d
WDLV	Donaldsonville, La.	
WBAL	Baltimore, Md.	50000
WILD	Boston, Mass.	1000d
WMUS	Muskegon, Mich.	1000d
WTAK	Garden City, Mich.	250d
KEXS	Excelsior Springs, Mo.	
WKTE	King, N. C.	1000d
KTGO	Tioga, N.D.	
WMWM	Wilmington, O.	1000d
WKSP	Kingstree, S.C.	
WBZB	Selma, N.C.	1000d
WENR	Englewood, Tenn.	1000d
WJKM	Hartsville, Tenn.	250d
WGOC	Kingsport, Tenn.	
KANN	Ogden, Utah	1000d
KING	Seattle, Wash.	50000
WISS	Berlin, Wis.	

1100—272.6

KFAX	San Francisco, Calif.	50000d
KREX	Grand Junction, Colo.	50000
WLBB	Carrollton, Ga.	250
WHLI	Hempstead, N.Y.	10000d
WKYC	Cleveland, O.	50000
WGPA	Bethlehem, Pa.	250d

1110—270.1

WBIB	Centreville, Ala.	1000d
KRLA	Pasadena, Cal.	50000
KPOP	Roseville, Cal.	
WALT	Tampa, Fla.	50000d
WEBS	Calhoun, Ga.	250d
KIPA	Hilo, Hawaii	1000
WMBI	Chicago, Ill.	5000d
WKDZ	Cadiz, Ky.	1000d
WFCG	Franklinton, La.	1000d
WUNN	Mason, Mich.	
WJML	Petoskey, Mich.	
WKRA	Holly Springs, Miss.	1000d
KFAB	Omaha, Nebr.	50000
WSFW	Seneca Falls, N.Y.	
WBT	Charlotte, N.C.	50000
WELX	Xenia, O.	
KEOR	Atoka, Okla.	
KBND	Bend, Oreg.	5000
WJSM	Martinsburg, Pa.	
WNAR	Norristown, Penn.	50000d
WVJP	Caguas, P.R.	250
WHIM	Providence, R.I.	1000d
KDRY	Alamo Heights, Tex.	1000d

1120—267.7

WUST	Washington, D.C.	1000d
KMOX	St. Louis, Mo.	50000
WWOL	Buffalo, N.Y.	1000d
KPNW	Eugene, Ore.	50000
KCNW	Springfield, Ore.	
KCLE	Cleburne, Tex.	250d

1130—265.3

KRDU	Dinuba, Calif.	1000
KSDO	San Diego, Cal.	50000
WMGA	Moultrie, Ga.	10000
KLEI	Kailua, Hawaii	10000
KLEY	Wellington, Kan.	250d
KWKH	Shreveport, La.	50000
WCAR	Detroit, Mich.	50000
WDGY	Minneapolis, Minn.	50000
KBLR	Bolivar, Mo.	250d
WNEW	New York, N.Y.	50000
WPYB	Benson, N.C.	1000d
WASP	Brownsville, Pa.	
KBGH	Memphis, Tenn.	1000d
WDTM	Selmer, Tenn.	250d
WISN	Milwaukee, Wis.	50000

1140—263.0

KRAK	Sacramento, Calif.	50000
KNAB	Burlington, Colo.	
WQBA	Miami, Fla.	10000
KGEM	Boise, Idaho	10000
WSIV	Pekin, Ill.	5000d
WAWK	Kendallville, Ind.	250d
KNEI	Waukon, Iowa	250d
KBIL	Liberty, Mo.	500d
KPWB	Piedmont, Mo.	1000d
KLUC	Las Vegas, Nev.	10000d
KLPR	Oklahoma City, Okla.	10000
WBZY	New Castle, Pa.	
WITA	San Juan, P.R.	10000
KSOO	Sioux Falls, S.Dak.	10000
KORC	Mineral Wells, Tex.	250d
WRVA	Richmond, Va.	50000

1150—260.7

WBCA	Bay Minette, Ala.	1000d
WGEA	Geneva, Ala.	1000d
WJRD	Tuscaloosa, Ala.	5000
KCKY	Coolidge, Ariz.	1000
KXLR	No. Little Rock, Ark.	5000
KRKD	Los Angeles, Calif.	5000
KPLS	Santa Rosa, Calif.	5000
KGMC	Englewood, Colo.	1000d
WCNX	Middletown, Conn.	1000d
WDEL	Wilmington, Del.	5000
WNDB	Daytona Bch., Fla.	1000
WTMP	Tampa, Fla.	5000d
WFPM	Fort Valley, Ga.	1000d
WJEM	Valdosta, Ga.	1000d
WGGH	Marion, Ill.	5000d
WYFE	Rockford, Ill.	500d
KYND	Burlington, Ia.	500d
KWKY	Des Moines, Iowa	1000
KSAL	Salina, Kans.	5000
WMST	Mt. Sterling, Ky.	500d
WLOC	Munfordville, Ky.	1000d
WJBO	Baton Rouge, La.	5000
WGHM	Skowhegan, Maine	5000d
WHMC	Gaithersburg, Md.	1000
WCOP	Boston, Mass.	5000
WCEN	Mt. Pleasant, Mich.	1000
KASM	Albany, Minn.	1000d
KRMS	Osage Beach, Mo.	1000d
KSEN	Shelby, Mont.	5000
KDEF	Albuquerque, N. M.	5000
WRUN	Utica, N.Y.	5000
WBAG	Burlington, N.C.	1000d
WGBR	Goldsboro, N.C.	5000
WCUE	Cuyahoga Falls, Ohio	1000d
WIMA	Lima, Ohio	1000
KNED	McAlester, Okla.	1000
KAGO	Klamath Falls, Oreg.	5000
WHUN	Huntingdon, Pa.	5000d
WYNS	Lehighton, Pa.	1000d
WKPA	New Kensington, Pa.	1000d
WDIX	Orangeburg, S.C.	5000
WTYC	Rock Hill, S.C.	1000d
WSNW	Seneca, S.C.	1000d
KIMM	Rapid City, S.Dak.	5000d
WAPO	Chattanooga, Tenn.	5000
WCRK	Morristown, Tenn.	1000
WTAW	Bryan, Tex.	1000d
KCCT	Corpus Christi, Tex.	1000d
KIZZ	El Paso, Tex.	1000d
KVIL	Highland Park, Tex.	1000d
KJBC	Midland, Tex.	1000d
KPNG	Port Neches, Tex.	500d
KOLJ	Quanah, Tex.	500d
KBER	San Antonio, Tex.	1000d
KPUL	Pullman, Wash.	1000d
KAYO	Seattle, Wash.	5000
KKEY	Vancouver, Wash.	1000d
WABH	Deerfield, Va.	1000d
WELC	Welch, W.Va.	1000d
WAXX	Chippewa Falls, Wis.	50000d
WJJD	Chicago, Ill.	50000d
KSL	Salt Lake City, Utah	50000

1160—258.5

WJJD	Chicago, Ill.	50000d
KSL	Salt Lake City, Utah	50000

1170—256.3

WCOV	Montgomery, Ala.	10000
KJNP	North Pole, Alaska	
KCBQ	San Diego, Calif	50000
KLOK	San Jose, Calif.	10000
KOHO	Honolulu, Hawaii	5000
WLBH	Mattoon, Ill.	250d
KSTT	Davenport, Iowa	1000
WWLE	Cornwall, N.Y.	
KVOO	Tulsa, Okla.	50000
WLED	Ponce, P.R.	250
KPUG	Bellingham, Wash.	5000
WWVA	Wheeling, W.Va.	50000
WLKE	Waupun, Wis.	1000d

1180—254.1

WLDS	Jacksonville, Ill.	1000d
KOFI	Kalispell, Mont.	50000
WHAM	Rochester, N.Y.	50000

1190—252.0

KRDS	Tolleson, Ariz.	250
KMCW	Augusta, Ark.	250d
KEZY	Anaheim, Calif	5000
KNBA	Vallejo, Calif.	250d
WGKA	Atlanta, Ga.	1000d
WRIP	Rossville, Ga.	500d
WOWO	Ft. Wayne, Ind.	50000
WANN	Annapolis, Md.	10000d
WKOX	Fram'gham, Mass.	1000d
KHAD	De Soto, Mo.	
KPAR	Albuquerque, N. M.	1000d
WLIB	New York, N.Y.	10000d
WSML	Graham, N. C.	250d
WIXE	Monroe, N. C.	
KEX	Portland, Oreg.	50000
WRAI	Rio Piedras, P.R.	500
WBMJ	San Juan, P.R.	10000
KLIF	Dallas, Tex.	50000

1200—249.9

WOAI	San Antonio, Tex.	50000

1210—247.8

KZOD	Honolulu, Hawaii	1000
WILY	Centralia, Ill.	1000d
WKNX	Saginaw, Mich.	10000d
WADE	Wadesboro, N.C.	1000d
WAVI	Dayton, Ohio	250d
KGYN	Guymon, Okla.	10000
WCAU	Philadelphia, Pa.	50000
WHOY	Salinas, P.R.	

1220—245.8

WAQY	Birmingham, Ala.	1000d
WABF	Fairhope, Ala.	1000d
KVSA	McGehee, Ark.	1000d
KLIP	Fowler, Calif.	250d
KIBE	Palo Alto, Cal.	5000d
KKAR	Pomona, Calif.	250d
KFSC	Denver, Colo.	1000d
WCDQ	Hamden, Conn.	1000d
WDCJ	Arlington, Fla.	1000d
WACY	Kissimmee, Fla.	
WOAH	Miami, Fla.	250d
WSAF	Sarasota, Fla.	1000d
WCLB	Camilla, Ga.	1000d
WPLK	Rockmart, Ga.	500d
WSFT	Thomaston, Ga.	250d
WLPO	LaSalle, Ill.	1000d
WKRS	Waukegan, Ill.	1000d
WSLM	Salem, Ind.	5000d
KJAN	Atlantic, Iowa	250d
KOUR	Independence, Iowa	250d
KOFO	Ottawa, Kans.	250d
WFKN	Franklin, Ky.	250d
KBCL	Shreveport, La.	250d
WLBI	Denham Springs, La.	250d
WSME	Sanford, Maine	1000d
WBCH	Hastings, Mich.	250d
WAVN	Stillwater, Minn.	5000d
WMDC	Hazlehurst, Miss.	250d
KZYM	Cape Girardeau, Mo.	250d
KBHM	Branson, Mo.	1000d
KLPW	Union, Mo.	1000d
WKBK	Keene, N.H.	1000n
WGNY	Newburgh, N.Y.	5000d
WSOQ	N. Syracuse, N.Y.	1000d
WKMT	Kings Mtn., N.C.	1000d
WREV	Reidsville, N.C.	1000d
WENC	Whiteville, N.C.	5000d
KEYD	Oakes, N.Dak.	1000d
WGAR	Cleveland, Ohio	50000
WERT	Van Wert, Ohio	250d
KBLY	Gold Beach, Oreg.	1000d
KAPT	Salem, Ore.	1000d
WJUN	Mexico, Pa.	1000d
WRIB	Providence, R.I.	1000d
WFWL	Camden, Tenn.	250d
WCPH	Etowah, Tenn.	1000d
KZEE	Weatherford, Tex.	250d
KVLL	Woodville, Tex.	250d
WLSD	Big Stone Gap, Va.	1000d
WFAX	Falls Church, Va.	5000d
KASY	Auburn, Wash.	250d
KOZI	Chelan, Wash.	1000d

1230—243.8

WAUD	Auburn, Ala.	1000
WJBB	Haleyville, Ala.	1000
WBHP	Huntsville, Ala.	1000
WNUZ	Talladega, Ala.	1000
WTBC	Tuscaloosa, Ala.	1000
KIFW	Sitka, Alaska	250
KSUN	Bisbee, Ariz.	250
KAAA	Kingman, Ariz.	1000
KRIZ	Phoenix, Ariz.	250
KATO	Safford, Ariz.	250
KIND	Winslow, Ariz.	1000
KCON	Conway, Ark.	250
KFPW	Ft. Smith, Ark.	1000
KBTM	Jonesboro, Ark.	1000
KCON	Conway, Ark.	1000
KGEE	Bakersfield, Calif.	1000
KWTC	Barstow, Calif.	1000
KIBS	Bishop, Calif.	1000
KVOC	Cathedral City, Calif.	1000
KXO	El Centro, Calif.	250
KDAC	Ft. Bragg, Calif.	250
KGFJ	Los Angeles, Calif.	1000
KPRL	Paso Robles, Calif.	1000
KRDG	Redding, Calif.	250
KWG	Stockton, Calif	1000
KEXO	Grand Junction, Colo.	1000
KBRR	Leadville, Colo.	250
KDZA	Pueblo, Colo.	1000d
KGEK	Sterling, Colo.	1000d
WINF	Manchester, Conn.	1000
WGGG	Gainesville, Fla.	1000
WONN	Lakeland, Fla	1000
WMAF	Madison, Fla.	1000
WSBB	New Smyrna Bch., Florida	1000
WNVY	Pensacola, Fla.	1000
WCNH	Quincy, Fla.	1000d
WJNO	W. Palm Beach, Fla.	250
WBIA	Augusta, Ga.	1000d
WBLJ	Dalton, Ga.	1000
WXLI	Dublin, Ga.	1000
WFOM	Marietta, Ga.	1000
WSOK	Savannah, Ga.	1000
WAYX	Waycross, Ga.	1000
KBAR	Burley, Idaho	1000
KORT	Grangeville, Ida.	1000
KRXK	Rexburg, Idaho	1000
WJBC	Bloomington, Ill.	1000
WQUA	Moline, Ill.	1000
WHCO	Sparta, Ill.	250
WJOB	Hammond, Ind.	1000
WSAL	Logansport, Ind.	1000
WTCJ	Tell City, Ind.	1000
WBOW	Terre Haute, Ind.	1000d
KFJB	Marshalltown, Iowa	1000
WHIR	Danville, Ky.	1000d
WHDP	Hopkinsville, Ky.	1000
WANO	Pineville, Ky.	1000d
KLIC	Monroe, La.	1000d
WBOK	New Orleans, La.	1000d
KSLO	Opelousas, La.	1000
WBME	Belfast, Me.	250
WQDY	Calais, Maine	1000d
WSJR	Madawaska, Me.	1000
WITH	Baltimore, Md.	1000d
WCUM	Cumberland, Md.	1000
WMNB	No. Adams, Mass.	1000d
WESX	Salem, Mass.	1000
WNEB	Worcester, Mass.	1000
WIEF	Grand Rapids, Mich.	1000
WIKB	Iron River, Mich.	1000d
WMPC	Lapeer, Mich.	250
WSOO	Sit. Ste. Marie, Mich.	1000
WSTR	Sturgis, Mich.	1000d
WKLK	Cloquet, Minn.	1000
KGHS	Internat'l Falls, Minn.	250
KYSM	Mankato, Minn.	1000
KMRS	Morris, Minn.	250
KTRF	Thief Riv. Falls, Minn.	1000
KWNO	Winona, Minn.	1000d
WCMA	Corinth, Miss.	1000
WHSY	Hattiesburg, Miss.	1000
WSSO	Starkville, Miss.	1000
WAZF	Yazoo City, Miss.	1000
KODE	Joplin, Mo.	1000
KLWT	Lebanon, Mo.	250
KWIT	Moberly, Mo.	1000
KBMN	Bozeman, Mont.	1000d
KHDN	Hardin, Mont.	1000
KXLO	Lewistown, Mont.	1000
KLCB	Libby, Mont.	1000
KTNC	Falls City, Nebr.	100
KHAS	Hastings, Neb.	1000
KELY	Ely, Nev.	250
KLAV	Las Vegas, Nev.	250
KCBN	Reno, Nev.	1000
WMOU	Berlin, N.H.	1000d
WTSV	Claremont, N.H.	1000
WCMC	Wildwood, N.J.	1000
KALG	Alamagordo, N. M.	1000
KOTS	Deming, N.Mex.	250
KYVA	Gallup, N. Mex.	1000
KFUN	Las Vegas, N.M.	1000
KRSY	Roswell, N. Mex.	1000
WNIA	Cheektowaga, N.Y.	500
WENY	Elmira, N.Y.	1000
WIGS	Gouverneur, N. Y.	1000

WHITE'S RADIO LOG

kHz	Wave Length	W.P.
WHUC	Hudson, N. Y.	1000
WLFH	Little Falls, N. Y.	1000
WFAS	White Plains, N. Y.	1000
WSKY	Asheville, N.C.	1000
WFAI	Fayetteville, N.C.	1000
WMFR	High Point, N.C.	1000
WISP	Kinston, N.C.	1000
WNNC	Newton, N. C.	1000
WCBT	Roanoke Rap., N. C.	1000
KDIX	Dickinson, N.Dak.	250
WUBE	Cincinnati, O.	1000
WCOL	Columbus, Ohio	1000
WIRO	Ironton, O.	1000
WCWA	Toledo, O.	1000
KADA	N. of Ada, Okla.	250
WBBZ	Ponca City, Okla.	250
KVAS	Astoria, Ore.	1000
KRNS	Burns, Ore.	1000
KOOS	Coos Bay, Ore.	1000
KROR	Gresham, Oreg.	1000
KYJC	Medford, Oreg.	1000
KQIK	Lakeview, Ore.	1000
KTDO	Toledo, Ore.	1000
WBVP	Beaver Falls, Pa.	1000
WEEX	Easton, Pa.	1000
WKBO	Harrisburg, Pa.	1000
WCRO	Johnstown, Pa.	1000
WBPZ	Lock Haven, Pa.	1000
WTIV	Titusville, Pa.	1000
WNIK	Arecibo, P.R.	1000
WERI	Westerly, R.I.	1000
WAIM	Anderson, S.C.	1000
WNOK	Columbia, S.C.	1000
WOLS	Florence, S.C.	1000
KISO	Sioux Falls, S.Dak.	1000
WAKI	McMinnville, Tenn.	1000
KSIX	Corpus Christi, Tex.	1000
KDLK	Del Rio, Tex.	250
KNUZ	Houston, Tex.	1000
KERV	Kerrville, Tex.	1000
KLVT	Levelland, Tex.	1000
KEEE	Nacogdoches, Tex.	1000
KOZA	Odessa, Tex.	1000
KGRO	Pampa, Tex.	250
KSEY	Seymour, Tex.	1000
KSST	Sulphur Sprgs., Tex.	1000
KWTX	Waco, Tex.	1000d
KMOR	Murray, Utah	1000
KOAL	Price, Utah	1000
WJOY	Burlington, Vt.	1000
WCVR	Randolph, Vt.	
WBBI	Abingdon, Va.	1000
WOOI	Brookneal, Va.	1000
WCFV	Clifton Forge, Va.	1000
WFVA	Fredericksburg, Va.	1000
WNOR	Norfolk, Va.	1000
KWYZ	Everett, Wash.	1000
KSPO	Spokane, Wash.	1000
KREW	Sunnyside, Wash.	1000
WLOG	Logan, W.Va.	1000
WTAP	Parkersburg, W.Va.	1000
WHBY	Appleton, Wis.	1000
WCLO	Janesville, Wis.	1000
WXCO	Wausau, Wis.	1000
KVOC	Casper, Wyo.	1000

1240—241.8

WEBJ	Brewton, Ala.	250
WPRN	Butler, Ala.	1000
WULA	Eufaula, Ala.	1000
WOWL	Florence, Ala.	1000
WARF	Jasper, Ala.	1000
KVRO	Cottonwood, Ariz.	250
KZOW	So. of Globe, Ariz.	1000
KCYN	Williams, Ariz.	1000
KVRC	Arkadelphia, Ark.	250
KTLO	Mountain Home, Ark.	1000
KWAK	Stuttgart, Ark.	250
KPLY	Crescent City, Calif.	250
KOAD	Lemoore, Cal.	250
KMBY	Monterey, Calif.	1000
KPPC	Pasadena, Calif.	100
KLOA	Ridgecrest, Calif.	250
KROY	Sacramento, Calif.	1000
KRNO	San Bernardino, Calif.	1000
KSON	San Diego, Calif.	250
KSMA	Santa Maria, Calif.	250
KSUE	Susanville, Calif.	1000
KRDO	Colo. Springs, Colo.	1000d
KDGO	Durango, Colo.	1000
KSLV	Monte Vista, Colo.	1000
KCRT	Trinidad, Colo.	250
WWCO	Waterbury, Conn.	1000
WBGC	Chipley, Fla.	1000
WLCO	Eustis, Fla.	1000
WINK	Ft. Myers, Fla.	1000
WMMB	Melbourne, Fla.	1000
WFOY	St. Augustine, Fla.	1000
WBHB	Fitzgerald, Ga.	1000
WDUN	Gainesville, Ga.	1000
WLAG	LaGrange, Ga.	1000
WBML	Macon, Ga.	1000
WWNS	Statesboro, Ga.	1000
WPAX	Thomasville, Ga.	1000
WTWA	Thomson, Ga.	250
KVNI	Coeur d'Alene, Idaho	1000
KFLI	Mountain Home, Idaho	250
KMCL	McCall, Ida.	1000
KWIK	Pocatello, Ida.	1000
WCRW	Chicago, Ill.	1000d
WEDC	Chicago, Ill.	1000
WSBC	Chicago, Ill.	1000
WEBQ	Harrisburg, Ill.	1000
WTAX	Springfield, Ill.	1000
WSDR	Sterling, Ill.	500
WHBU	Anderson, Ind.	1000
KDEC	Decorah, Iowa	1000
KWLC	Decorah, Iowa	1000
KBIZ	Ottumwa, Iowa	1000
KICO	Spencer, Iowa	1000
KIUL	Garden City, Kans.	1000
KAKE	Wichita, Kans.	250
WINN	Louisville, Ky.	1000
WFTM	Maysville, Ky.	1000
WPKE	Pikeville, Ky.	1000
WSFC	Somerset, Ky.	1000
KASO	Minden, La.	1000
KANE	New Iberia, La.	1000
WCOU	Lewiston, Maine	1000
WMKR	Millinocket, Me.	1000
WCEM	Cambridge, Md.	1000
WJEJ	Hagerstown, Md.	1000
WHAI	Greenfield, Mass.	250
WOCB	W. Yarmouth, Mass.	1000
WATT	Cadillac, Mich.	1000
WCBY	Cheboygan, Mich.	1000
WJPD	Ishpeming, Mich.	1000
WJIM	Lansing, Mich.	1000
WMFG	Hibbing, Minn.	1000
KPRM	Park Rapids, Minn.	1000
WJON	St. Cloud, Minn.	1000
WMPA	Aberdeen, Miss.	1000
WGRM	Greenwood, Miss.	250
WGCM	Gulfport, Miss.	1000
WMIS	Natchez, Miss.	1000
WNAT	Natchez, Miss.	1000
KFMO	Flat River, Mo.	1000
KWOS	Jefferson City, Mo.	1000
KNEM	Nevada, Mo.	250
KBMY	Billings, Mont.	1000
KLTZ	Glasgow, Mont.	1000
KBLL	Helena, Mont.	1000
KFOR	Lincoln, Nebr.	1000
KODY	North Platte, Nebr.	1000
KELK	Elko, Nev.	1000
WFTN	Franklin, N.H.	250
WSNJ	Bridgeton, N. J.	1000
KAVE	Carlsbad, N.Mex.	1000
KCLV	Clovis, N.Mex.	1000
WGBB	Freeport, N.Y.	1000
WGVA	Geneva, N.Y.	1000
WJTN	Jamestown, N.Y.	500
WVDS	Liberty, N. Y.	1000
WNBZ	Saranac Lake, N.Y.	1000
WSNY	Schenectady, N.Y.	1000
WATN	Watertown, N. Y.	1000
WPNF	Brevard, N.C.	1000
WIST	Charlotte, N.C.	1000
WCNC	Elizabeth City, N.C.	1000
WJNC	Jacksonville, N.C.	1000
WRNC	Raleigh, N.C.	1000
KDLR	Devils Lake, N.Dak.	250
WBBW	Youngstown, Ohio	1000
WHIZ	Zanesville, Ohio	1000
KVSO	Ardmore, Okla.	250
KBEK	Elk City, Okla.	250
KBEL	Idabel, Okla.	250
KOKL	Okmulgee, Okla.	1000
KFLY	Corvallis, Oreg.	1000
KTIX	Pendleton, Oreg.	1000
KPRR	Redmond, Oreg.	250
KOEN	Roseburg, Ore.	1000
WRTA	Altoona, Pa.	1000
WHUM	Reading, Pa.	1000
WSEW	Selinsgrove, Pa.	
WBAX	Wilkes-Barre, Pa.	1000
WALO	Humacao, P.R.	1000
WWON	Woonsocket, R.I.	1000
WKDK	Newberry, S.C.	1000
WOXY	Sumter, S. C.	1000
KCCR	Pierre, S. D.	1000
WBEJ	Elizabethton, Tenn.	1000
WEKR	Fayetteville, Tenn.	1000
WBIR	Knoxville, Tenn.	1000
WKDA	Nashville, Tenn.	1000
WENK	Union City, Tenn.	1000
KVLF	Alpine, Tex.	1000
KEAN	Brownwood, Tex.	1000
KORA	Bryan, Tex.	1000
KOCA	Kilgore, Tex.	1000
KSOX	Raymondville, Tex.	250
KXOX	Sweetwater, Tex.	1000
WSKI	Montpelier, Vt.	1000
WSSV	Petersburg, Va.	1000
WROV	Roanoke, Va.	1000
WTON	Staunton, Va.	1000
KXLE	Ellensburg, Wash.	1000
KGY	Olympia, Wash.	1000
WKOY	Bluefield, W.Va.	1000
WTIP	Charleston, W.Va.	1000
WDNE	Elkins, W.Va.	1000
WOMT	Manitowoc, Wis.	1000
WIBU	Poynette, Wis.	1000
WOBT	Rhinelander, Wis.	1000
WJMC	Rice Lake, Wis.	1000
KFBC	Cheyenne, Wyo.	1000
KEVA	Evanston, Wyo.	1000
KASL	Newcastle, Wyo.	250
KRAL	Rawlins, Wyo.	1000
KTHE	Thermopolis, Wyo.	1000

1250—239.9

WZOB	Ft. Payne, Ala.	1000d
WETU	Wetumpka, Ala.	5000d
KSWW	Wickenburg, Ariz.	500d
KHIL	Willcox, Ariz.	5000d
KFAY	Fayetteville, Ark.	1000d
KALO	Little Rock, Ark.	1000
KHOT	Madera, Calif.	500d
KTMS	Santa Barbara, Calif.	1000
KOHI	Twenty-Nine Palms, California	1000d
KICM	Golden, Colo.	1000d
WNER	Live Oak, Fla.	1000d
WDAE	Tampa, Fla.	5000
WLYB	Albany, Ga.	1000d
WYTH	Madison, Ga.	1000d
WIZZ	Streator, Ill.	500d
WGL	Ft. Wayne, Ind.	1000
WRAY	Princeton, Ind.	1000d
KCFI	Cedar Falls, Iowa	500d
KFKU	Lawrence, Kans.	5000
WREN	Topeka, Kans.	5000
WNVL	Nicholasville, Ky.	500
WLCK	Scottsville, Ky.	500d
WGUY	Bangor, Maine	5000d
WARE	Ware, Mass.	1000
WXOX	Bay City, Mich.	1000d
KBRF	Fergus Falls, Minn.	1000
KCUE	Red Wing, Minn.	1000d
WHNY	McComb, Miss.	5000
KBTC	Houston, Mo.	1000d
WKBR	Manchester, N.H.	5000
WMTR	Morristown, N.J.	5000d
WIPS	Ticonderoga, N.Y.	1000d
WFAG	Farmville, N.C.	500d
WKDX	Hamlet, N. C.	1000d
WBRM	Marion, N.C.	1000d
WCHO	Washington Court House, Ohio	500d
WLEM	Emporium, Pa.	1000d
WPEL	Montrose, Pa.	1000d
WTAE	Pittsburgh, Pa.	5000
WNOW	York, Pa.	5000d
WTMA	Charleston, S.C.	5000
WCKM	Winnsboro, S.C.	500d
WKBL	Covington, Tenn.	1000d
WKYZ	Madisonville, Tenn.	
WNTT	Tazewell, Tenn.	500d
KFTV	Paris, Tex.	500d
KPAC	Port Arthur, Tex.	5000
KUKA	San Antonio, Tex.	500d
KIKZ	Seminole, Tex.	1000d
KVEL	Vernal, Utah	5000d
WDVA	Danville, Va.	5000
WYSR	Franklin, Va.	1000d
WEER	Warrenton, Va.	1000d
KWSC	Pullman, Wash.	5000
KTW	Seattle, Wash.	5000
WEMP	Milwaukee, Wis.	5000

1260—238.0

KPIN	Casa Grande, Ariz.	1000d
KCCB	Corning, Ark.	1000d
KBHC	Nashville, Ark.	500d
KGIL	San Fernando, Calif.	5000
KYA	San Francisco, Calif.	5000
KSNO	Aspen, Colo.	5000d
WCRT	Birmingham, Ala.	5000d
WMMM	Westport, Conn.	1000d
WNRK	Newark, Del.	500d
WWDC	Washington, D.C.	5000
WFTW	Fort Walton Beach, Florida	1000d
WAME	Miami, Fla.	5000
WWPF	Palatka, Fla.	1000
WHAB	Baxley, Ga.	5000d
WBBK	Blakely, Ga.	1000d
WTJH	East Point, Ga.	5000d
KTEE	Idaho Falls, Ida.	5000d
KWEI	Weiser, Ida.	1000d
WIBV	Belleville, Ill.	5000
WFBM	Indianapolis, Ind.	5000
KFGQ	Boone, Iowa	1000d
KWHK	Hutchinson, Kans.	1000
WAIL	Baton Rouge, La.	1000d
WEZE	Boston, Mass.	5000
WALM	Alpion, Mich.	1000
WJBL	Holland, Mich.	5000
KROX	Crookston, Minn.	1000
KDUZ	Hutchinson, Minn.	1000d
WGVM	Greenville, Miss.	5000d
WNSL	Laurel, Miss.	5000d
WCSA	Ripley, Miss.	500
KGBX	Springfield, Mo.	5000
KIMB	Kimball, Nebr.	1000d
WBUD	Trenton, N.J.	5000
KVSF	Santa Fe, N.Mex.	1000
WBNR	Beacon, N.Y.	1000d
WNDR	Syracuse, N.Y.	5000
WGWR	Asheboro, N.C.	5000
WCDJ	Edenton, N.C.	1000d
WIXY	Cleveland, O.	5000
WNXT	Portsmouth, Ohio	5000
KWSH	Wewoka-Seminole, Oklahoma	1000
KMCM	McMinnville, Oreg.	1000
WWYN	Erie, Pa.	5000
WPHB	Philipsburg, Pa.	5000d
WISO	Ponce, P.R.	1000
WMUU	Greenville, S.C.	5000d
WJDT	Lake City, S.C.	1000d
KWYR	Winner, S.Dak.	5000d
WNOO	Chattanooga, Tenn.	1000d
WMCH	Church Hill, Tenn.	1000d
WOKN	Dickson, Tenn.	1000d
WCLC	Jamestown, Tenn.	1000d
KSPL	Diboll, Tex.	1000d
KPSD	Falfurrias, Tex.	500d
KWFR	San Angelo, Tex.	1000d
KTUE	Tulia, Tex.	1000d
KTAE	Taylor, Tex.	1000d
WCHV	Charlottesville, Va.	5000
WJJJ	Christiansburg, Va.	1000d
KWIQ	Moses Lake, Wash.	1000d
WVVW	Grafton, W.Va.	500
WWIS	Black River Falls, Wis.	1000d
WEKZ	Monroe, Wis.	1000d
WOCO	Oconto, Wis.	
KPOW	Powell, Wyo.	5000

1270—236.1

WGSV	Guntersville, Ala.	1000d
WZAM	Prichard, Ala.	1000d
KBYR	Anchorage, Alaska	1000
KOJI	Holbrook, Ariz.	5000d
KADL	Pine Bluff, Ark.	5000d
KBLC	Lakeport, Calif.	
KGDL	Palm Desert, Cal.	500d
KCOK	Tulare, Calif.	5000
WNOG	Naples, Fla.	500d
WHIY	Orlando, Fla.	5000d
WTNT	Tallahassee, Fla.	5000
WKRW	Cartersville, Ga.	500d
WHYO	Columbus, Ga.	5000d
WJJC	Commerce, Ga.	1000d
KNDI	Honolulu, Hawaii	5000
KTFI	Twin Falls, Idaho	5000
WEIC	Charleston, Ill.	1000d
WHBF	Rock Island, Ill.	5000
WCMR	Elkhart, Ind.	5000
WWCA	Gary, Ind.	1000
WORX	Madison, Ind.	1000d
KSCB	Liberal, Kans.	1000
WAIN	Columbia, Ky.	1000d
WFUL	Fulton, Ky.	1000d
KVCL	Winnfield, La.	1000d
WUDK	Cumberland, Md.	5000
WSPR	Springfield, Mass.	5000
WXYZ	Detroit, Mich.	5000
KWEB	Rochester, Minn.	5000
WVOM	Iuka, Miss.	1000d
WLSM	Louisville, Miss.	5000d
KUSN	St. Joseph, Mo.	1000d
KFBO	Waynesville, Mo.	
KBUB	Sparks, Nev.	1000d
WTSN	Dover, N.H.	500d
WOVL	Vineland, N.J.	500d
KINN	Alamogordo, N.M.	1000d
WHLO	Niagara Falls, N.Y.	5000d
WOLA	Walton, N.Y.	1000d
WCGC	Belmont, N. C.	1000
WMPM	Smithfield, N.C.	5000d
KBOM	Mandan, N.Dak.	1000
WILE	Cambridge, Ohio	1000d
KWPR	Claremore, Okla.	500d
KAJO	Grants Pass, Oreg.	5000d
WLBR	Lebanon, Pa.	5000
WBHC	Hampton, S.C.	1000d
KNWC	Sioux Falls, S.Dak.	1000
WLIK	Newport, Tenn.	5000
KIOX	Bay City, Tex.	1000
KHEM	Big Spring, Tex.	1000d
KEPS	Eagle Pass, Tex.	1000d
KFJZ	Fort Worth, Tex.	5000
WTID	Newport News, Va.	1000d
KCVL	Colville, Wash.	1000d
KBAM	Longview, Wash.	5000d
WRJC	Mauston, Wis.	500d
WWJC	Superior, Wis.	5000d
KIML	Gillette, Wyo.	5000

1280—234.2

WPID	Piedmont, Ala.	1000d
WNPT	Tuscaloosa, Ala.	5000
KHEP	Phoenix, Ariz.	1000d
KNBY	Newport, Ark.	1000d
KOAG	Arroyo Grande, Cal.	1000
KIXF	Fortuna, Cal.	5000d
KFOX	Long Beach, Calif.	1000
KJOY	Stockton, Calif.	1000
KTLN	Denver, Colo.	5000
WSUX	Seaford, Del.	1000d
WDSP	DeFuniak Springs, Florida	5000d
WIPC	Lake Wales, Fla.	1000d
WYND	Sarasota, Fla.	500d
WIBB	Macon, Ga.	5000d
WMRO	Aurora, Ill.	1000d
WGBF	Evansville, Ind.	5000
KCOB	Newton, Iowa	1000d
KSOK	Arkansas City, Kans.	1000
WCPM	Cumberland, Ky.	1000d

kHz	Wave Length	W.P.
WIXI	Lancaster, Ky.	1000d
WDSU	New Orleans, La.	5000
KWCL	Oakgrove, La.	1000d
WABK	Gardiner, Me.	
WEIM	Fitchburg, Mass.	5000
WFYC	Alma, Mich.	5000d
WWTC	Minneapolis, Minn.	5000
KVOX	Moorhead, Minn.	1000
WSCO	Taylorsville, Miss.	
KDKD	Clinton, Mo.	1000d
KYRO	Potosi, Mo.	500d
KCNI	Broken Bow, Nebr.	1000d
KTOO	Henderson, Nev.	5000d
KRZE	Farmington, N.Mex.	5000d
WADO	New York, N.Y.	5000
WROC	Rochester, N.Y.	5000
WSAT	Salisbury, N.C.	1000
WYAL	Scotland Neck, N.C.	5000d
WONW	Defiance, Ohio	1000
WLMJ	Jackson, Ohio	1000d
KLCO	Poteau, Okla.	1000d
KERG	Eugene, Oreg.	5000
WBRX	Berwick, P.	1000d
WHVR	Hanover, Pa.	5000
WKST	New Castle, Pa.	1000
WCMN	Arecibo, P.R.	5000
WANS	Anderson, S.C.	5000
WJAY	Mullins, S.C.	5000d
WMCP	Columbia, Tenn.	1000d
WDNT	Dayton, Tenn.	1000d
KNIT	Abilene, Tex.	500d
KWHI	Brenham, Tex.	1000d
KLUE	Longview, Tex.	1000d
KRAN	Morton, Tex.	500
KVWG	Pearsall, Tex.	500d
KNAK	Salt Lake City, Utah	5000
WYVE	Wytheville, Va.	1000d
KMAS	Shelton, Wash.	1000d
KUDY	Spokane, Wash.	5000d
KIT	Yakima, Wash.	5000
WNAM	Neenah, Wis.	5000

1290—232.4

WHOD	Jackson, Ala.	1000d
WSHF	Sheffield, Ala.	1000d
WMLS	Sylacauga, Ala.	1000d
KCUB	Tucson, Ariz.	1000
KOMS	El Dorado, Ark.	5000d
KUOA	Siloam Sprgs., Ark.	5000d
KHSL	Chico, Calif.	5000
KAZA	Gilroy, Calif.	5000d
KMEN	San Bernardino, California	5000
KACL	Santa Barbara, Cal.	500d
WCCC	Hartford, Conn.	500d
WTUX	Wilmington, Del.	1000d
WTMC	Ocala, Fla.	5000
WSCM	Panama City Beach, Florida	500d
WIRK	W. Palm Bch., Fla.	5000
WDEC	Americus, Ga.	1000d
WCHK	Canton, Ga.	1000d
WTOC	Savannah, Ga.	5000
KSNN	Pocatello, Idaho	1000d
WIRL	Peoria, Ill.	5000
WREY	New Albany, Ind.	500d
KWNS	Pratt, Kansas	5000
WCBL	Benton, Ky.	5000d
KJEF	Jennings, La.	1000d
WHGR	Houghton Lake, Mich.	5000
WNIL	Niles, Mich.	500d
WOIB	Saline, Mich.	500d
KBMO	Benson, Minn.	500d
WBLE	Batesville, Miss.	1000d
KALM	Thayer, Mo.	1000d
KGVO	Missoula, Mont.	5000
KOIL	Omaha, Nebr.	5000
WKNE	Keene, N.H.	5000
KSRC	Socorro, N.M.	1000d
WGLI	Babylon, N.Y.	5000
WNBF	Binghamton, N.Y.	5000
WHKY	Hickory, N.C.	5000
WBBS	Jacksonville, N.C.	
WEYE	Sanford, N.C.	1000d
WOMP	Bellaire, Ohio	1000d
WHIO	Dayton, Ohio	5000
KUMA	Pendleton, Oreg.	5000
KLIQ	Portland, Oreg.	5000d
WFBG	Altoona, Pa.	5000
WICE	Providence, R.I.	5000
WFIG	Sumter, S.C.	1000
WATO	Oak Ridge, Tenn.	5000
KBLT	Big Lake, Tex.	1000d
KIVY	Crockett, Tex.	500d
KRGV	Weslaco, Tex.	5000
KTRN	Wichita Falls, Tex.	5000
WPVA	Colonial Hgts., Va.	5000d
WAGE	Leesburg, Va.	1000d
WKWS	Rocky Mount, Va.	1000d
WVOW	Logan, W.Va.	5000
KAPY	Port Angeles, Wash.	1000d
WMIL	Milwaukee, Wis.	1000d
WCOW	Sparta, Wis.	5000d
KOWB	Laramie, Wyo.	5000

1300—230.6

WBSA	Boaz, Ala.	1000d
WTLS	Tallassee, Ala.	1000d
WEZQ	Winfield, Ala.	1000d
KHAC	Window Rock, Ariz.	
KWCB	Searcy, Ark.	1000d
KROP	Brawley, Calif.	1000
KYNO	Fresno, Calif.	5000
KWKW	Pasadena, Calif.	5000
KVOR	Colorado Springs, Colo.	5000
WAVZ	New Haven, Conn.	1000
WRKT	Cocoa Beach, Fla.	5000
WFFG	Marathon, Fla.	500
WSOL	Tampa, Fla.	5000d
WMTM	Moultrie, Ga.	5000d
WNEA	Newman, Ga.	500
WIMO	Winder, Ga.	1000d
KOZE	Lewiston, Idaho	5000
WTAQ	La Grange, Ill.	5000
WFRX	W. Frankfort, Ill.	1000d
WHLT	Huntington, Ind.	500d
WAAC	Terre Haute, Ind.	500d
KGLO	Mason City, Iowa	5000
WBLG	Lexington, Ky.	1000
WIBR	Baton Rouge, La.	1000
WFBR	Baltimore, Md.	5000
WJDA	Quincy, Mass.	1000d
WOOD	Grand Rapids, Mich.	5000
WKPM	Princeton, Minn.	
WRBC	Jackson, Miss.	5000
KMMO	Marshall, Mo.	1000d
KBRL	McCook, Nebr.	5000d
KPTL	Carson City, Nev.	5000
WPNH	Plymouth, N.H.	1000d
WAAT	Trenton, N.J.	5000d
WOSC	Fulton, N.Y.	1000d
WMMJ	Lancaster, N.Y.	1000d
WEEE	Rensselaer, N.Y.	5000d
WKQW	Spring Valley, N.Y.	500d
WGOL	Goldsboro, N.C.	1000d
WLNC	Laurinburg, N.C.	500d
WSYD	Mt. Airy, N.C.	5000
WERE	Cleveland, Ohio	5000
WMVO	Mt. Vernon, Ohio	500
KCNW	Tulsa, Okla.	5000
KDOV	Medford, Oreg.	5000d
KACI	The Dalles, Oreg.	1000d
WWCH	Clarion, Pa.	500d
WTHT	Hazleton, Pa.	1000d
WTIL	Mayaguez, P.R.	1000
WLOW	Aiken, S.C.	500d
WDOG	Allendale, S.C.	1000d
WCKI	Greer, S.C.	1000d
WKSC	Kershaw, S.C.	500d
KOLY	Mobridge, S.D.	5000d
WMTN	Morristown, Tenn.	5000d
WMAK	Nashville, Tenn.	5000
KVET	Austin, Tex.	5000
KKUB	Brownfield, Tex.	1000d
KGNS	Laredo, Tex.	1000
KKAS	Silsbee, Tex.	500d
KSTU	Logan, Utah	1000
WKCY	Harrisonburg, Va.	5000d
KOL	Seattle, Wash.	5000
WCLG	Morgantown, W.Va.	1000d
WKLC	St. Albans, W.Va.	1000d

1310—228.9

WHEP	Foley, Ala.	1000d
WJAM	Marion, Ala.	5000d
KBUZ	Mesa, Ariz.	5000
KBOK	Malvern, Ark.	1000d
KIOT	Barstow, Calif.	5000d
KPOD	Crescent City, Calif.	1000d
KDIA	Oakland, Cal.	5000
KTKR	Taft, Calif.	1000d
KFKA	Greeley, Colo.	5000d
WICH	Norwich, Conn.	5000
WOOD	Deland, Fla.	5000d
WGKR	Perry, Fla.	1000d
WAUC	Wauchula, Fla.	500d
WOMN	Decatur, Ga.	500
WOKA	Douglas, Ga.	1000d
WBRO	Waynesboro, Ga.	1000d
WBMK	West Point, Ga.	1000d
KNUI	Makawao, Hawaii	5000
KLIX	Twin Falls, Idaho	5000
WIFE	Indianapolis, Ind.	5000
KDLS	Perry, Iowa	500d
KOKX	Keokuk, Ia.	1000
KFLA	Scott City, Kans.	500d
WTTL	Madisonville, Ky.	1000
WDOC	Prestonsburg, Ky.	5000d
KIKS	Sulphur, La.	500d
KUZN	W. Monroe, La.	1000d
WLOB	Portland, Me.	5000
WORC	Worcester, Mass.	5000
WKNR	Dearborn, Mich.	5000
WCCW	Traverse City, Mich.	5000d
KRBI	St. Peter, Minn.	1000d
WXXX	Hattiesburg, Miss.	1000d
KFSB	Joplin, Mo.	5000
KFBB	Great Falls, Mont.	5000
KGMT	Fairbury, Nebr.	500d
WJLK	Asbury Park, N.J.	1000d
WCAM	Camden, N. J.	1000
KARA	Albuquerque, N.M.	1000d
WVIP	Mt. Kisco, N.Y.	5000d
WTLB	Utica, N.Y.	1000
WISE	Asheville, N.C.	5000
WKTC	Charlotte, N.C.	1000
WTIK	Durham, N.C.	5000
KNDX	Grand Forks, N.Dak.	5000
WFAH	Alliance, Ohio	1000d
KNPT	Newport, Oreg.	5000
WBFD	Bedford, Pa.	5000d
WGSA	Ephrata, Pa.	5000d
WNAE	Warren, Pa.	5000
WDKD	Kingstree, S.C.	5000d
WDOD	Chattanooga, Tenn.	5000
WOXI	Jackson, Tenn.	5000
WBNT	Oneida, Tenn.	1000d
KZIP	Amarillo, Tex.	1000d
WRR	Dallas, Tex.	5000
KOYL	Odessa, Tex.	1000d
KBUC	San Antonio, Tex.	5000
WEEL	Fairfax, Va.	5000
WGH	Newport News, Va.	5000
KARY	Prosser, Wash.	1000d
WIBA	Madison, Wis.	5000

1320—227.1

WAGF	Dothan, Ala.	1000
WENN	Birmingham, Ala.	5000d
KBLU	Yuma, Ariz.	500d
KWHN	Fort Smith, Ark.	5000
KRLW	Walnut Ridge, Ark.	1000d
KHSJ	Hemet, Calif.	500d
KLAN	Lemoore, Calif.	1000d
KUDE	Oceanside, Calif.	500
KCRA	Sacramento, Calif.	5000
KAVI	Rocky Ford, Colo.	1000d
WATR	Waterbury, Conn.	5000
WGMA	Hollywood, Fla.	5000
WVOJ	Jacksonville, Fla.	5000
WAMR	Venice, Fla.	500d
WHIE	Griffin, Ga.	5000d
WKAN	Kankakee, Ill.	1000
KNIA	Knoxville, Iowa	500d
KMAQ	Maquoketa, Iowa	500d
KLWN	Lawrence, Kans.	500d
WBRT	Bardstown, Ky.	1000d
WCLU	Covington, Ky.	500d
WNGO	Mayfield, Ky.	1000d
KHAL	Homer, La.	1000d
WICO	Salisbury, Md.	1000d
WARA	Attleboro, Mass.	1000
WILS	Lansing, Mich.	5000
WDMJ	Marquette, Mich.	1000
WRJW	Picayune, Miss.	5000d
WVLY	Water Valley, Miss.	500d
KXLW	Clayton, Mo.	1000d
KOLT	Scottsbluff, Nebr.	5000
KRDO	Roswell, N.M.	1000d
WWHG	Hornell, N.Y.	5000d
WAGY	Forest City, N.C.	1000d
WCOG	Greensboro, N.C.	5000
WKRK	Murphy, N.C.	5000d
WEEW	Washington, N.C.	500d
KHRT	Minot, N.D.	1000d
WHOK	Lancaster, Ohio	1000d
KWOE	Clinton, Okla.	1000d
KATR	Eugene, Ore.	1000d
WKAP	Allentown, Pa.	5000
WGET	Gettysburg, Pa.	1000
WJAS	Pittsburgh, Pa.	5000
WSCR	Scranton, Pa.	1000
WUNO	Rio Piedras, P.R.	5000
WOIC	Columbia, S. C.	5000
KELO	Sioux Falls, S.Dak.	5000
WKIN	Kingsport, Tenn.	5000d
WMSR	Manchester, Tenn.	5000d
KVMC	Colo. City, Tex.	1000d
KXYZ	Houston, Tex.	5000
KCPX	Salt Lake City, Utah	5000
WLGM	Lynchburg, Va.	1000d
WEET	Richmond, Va.	1000d
KXRO	Aberdeen, Wash.	5000
KHIT	Walla Walla, Wash.	1000d
WAKX	Superior, Wis.	1000d
WFHR	Wisconsin Rapids, Wis.	5000

1330—225.4

WROS	Scottsboro, Ala.	1000d
KHYT	Tucson, Ariz.	500d
KVEE	Conway, Ark.	500d
KLOM	Lompoc, Cal.	1000d
KFAC	Los Angeles, Calif.	5000
KLBS	Los Banos, Calif.	500d
KAHR	Redding, Calif.	5000d
WARN	Ft. Pierce, Fla.	1000
WWAB	Lakeland, Fla.	1000d
WEBY	Milton, Fla.	5000d
WMEN	Tallahassee, Fla.	5000d
WMLT	Dublin, Ga.	5000
WEAW	Evanston, Ill.	5000d
WRAM	Monmouth, Ill.	1000d
WRRR	Rockford, Ill.	1000d
WJPS	Evansville, Ind.	5000
WTRE	Greensburg, Ind.	
KWWL	Waterloo, Iowa	5000
KFH	Wichita, Kans.	5000
WYGO	Corbin, Ky.	5000d
WMOR	Morehead, Ky.	1000d
KVOL	Lafayette, La.	5000
WASA	Havre de Grace, Md.	5000d
KUKU	Willow Springs, Mo.	1000d
KGAK	Gallup, N.Mex.	5000
WWHG	Hornell, N.Y.	
WEVD	New York, N.Y.	5000
WPOW	New York, N.Y.	5000
WEBO	Owego, N.Y.	1000d
WHAZ	Troy, N.Y.	1000
WUSM	Havelock, N.C.	1000d
WHOT	Campbell, Ohio	1000
WFIN	Findlay, Ohio	1000d
WKOV	Wellston, Ohio	500d
WELW	Willoughby, O.	500d
KPOJ	Portland, Oreg.	5000
WBLF	Bellefonte, Pa.	500d
WRIE	Erie, Pa.	5000
WLAT	Conway, S. C.	5000
WFBC	Greenville, S.C.	5000
WAEW	Crossville, Tenn.	1000d
WTRO	Dyersburg, Tenn.	500d
KMIL	Cameron, Tex.	500d
KSWA	Graham, Tex.	500d
KINE	Kingsville, Tex.	1000d
KVKM	Monahans, Tex.	5000
KZAK	Tyler, Tex.	1000d
WBTM	Danville, Va.	5000
WRAA	Luray, Va.	1000d
WOLD	Marion, Va.	1000d
WESR	Tasley, Va.	5000d
KCFA	Spokane, Wash.	5000d
WETZ	New Martinsville, W.Va.	1000d
WHBL	Sheboygan, Wis.	5000
KOVE	Lander, Wyo.	5000

1340—223.7

WKUL	Cullman, Ala.	1000
WJOI	Florence, Ala.	1000
WAMA	Selma, Ala.	250
WFEB	Sylacauga, Ala.	1000
KIKO	Miami, Ariz.	1000
KFBR	Nogales, Ariz.	250
KPGE	Page, Ariz.	1000
KBTA	Batesville, Ark.	1000
KZNG	Hot Springs, Ark.	1000
KBRS	Springdale, Ark.	1000
KATA	Arcata, Cal.	1000
KWXY	Cathedral City, Cal.	500
KMAK	Fresno, Calif	1000
KDOL	Mojave, Cal.	500
KSFE	Needles, Calif.	250
KAOR	Oroville, Cal.	1000
KATY	San Luis Obispo, California	1000
KIST	Santa Barbara, Calif.	1000
KOMY	Watsonville, Calif.	1000
KDEN	Denver, Colo.	1000
KWSL	Grand Junction, Colo.	250
KVRH	Salida, Colo.	1000
WNHC	New Haven, Conn.	1000
WOOK	Washington, D. C.	1000
WSLC	Clermont, Fla.	250
WTAN	Clearwater, Fla.	250
WROD	Daytona Bch., Fla.	1000
WDSR	Lake City, Fla.	1000
WTYS	Marianna, Fla.	1000
WQXT	Palm Beach, Fla.	500
WSEB	Sebring, Fla.	1000
WFSH	Valparaiso, Fla.	1000
WIGO	Atlanta, Ga.	1000
WGAU	Athens, Ga.	1000
WBBQ	Augusta, Ga.	1000
WGAA	Cedartown, Ga.	1000
WOKS	Columbus, Ga.	1000
WBBT	Lyons, Ga.	1000
WTIF	Tifton, Ga.	1000
KAIN	Nampa, Idaho	1000
KPST	Preston, Idaho	250
KSKI	Sun Valley, Idaho	1000
WSOY	Decatur, Ill.	1000
WJPF	Herrin, Ill.	1000
WJOL	Joliet, Ill.	1000
WBIW	Bedford, Ind.	1000
WTRC	Elkhart, Ind.	1000
WLBC	Muncie, Ind.	1000
KROS	Clinton, Iowa	1000
KCKN	Kansas City, Kans.	1000
KSEK	Pittsburg, Kans.	1000
WCMI	Ashland, Ky.	1000
WNBS	Murray, Ky.	1000
WEKY	Richmond, Ky.	1000
KVOB	Bastrop, La.	1000
KRMD	Shreveport, La.	1000
WFAU	Augusta, Maine	1000
WDME	Dover-Foxcroft, Me.	250
WHOU	Houlton, Maine	1000
WGAW	Gardner, Mass.	1000
WNBH	New Bedford, Mass.	1000
WBRK	Pittsfield, Mass.	1000
WLEW	Bad Axe, Mich.	1000
WLAV	Grand Rap., Mich.	1000
WCSR	Hillsdale, Mich.	1000
WMTE	Manistee, Mich.	1000
WAGN	Menominee, Mich.	1000
WMBN	Petoskey, Mich.	1000
WEXL	Royal Oak, Mich.	1000
KVBR	Brainerd, Minn.	1000
KDLM	Detroit Lakes, Minn.	1000
WEVE	Eveleth, Minn.	1000
KROC	Rochester, Minn.	1000
KWLM	Willmar, Minn.	1000
WJMB	Brookhaven, Miss.	250
WAML	Laurel, Miss.	250
KXEO	Mexico, Mo.	1000
KLID	Poplar Bluff, Mo.	1000d
KSGM	St. Genevieve, Mo.	1000
KSMO	Salem, Mo.	1000
KICK	Springfield, Mo.	1000

WHITE'S RADIO LOG

kHz	Wave Length	W.P.
KCAP	Helena, Mont.	1000
KPRK	Livingston, Mont.	1000
KATL	Miles City, Mont.	1000
KYLT	Missoula, Mont.	250
KHUB	Fremont, Nebr.	500
KGFW	Kearney, Nebr.	1000
KSID	Sidney, Nebr.	1000
KORK	Las Vegas. Nev.	1000
KBET	Reno, Nev.	1000
WDCR	Hanover, N.H.	1000
WMID	Atlantic City, N.J.	1000
KHAP	Aztec, N.M.	1000
KRRR	Ruidoso, N. Mex.	1000
KKIT	Taos, N.Mex.	250
KSIL	Silver City, N.Mex.	1000
WMBO	Auburn, N.Y.	1000
WENT	Gloversville, N.Y.	1000
WKSN	Jamestown, N.Y.	250
WUSJ	Lockport, N.Y.	250
WMSA	Massena, N.Y.	1000
WALL	Middletown, N.Y.	1000
WIRY	Plattsburgh, N.Y.	1000
WJRI	Lenoir, N.C.	1000
WTSB	Lumberton, N.C.	1000
WOXF	Oxford, N.C.	1000
WOOW	Greenville, N.C.	1000
WGNI	Wilmington, N.C.	1000
WAIR	Winston-Salem, N.C.	250
KGPC	Grafton, N.Dak.	1000
WNCO	Ashland, O.	1000
WOUB	Athens, Ohio	250
WIZE	Springfield, Ohio	1000
WSTV	Steubenville, Ohio	1000
KIHN	Hugo, Okla.	250
KOCY	Okla. City, Okla.	1000
KTOW	Sand Springs, Okla.	500
KLOO	Corvallis, Ore.	1000
KWVR	Enterprise, Oreg.	250
KIHR	Hood River, Ore.	1000
KBBR	N. Bend, Ore.	1000
WCVI	Connellsville, Pa.	1000
WSAJ	Grove City, Pa.	100
WKRZ	Oil City, Pa.	1000
WHAT	Philadelphia, Pa.	1000
WRAW	Reading, Pa.	1000
WTRN	Tyrone, Pa.	1000
WBRE	Wilkes-Barre, Pa.	1000
WWPA	Williamsport, Pa.	1000
WUNA	Aguadilla, P.R.	250
WOKE	Charleston, S.C.	1000
WRHI	Rock Hill, S.C.	1000
WSSC	Sumter, S.C.	1000
KIJV	Huron, S. D.	1000
KRSD	Rapid City, S.Dak.	1000
WBAC	Cleveland, Tenn.	1000
WKRM	Columbia, Tenn.	1000
WGRV	Greeneville Tenn.	1000
WKGN	Knoxville, Tenn.	1000
WLOK	Memphis, Tenn.	1000
WCDT	Winchester, Tenn.	1000
KWKC	Abilene, Tex.	250
KTSL	Burnett, Tex.	1000
KAND	Corsicana, Tex.	250
KSET	El Paso, Tex.	1000
KLBK	Lubbock, Tex.	250
KRBA	Lufkin, Tex.	1000
KPDN	Pampa, Tex.	250
KOLE	Port Arthur, Tex.	250
KTEO	San Angelo, Tex.	250
KVIC	Victoria, Tex.	250
WTWN	St. Johnsbury, Vt.	1000
WSTA	Charlotte Amalie, V.I.	250
WKEY	Covington, Va.	1000
WHAP	Hopewell, Va.	1000
WJMA	Orange, Va.	1000
KAGT	Anacortes, Wash.	250
KSMK	Kennewick, Wash.	1000
KAPA	Raymond, Wash.	1000
KMEL	Wenatchee, Wash.	250
WHAR	Clarksburg, W.Va.	1000
WEPM	Martinsburg, W. Va.	1000
WMON	Montgomery, W.Va.	1000
WOVE	Welch, W.Va.	1000
WLDY	Ladysmith, Wis.	1000
WRIT	Milwaukee, Wis.	1000
KSGT	Jackson, Wyo.	250
KYCN	Wheatland, Wyo.	250
KWOR	Worland, Wyo.	1000

1350—222.1

WELB	Elba, Ala.	1000d
WGAD	Gadsden, Ala.	5000d
KLYD	Bakersfield, Calif.	1000d
KCKC	San Bernardino, Cal.	5000
KSRO	Santa Rosa, Calif.	5000
KKAM	Pueblo, Colo.	5000
WNLK	Norwalk, Conn.	1000
WINY	Putnam, Conn.	1000d
WEZY	Cocoa, Fla.	1000
WDCF	Dade City, Fla.	1000d
WCAI	Ft. Myers, Fla.	1000d
WBSG	Blackshear, Ga.	500d
WRWH	Cleveland, Ga.	1000d
WAVC	Warner Robins, Ga.	5000d
KTOH	Lihue, Hawaii	5000
KRLC	Lewiston, Ida.-Clarkston, Wash.	5000d
WXCL	Peoria, Ill.	1000
WJBD	Salem, Ill.	1000d
WIOU	Kokomo, Ind.	5000
KRNT	Des Moines, Iowa	5000
KMAN	Manhattan, Kans.	500d
WLOU	Louisville, Ky.	5000d
WSMB	New Orleans, La.	5000
WHMI	Howell, Mich.	500
KOIO	Ortonville, Minn.	1000d
WCMP	Pine City, Minn.	1000d
WKCU	Corinth, Miss.	1000
WKOZ	Kosciusko, Miss.	5000d
KCHR	Charleston, Mo.	1000d
KBRX	O'Neill, Nebr.	1000d
WLNH	Laconia, N.H.	5000d
WHWH	Princeton, N.J.	5000
KABQ	Albuquerque, N.M.	5000
WCBA	Corning, N.Y.	1000d
WRNY	Rome, N.Y.	500d
WBMS	Black Mountain, N. C.	500d
WHIP	Mooresville, N.C.	1000d
WLLY	Wilson, N.C.	1000d
KBMR	Bismarck, N. D.	500d
WSLR	Akron, O.	5000
WCSM	Celina, Ohio	500d
WCHI	Chillicothe, Ohio	1000d
KRHD	Duncan, Okla.	250
KTLQ	Tahlequah, Okla.	1000d
KRVC	Ashland, Oreg.	1000d
WDRK	York, Pa.	5000
WWBR	Windber, Pa.	1000d
WDAR	Darlington, S.C.	1000d
WGSW	Greenwood, S.C.	1000d
WRKM	Carthage, Tenn.	1000d
KCAR	Clarksville, Tex.	500d
KTXJ	Jasper, Tex.	1000d
KCOR	San Antonio, Tex.	5000
WBLT	Bedford, Va.	1000d
WFLS	Fredericksburg, Va.	1000d
WNVA	Norton, Va.	5000d
WCVU	Portsmouth, Va.	5000
WPDR	Portage, Wis.	5000d

1360—220.4

WWWB	Jasper, Ala.	1000d
WLIQ	Mobile, Ala.	5000d
WMFC	Monroeville, Ala.	1000d
WELR	Roanoke, Ala.	1000d
KRUX	Glendale, Ariz.	5000
KLYR	Clarksville, Ark.	500d
KFFA	Helena, Ark.	1000
KFIV	Modesto, Cal.	5000
KRCK	Ridgecrest, Calif.	1000d
KGB	San Diego, Calif.	5000
WDRC	Hartford, Conn.	5000
WOBS	Jacksonville, Fla.	5000d
WKAT	Miami Beach, Fla.	5000
WINT	Winter Haven, Fla.	1000d
WAZA	Bainbridge, Ga.	1000d
WLAW	Lawrenceville, Ga.	1000d
WMAC	Metter, Ga.	500d
WIYN	Rome, Ga.	500d
WLBK	DeKalb, Ill.	1000d
WVMC	Mt. Carmel, Ill.	500d
WGFA	Watseka, Ill.	1000d
KHAK	Cedar Rapids, Iowa	1000d
KXGI	Ft. Madison, Iowa	1000d
KSCJ	Sioux City, Iowa	5000
KBTO	El Dorado, Kans.	500d
WFLW	Monticello, Ky.	1000d
KDXI	Mansfield, La.	1000d
KNIR	New Iberia, La.	1000d
KTLD	Tallulah, La.	500d
WEBB	Baltimore, Md.	5000d
WLYN	Lynn, Mass.	1000d
WKYO	Caro, Mich.	500d
WKMI	Kalamazoo, Mich.	5000
KLRS	Mountain Grove, Mo.	1000d
KICX	McCook, Nebr.	1000d
WNNJ	Newton, N.J.	1000d
WWBZ	Vineland, N.J.	1000
WKOP	Binghamton, N.Y.	5000
WMNS	Olean, N.Y.	1000d
WCNL	Chapel Hill, N.C.	1000d
KEYZ	Williston, N.D.	5000
WSAI	Cincinnati, Ohio	5000
WWOW	Conneaut, Ohio	500d
KUIK	Hillsboro, Oreg.	1000d
WMCK	McKeesport, Pa.	5000
WPPA	Pottsville, Pa.	5000
WELP	Easley, S.C.	1000d
WLCM	Lancaster, S.C.	1000d
WBLC	Lenoir City, Tenn.	
WNAH	Nashville, Tenn.	1000d
KRAY	Amarillo, Tex.	500d
KACT	Andrews, Tex.	1000d
KWBA	Baytown, Tex.	1000
KRYS	Corpus Christi, Tex.	1000
KXOL	Ft. Worth, Tex.	5000
WBOB	Galax, Va.	1000d
WHBG	Harrisonburg, Va.	5000d
KFDR	Grand Coulee, Wash.	1000d
KMO	Tacoma, Wash.	5000
WHJC	Matawan, W.Va.	1000d
WMOV	Ravenswood, W.Va.	1000d
WBAY	Green Bay, Wis.	5000
WISV	Viroqua, Wis.	1000
WMNE	Menomonie, Wis.	1000d
KVRS	Rock Springs, Wyo.	1000

1370—218.8

WBYE	Calera, Ala.	1000d
KAWW	Heber Springs, Ark.	500d
KTPA	Prescott, Ark.	500d
KREL	Corona, Cal.	5000
KPCO	Quincy, Cal.	500d
KEEN	San Jose, Calif.	1000d
KGEN	Tulare, Calif.	1000d
WKMK	Blountstown, Fla.	500d
WWKE	Ocala, Fla.	5000d
WCOA	Pensacola, Fla.	5000
WAXE	Vero Beach, Fla.	1000d
WLOP	Jesup, Ga.	5000
WFOR	Manchester, Ga.	1000d
WLOV	Washington, Ga.	1000d
WPRC	Lincoln, Ill.	1000d
WTTS	Bloomington, Ind.	5000
WLTH	Gary, Ind.	1000d
KDTH	Dubuque, Iowa	5000
KGNO	Dodge City, Kans.	5000
KALN	Iola, Kans.	500d
WABD	Ft. Campbell, Ky.	500d
WGOH	Grayson, Ky.	5000d
WTKY	Tompkinsville, Ky.	1000d
KAPB	Marksville, La.	1000d
WDEA	Ellsworth, Me.	5000
WMHI	Braddocks Hts., Md.	500d
WKJK	Leonardtown, Md.	1000d
WWAM	Cadillac, Mich.	5000
WGHN	Grand Haven, Mich.	500d
KSUM	Fairmont, Minn.	1000
WMKT	S. St. Paul, Minn.	500d
WMGO	Canton, Miss.	1000d
KWRT	Boonville, Mo.	1000d
KCRV	Caruthersville, Mo.	1000d
KXLF	Butte, Mont.	5000
KAWL	York, Nebr.	500d
WFEA	Manchester, N.H.	5000
WELV	Ellenville, N.Y.	500
WALK	Patchogue, N.Y.	500d
WSAY	Rochester, N.Y.	5000
WLTC	Gastonia, N.C.	5000d
WTAB	Tabor City, N.C.	5000d
KFJM	Grand Forks, N.D.	1000d
WSPD	Toledo, Ohio	5000
KVYL	Holdenville, Okla.	500d
KAST	Astoria, Oreg.	1000
KFIR	Sweet Home, Ore.	
WOTR	Corry, Pa.	1000
WPAZ	Pottstown, Pa.	1000d
WKMC	Roaring Sprgs., Pa.	1000d
WIVV	Vieques, P.R.	1000
WKFD	Wickford, R.I.	500d
WDEF	Chattanooga, Tenn.	5000
WDXE	Lawrenceburg, Tenn.	1000d
WRGS	Rogersville, Tenn.	1000d
KOKE	Austin, Tex.	1000d
KFRO	Longview, Tex.	1000
KPOS	Post, Tex.	1000d
KSOP	Salt Lake City, Utah	1000d
WBTN	Bennington, Vt.	1000d
WHEE	Martinsville, Va.	5000d
WJWS	South Hill, Va.	5000d
KPOR	Quincy, Wash.	1000d
WEIF	Moundsville, W. Va.	1000d
WCCN	Nellsville, Wis.	5000d
KVWO	Cheyenne, Wyo.	1000

1380—217.3

WRAB	Arab, Ala.	1000d
WGYV	Greenville, Ala.	1000d
WVSA	Vernon, Ala.	
KDXE	N. Little Rock, Ark.	1000d
KBVM	Lancaster, Calif.	1000d
KGMS	Sacramento, Calif.	1000
KTOM	Salinas, Cal.	5000
KFLJ	Watsenburg, Colo.	1000d
WOWW	Naugatuck, Conn.	5000
WAMS	Wilmington, Del.	5000
WLIZ	Lake Worth, Fla.	5000
WQXQ	Ormond Bch., Fla.	5000
WLCY	St. Petersburg, Fla.	5000
WAOK	Atlanta, Ga.	5000
WSIZ	Ocilla, Ga.	5000d
KPOI	Honolulu, Hawaii	5000
WWCM	Brazil, Ind.	5000
WKJG	Ft. Wayne, Ind.	5000
KCIM	Carroll, Iowa	1000
KCII	Washington, Iowa	5000
KUDL	Fairway, Kan.	5000
WMTA	Central City, Ky.	500d
WWKY	Winchester, Ky.	1000d
WYNK	Baton Rouge, La.	500d
WKTJ	Farmington, Me.	1000d
WPHM	Port Huron, Mich.	1000
WPLB	Greenville, Mich.	1000
KLIZ	Brainerd, Minn.	5000
KAGE	Winona, Minn.	1000
WDLT	Indianola, Miss.	500d
KWK	St. Louis, Mo.	5000
KUVR	Holdredge, Nebr.	500
WBBX	Portsmouth, N.H.	1000
WAWZ	Zarephath, N.J.	5000
WFSR	Bath, N.Y.	500d
WBNX	New York, N.Y.	5000
WLOS	Asheville, N.C.	5000
WTOB	Winston-Salem, N.C.	5000
WPKO	Waverly, Ohio	1000d
KSWO	Lawton, Okla.	1000
KMUS	Muskogee, Okla.	1000
KBCH	Ocean Lake, Oreg.	1000d
KSHV	Ontario, Oreg.	5000
WACB	Kittanning, Pa.	1000d
WMLP	Milton, Pa.	1000d
WAYZ	Waynesboro, Pa.	1000d
WNRI	Woonsocket, R.I.	1000d
WAGS	Bishopville, S.C.	1000d
WGUS	N. Augusta, S.C.	1000d
KOTA	Rapid City, S.Dak.	5000
KFCB	Redfield, S.Dak.	500d
WYSH	Clinton, Tenn.	1000d
WIZO	Franklin, Tenn.	
WGMM	Millington, Tenn.	500d
KJET	Beaumont, Tex.	1000
KBWD	Brownwood, Tex.	1000
KCRM	Crane, Tex.	1000d
KTSM	El Paso, Tex.	5000
KMUL	Muleshoe, Tex.	1000d
KBOP	Pleasanton, Tex.	1000d
WSYB	Rutland, Vt.	5000
WTVR	Richmond, Va.	5000
KRKO	Everett, Wash.	5000
KPEG	Spokane, Wash.	5000d
WMTD	Hinton, W.Va.	1000d
WBEL	S. Beloit, Wis.	5000

1390—215.7

WHMA	Anniston, Ala.	5000
KDQN	DeQueen, Ark.	500d
KAMO	Rogers, Ark.	1000d
KGER	Long Beach, Calif.	5000
KCEY	Turlock, Calif.	5000
KFML	Denver, Colo	5000d
WUWU	Gainsville, Fla.	5000d
WISK	Americus, Ga.	5000d
WNUS	Chicago, Ill.	5000
WFIW	Fairfield, Ill.	1000
WJCD	Seymour, Ind.	1000d
KCLN	Clinton, Iowa	1000d
KCBC	Des Moines, Iowa	1000
KNCK	Concordia, Kans.	500d
WANY	Albany, Ky.	1000d
WKIC	Hazard, Ky.	5000d
KFRA	Franklin, La.	500d
WEGP	Presque Isle, Me.	5000d
KJPW	Waynesville, Mo.	1000d
WCAT	Orange, Mass.	1000d
WPLM	Plymouth, Mass.	5000
WCER	Charlotte, Mich.	5000d
KAOH	Duluth, Minn.	500
KRFO	Owatonna, Minn.	500d
WROA	Gulfport, Miss.	1000d
WQIC	Meridian, Miss.	5000d
KJPW	Waynesville, Mo.	1000d
KENN	Farmington, N.Mex.	5000
KHOB	Hobbs, N.Mex.	5000d
WEOK	Poughkeepsie, N.Y.	5000
WRIV	Riverhead, N.Y.	1000d
WFBL	Syracuse, N.Y.	5000
WEED	Rocky Mount, N.C.	5000
WADA	Shelby, N.C.	1000
WJRM	Troy, N.C.	500d
KLPM	Minot, N.Dak.	5000
WTOO	Bellefontaine, O.	500d
WPMO	Middleport-Pomeroy, O.	5000d
WFMJ	Youngstown, Ohio	5000
KCRC	Enid, Okla.	1000
KSLM	Salem, Oreg.	5000
WLAN	Lancaster, Pa.	5000
WRSC	State College, Pa.	1000d
WISA	Isabella, P.R.	1000
WHPB	Belton, S.C.	1000d
WCSC	Charleston, S.C.	5000
KJAM	Madison, S.D.	5000d
WYXI	Athens, Tenn.	500d
WTJS	Jackson, Tenn.	5000
WMCT	Mountain City, Tenn.	
KULP	El Campo, Tex.	500d
KBEC	Waxahachie, Tex.	500d
KBLW	Logan, Utah	1000
WEAM	Arlington, Va.	5000
WWDO	Lynchburg, Va.	5000
WKLP	Keyser, W.Va.	1000d
KBBO	Yakima, Wash.	1000

1400—214.2

WMSL	Decatur, Ala.	1000
WXAL	Demopolis, Ala.	1000
WFPA	Ft. Payne, Ala.	1000
WJLD	Homewood, Ala.	1000
WJHO	Opelika, Ala.	1000
KSEW	Sitka, Alaska	1000
KCLF	Clifton, Ariz.	250
KXIV	Phoenix, Ariz.	1000
KTUC	Tucson, Ariz.	250
KVOY	Yuma, Ariz.	250
KELD	El Dorado, Ark.	1000
KCLA	Pine Bluff, Ark.	1000
KWYN	Wynne, Ark.	1000
KPAT	Berkeley, Calif.	1000
KREO	Indio, Calif.	250
KQMS	Redding, Calif.	250
KSLY	San Luis Obispo, Cal.	250
KQIQ	Santa Paula, Cal.	250
KTRT	Truckee, Cal.	1000

kHz	Wave Length	W.P.
KUKI	Ukiah, Calif.	1000
KONG	Visalia, Calif.	1000
KRLN	Canon City, Colo.	250
KOTA	Delta, Colo.	250
KFTM	Ft. Morgan, Colo.	250
KBZZ	La Junta, Colo.	1000
WSTC	Stamford, Conn.	1000
WILI	Willimantic, Conn.	1000
WFTL	Ft. Lauderdale, Fla.	1000
WIRA	Ft. Pierce, Fla.	1000
WNUE	Ft. Walton Beach, Fla.	1000
WRHC	Jacksonville, Fla.	1000
WPRY	Perry, Fla.	1000
WTRR	Sanford, Fla.	1000
WPAS	Zephyrhills, Fla.	1000
WULF	Alma, Ga.	1000
WSGC	Elberton, Ga.	1000
WNEX	Macon, Ga.	1000
WCOH	Newnan, Ga.	1000
WSGA	Savannah, Ga.	1000
KART	Jerome, Ida.	1000
KRPL	Moscow, Ida.	1000
KIGO	St. Anthony, Ida.	
KSPT	Sandpoint, Idaho	1000
WDWS	Champaign, Ill.	1000
WGIL	Galesburg, Ill.	1000
WROZ	Evansville, Ind.	1000
WBAT	Marion, Ind.	1000
KCOG	Centerville, Ia.	500
KVFD	Fort Dodge, Iowa	1000
KVOE	Emporia, Kans.	1000
KAYS	Hays, Kans.	1000
WCYN	Cynthiana, Ky.	250
WIEL	Elizabethtown, Ky.	1000
WFTG	London, Ky.	250
WFPR	Hammond, La.	1000
KAOK	Lake Charles, La.	1000
WRDO	Augusta, Maine	1000
WIDE	Biddeford, Maine	1000
WMCS	Machias, Me.	1000
WWIN	Baltimore, Md.	1000
WALE	Fall River, Mass.	1000
WLLH	Lowell, Mass.	1000
WHMP	Northampton, Mass.	1000
WKFR	Battle Creek, Mich.	1000
WJLB	Detroit, Mich.	1000
WHDF	Houghton, Mich.	250
WGON	Munising, Mich.	1000
WSAM	Saginaw, Mich.	1000
WSJM	St. Joseph, Mich.	1000
WTCM	Traverse City, Mich.	1000
KEYL	Long Prairie, Minn.	1000
KMHL	Marshall, Minn.	1000
WMIN	Mpls.-St. Paul, Minn.	1000
WHLB	Virginia, Minn.	1000
WBIP	Booneville, Miss.	1000
WNAG	Grenada, Miss.	1000
WFOR	Hattiesburg, Miss.	1000
WJQS	Jackson, Miss.	1000
WMBC	Macon, Miss.	1000
KFRU	Columbia, Mo.	1000
KJCF	Festus, Mo.	1000
KSIM	Sikeston, Mo.	1000
KTTS	Springfield, Mo.	1000
KORG	Deer Lodge, Mont.	250
KXGN	Glendive, Mont.	250
KARR	Great Falls, Mont.	1000
KBRB	Ainsworth, Neb.	1000
KCOW	Alliance, Nebr.	1000
KLIN	Lincoln, Neb.	1000
KBMI	Henderson, Nev.	250
KWNA	Winnemucca, Nev.	1000
WBRL	Berlin, N.H.	250
WTSL	Hanover, N.H.	1000
WLTN	Littleton, N.H.	250
KTRC	Santa Fe, N.M.	1000
KCHS	Truth or Consequences, New Mexico	250
KTNM	Tucumcari, N.M.	1000
WOND	Pleasantville, N.J.	1000
WABY	Albany, N.Y.	1000
WYSL	Buffalo, N.Y.	1000d
WSLB	Ogdensburg, N.Y.	1000
WOTT	Watertown, N.Y.	
WBMA	Beaufort, N.C.	250
WGBG	Greensboro, N.C.	1000
WSHB	Raeford, N.C.	1000
WSIC	Statesville, N.C.	1000
WLSE	Wallace, N. C.	1000
WHCC	Waynesville, N.C.	1000
WSMY	Weldon, N.C.	1000
KEYJ	Jamestown, N.Dak.	1000
WMAN	Mansfield, Ohio	1000
WPAY	Portsmouth, Ohio	1000
KWON	Bartlesville, Okla.	1000
KTMC	McAlester, Okla.	250
KNOR	Norman, Okla.	250
KPTN	Central Point, Ore.	250
KNND	Cottage Grove, Oreg.	1000
KJDY	John Day, Ore.	1000
WEST	Easton, Pa.	1000
WJET	Erie, Pa.	1000
WFEC	Harrisburg, Pa.	1000
WWSF	Loretto, Pa.	250
WICK	Scranton, Pa.	250
WRAK	Williamsport, Pa.	1000
WVOZ	Carolina, P. R.	500
WCOS	Columbia, S.C.	1000
WGTN	Georgetown, S.C.	1000
WHCQ	Spartanburg, S.C.	1000
KBJM	Lemmon, S.D.	1000
WJZM	Clarksville, Tenn.	1000
WHUB	Cookeville, Tenn.	1000
WLSB	Copperhill, Tenn.	1000
WGAP	Maryville, Tenn.	1000
WHAL	Shelbyville, Tenn.	1000
KRUN	Ballinger, Tex.	1000
KBYG	Big Spring, Tex.	1000
KUNO	Corpus Christi, Tex.	1000
KILE	nr. Galveston, Tex.	250
KGVL	Greenville, Tex.	1000
KEBE	Jacksonville, Tex.	1000
KIUN	Pecos, Tex.	1000
KEYE	Perryton, Tex.	1000
KWOP	Plainview, Tex.	1000
KDWT	Stamford, Tex.	1000
KTEM	Temple, Tex.	1000
KTFS	Texarkana, Tex.	250
KVOU	Uvalde, Tex.	250
KIXX	Provo, Utah	250
WDOT	Burlington, Vt.	1000
WELK	Charlottesville, Va.	1000
WHHV	Hillsville, Va.	1000
WHIH	Portsmouth, Va.	1000
WHLF	So. Boston, Va.	1000
WINC	Winchester, Va.	1000
KEDO	Longview, Wash.	1000
KRSC	Othello, Wash.	250
KTNT	Tacoma, Wash.	1000
WBOY	Clarkesburg, W.Va.	1000
WRON	Ronceverte, W.Va.	1000
WVRC	Spencer, W.Va.	1000
WKWK	Wheeling, W.Va.	250
WBTH	Williamson, W.Va.	1000
WATW	Ashland, Wis.	1000
WBIZ	Eau Claire, Wis.	1000
WDUZ	Green Bay, Wis.	1000
WRJN	Racine, Wis.	1000
WRDB	Reedsburg, Wis.	1000
WRIG	Wausau, Wis.	1000
KATI	Casper, Wyo.	1000
KODI	Cody, Wyo.	1000

1410—212.6

WUNI	Mobile, Ala.	5000
WRCK	Tuscumbia, Ala.	500d
KTCS	Fort Smith, Ark.	1000d
KERN	Bakersfield, Calif.	1000
KRML	Carmel, Calif.	500d
KKOK	Lompoc, Calif.	500d
KMYC	Marysville, Calif.	5000
KCAL	Redlands, Cal.	5000
KCOL	Ft. Collins, Colo.	1000
WPOP	Hartford, Conn.	5000
WDOV	Dover, Del.	5000
WMYR	Fort Myers, Fla.	5000
WZST	Leesburg, Fla.	1000d
WONS	Tallahassee, Fla.	5000d
WGRI	Griffin, Ga.	1000d
WSNE	Cummings, Ga.	1000d
WDAX	McRae, Ga.	1000d
WLAQ	Rome, Ga.	1000
WRMN	Elgin, Ill.	1000d
WTIM	Taylorville, Ill.	1000d
WAZY	Lafayette, Ind.	1000d
KGRN	Grinnell, Iowa	500d
KLEM	LeMars, Iowa	1000d
KCLO	Leavenworth, Kans.	5000d
KWBB	Wichita, Kans.	5000
WLBJ	Bowling Green, Ky.	5000
WHLN	Harlan, Ky.	5000d
KDBS	Alexandria, La.	1000d
WHAG	Halfway, Md.	1000d
WOKW	Brockton, Mass.	1000d
WGRD	Grand Rap., Mich.	1000d
KLFD	Litchfield, Minn.	500d
KRWB	Roseau, Minn.	1000
WDSK	Cleveland, Miss.	1000d
WBKN	Newton, Miss.	500d
KNOP	N. Platte, Neb.	1000d
WHTG	Asbury Park-Eatontown, N.J.	500d
WDOE	Dunkirk, N.Y.	1000
WELM	Elmira, N.Y.	1000
WBZA	Glens Falls, N. Y.	1000d
WOTT	Watertown, N.Y.	5000
WVCB	Shallotte, N.C.	500d
WEGO	Concord, N.C.	1000d
WSRC	Durham, N.C.	1000d
WING	Dayton, Ohio	5000
KPAM	Portland, Oreg.	5000d
WLSH	Lansford, Pa.	5000d
KQV	Pittsburgh, Pa.	5000
WPCC	Clinton, S.C.	1000d
WYMB	Manning, S.C.	1000d
WCMT	Martin, Tenn.	1000d
KBUD	Athens, Tex.	1000d
KBAN	Bowie, Tex.	500d
KVLB	Cleveland, Tex.	500
KXIT	Dalhart, Tex.	500d
KDOX	Marshall, Tex.	500
KRIG	Odessa, Tex.	1000
KBAL	San Saba, Tex.	500d
KNAL	Victoria, Tex.	500
WIKI	Chester, Va.	5000d
WRIS	Roanoke, Va.	5000d
WRDS	S. Charleston, W.Va.	1000d
WKBH	LaCrosse, Wis.	5000
KWYO	Sheridan, Wyo.	1000

1420—211.1

WACT	Tuscaloosa, Ala.	5000d
KHFH	Sierra Vista, Ariz.	1000
KXOW	Hot Springs, Ark.	
KPOC	Pocahontas, Ark.	1000d
KJST	Joshua Tree, Cal.	1000d
KSTN	Stockton, Calif.	5000
WLIS	Old Saybrook, Conn.	500d
WBRD	Bradenton, Fla.	1000
WDBF	Delray Beach, Fla.	5000d
WETH	St. Augustine, Fla.	1000d
WAVO	Avondale Estates, Ga.	1000d
WRBL	Columbus, Ga.	5000
WPEH	Louisville, Ga.	1000d
WLET	Toccoa, Ga.	5000d
KCCN	Honolulu, Hawaii	5000
WINI	Murphysboro, Ill.	500d
WIMS	Michigan City, Ind.	5000d
WOC	Davenport, Iowa	5000
KJCK	Junction City, Kans.	1000d
KULY	Ulysses, Kans.	1000d
WTCR	Ashland, Ky.	5000d
WHBN	Harrodsburg, Ky.	1000d
WVJS	Owensboro, Ky.	5000
KPEL	Lafayette, La.	1000
WBSM	New Bedford, Mass.	5000
WBEC	Pittsfield, Mass.	1000
WAMM	Flint, Mich.	1000d
WKPR	Kalamazoo, Mich.	1000d
KTOE	Mankato, Minn.	5000
WSUH	Oxford, Miss.	1000d
WQBC	Vicksburg, Miss.	1000
WIGG	Wiggins, Miss.	1000d
KBTN	Neosho, Mo.	500d
KDOO	Omaha, Nebr.	1000d
KSYX	Santa Rosa, N.Mex.	1000d
WALY	Herkimer, N.Y.	1000d
WACK	Newark, N.Y.	500
WLNA	Peekskill, N.Y.	1000d
WMYN	Mayodan, N.C.	500d
WGAS	S. Gastonia, N.C.	500d
WVOT	Wilson, N.C.	1000
WHK	Cleveland, Ohio	5000
KYNG	Coos Bay, Oreg.	1000d
WCOJ	Coatesville, Pa.	5000
WCED	DuBois, Pa.	5000
WEUC	Ponce, P.R.	1000
WCRE	Cheraw, S.C.	1000d
KABR	Aberdeen, S. D.	1000d
WEMB	Erwin, Tenn.	5000d
WKSR	Pulaski, Tenn.	1000
KFYN	Bonham, Tex.	250d
KLFB	Lubbock, Tex.	500d
KTRE	Lufkin, Tex.	1000
KGNB	New Braunfels, Tex.	1000d
KPEP	San Angelo, Tex.	1000d
WWSR	St. Albans, Vt.	1000d
WDDY	Gloucester, Va.	1000d
WKCW	Warrenton, Va.	5000d
KITI	Chehalis-Centralia, Wash.	1000d
KREN	Renton, Wash.	500d
KUJ	Walla Walla, Wash.	5000
WPLY	Plymouth, Wis.	500d

1430—209.7

WRMG	Red Bay, Ala.	
WFHK	Pell City, Ala.	1000d
KHBM	Monticello, Ark.	1000d
KAMP	El Centro, Calif.	1000d
KARM	Fresno, Calif.	5000
KALI	San Gabriel, Cal.	5000
KJAY	Sacramento, Calif.	500d
KGNU	Santa Clara, Cal.	1000
KOSI	Aurora, Colo.	5000
WILI	Homestead, Fla.	500d
WLAK	Lakeland, Fla.	5000
WPCF	Panama City, Fla.	5000
WGFS	Covington, Ga.	1000d
WRCD	Dalton, Ga.	1000d
WWGS	Tifton, Ga.	5000
WEEF	Highland Park, Ill.	1000d
WCMY	Ottawa, Ill.	500d
WIRE	Indianapolis, Ind.	5000
KASI	Ames, Iowa	1000d
KMRC	Morgan City, La.	500d
WNAV	Annapolis, Md.	5000
WTTT	Amherst, Mass.	5000d
WHIL	Medford, Mass.	5000d
WION	Ionia, Mich.	5000d
WBRB	Mt. Clemens, Mich.	500d
WLAU	Laurel, Miss.	5000d
KSOA	Ava, Mo.	
KAOL	Carrollton, Mo.	500d
WIL	St. Louis, Mo.	5000
KRGI	Grand Island, Nebr.	5000
WNJR	Newark, N.J.	5000
KQFL	Roswell, N.M.	5000d
WENE	Endicott, N.Y.	5000
WMNC	Morganton, N.C.	5000
WDJS	Mt. Olive, N.C.	1000d
WRXO	Roxboro, N.C.	1000d
KTYN	Minot, N.D.	
WFOB	Fostoria, Ohio	1000
WCLT	Newark, Ohio	500d
KALV	Alva, Okla.	500
KELI	Tulsa, Okla.	5000
KGAY	Salem, Oreg.	5000d
WVAM	Altoona, Pa.	5000
WNEL	Caguas, P. R.	5000
WBLR	Batesburg, S.C.	5000d
WATP	Marion, S.C.	1000d
WBUG	Ridgeland, S.C.	1000d
KBRK	Brookings, S. Dak.	1000d
WJBE	Knoxville, Tenn.	1000d
WENO	Madison, Tenn.	5000
WHER	Memphis, Tenn.	1000
KSTB	Breckenridge, Tex.	1000d
KEES	Gladewater, Tex.	1000d
KCOH	Houston, Tex.	1000d
KLO	Ogden, Utah	5000
KDXU	St. George, Utah	
WIVE	Ashland, Va.	1000d
WKEX	Blacksburg, Va.	
WDIC	Clinchco, Va.	1000d
KBRC	Mt. Vernon, Wash.	5000
WEIR	Weirton, W.Va.	1000
WBEV	Beaver Dam, Wis.	1000d
WRDN	Durand, Wis.	

1440—208.2

WHHY	Montgomery, Ala.	5000
KDOT	Scottsdale, Ariz.	5000d
KHOG	Fayetteville, Ark.	1000d
KOKY	Little Rock, Ark.	5000d
KVON	Napa, Cal.	5000
KPRO	Riverside, Calif.	1000
KCOY	Santa Maria, Calif.	1000
WBIS	Bristol, Conn.	500d
WLEH	Lehigh Acres, Fla.	5000
WABR	Winter Park, Fla.	5000
WWCC	Bremen, Ga.	1000d
WGIG	Brunswick, Ga.	5000
WVMG	Cochran, Ga.	
WRAJ	Anna, Ill.	500d
WIOK	Normal, Ill.	1000
WPRS	Paris, Ill.	1000d
WGEM	Quincy, Ill.	5000
WROK	Rockford, Ill.	5000
WPGW	Portland, Ind.	500d
KCHE	Cherokee, Iowa	500d
KEWI	Topeka, Kans.	5000
WCDS	Glasgow, Ky.	1000d
WPDE	Paris, Ky.	1000d
WEZJ	Williamsburg, Ky.	1000d
KMLB	Monroe, La.	5000
WJAB	Westbrook, Me.	5000d
WAAB	Worcester, Mass.	5000
WBCM	Bay City, Mich.	1000
WDOW	Dowagiac, Mich.	1000d
WCHB	Inkster, Mich.	1000
KQRS	Golden Valley, Minn.	5000
KEYL	Long Prairie, Minn.	1000
WRBE	Lucedale, Miss.	500d
WSEL	Pontotoc, Miss.	1000d
WMVB	Millville, N.J.	1000d
WBAB	Babylon, N.Y.	1000d
WJJL	Niagara Falls, N.Y.	1000d
WSGO	Oswego, N.Y.	1000d
WBLA	Elizabethtown, N.C.	1000d
WBUY	Lexington, N.C.	5000
KILO	Grand Forks, N.D.	1000
WHHH	Warren, Ohio	5000
KMED	Medford, Oreg.	5000
KODL	The Dalles, Oreg.	1000
WCDL	Carbondale, Pa.	5000d
WNPV	Lansdale, Pa.	500d
WGCB	Red Lion, Pa.	1000d
WQOK	Greenville, S.C.	5000
WZYX	Cowan, Tenn.	1000d
WHDM	McKenzie, Tenn.	500d
KPUR	Amarillo, Tex.	5000
KEYS	Corpus Christi, Tex.	1000
KDNT	Denton, Tex.	5000
KGVL	Greenville, Tex.	1000
KWEL	Midland, Tex.	5000d
KETX	Livingston, Tex.	5000d
WKLV	Blackstone, Va.	5000d
WHRN	Herndon, Va.	1000
KDNC	Spokane, Wash.	5000d
WHIS	Bluefield, W.Va.	5000
WAJR	Morgantown, W.Va.	5000
WNFL	Green Bay, Wis.	5000

1450—206.8

WDNG	Anniston, Ala.	1000
WYAM	Bessemer, Ala.	1000
WDIG	Dothan, Ala.	1000
WFIX	Huntsville, Ala.	1000
WLAY	Muscle Shoals City, Alabama	1000
KLAM	Cordova, Alaska	250
KAWT	Douglas, Ariz.	250
KNOT	Prescott, Ariz.	1000
KVSL	Show Low, Ariz.	1000
KOLD	Tucson, Ariz.	250
KENA	Mena, Ark.	250
KJWH	Camden, Ark.	1000
KYOR	Blythe, Cal.	1000
KAVA	Burney, Cal.	
KOWN	Escondido, Calif.	250
KPAL	Palm Snrings, Cal.	1000
KTIP	Porterville, Calif.	1000
KSOL	San Francisco, Cal.	1000
KVML	Sonora, Calif.	1000
KVEN	Ventura, Calif.	1000
KZIN	Yuba City, Calif.	100
KGIW	Alamosa, Colo.	1000
KYOU	Greeley, Colo.	1000
WNAB	Bridgeport, Conn.	1000
WILM	Wilmington, Del.	1000
WOL	Washington, D. C.	1000
WWJB	Brooksville, Fla.	250
WMFJ	Daytona Beach, Fla.	1000
WOCN	Miami, Fla.	250
WSPB	Sarasota, Fla.	1000
WSTU	Stuart, Fla.	250
WTAL	Tallahassee, Fla.	1000

WHITE'S

RADIO LOG

kHz	Wave Length	W.P.
WGPC	Albany, Ga.	1000
WBHF	Cartersville, Ga.	1000
WCON	Cornelia, Ga.	250
WKEU	Griffin, Ga.	1000
WMVG	Milledgeville, Ga.	1000
WBYG	Savannah, Ga.	1000
WVLD	Valdosta, Ga.	1000
KVSI	Montpelier, Ida.	1000
KEEP	Twin Falls, Idaho	1000
WVON	Cicero, Ill.	1000
WKEI	Kewanee, Ill.	500
WCVS	Springfield, Ill.	1000
WLYV	Ft. Wayne, Ind.	1000
WXVW	Jeffersonville, Ind.	1000
WASK	Lafayette, Ind.	1000
WAOV	Vincennes, Ind.	1000
KLWW	Cedar Rapids, Ia.	250
KYET	Payette, Ida.	250
KWBW	Hutchinson, Kans.	1000
WTCO	Campbellsville, Ky.	1000
WWXL	Manchester, Ky.	1000
WPAD	Paducah, Ky.	1000
WLKS	W. Liberty, Ky.	1000
KSIG	Crowley, La.	1000
KNOC	Natchitoches, La.	1000
WNPS	New Orleans, La.	250
WLKN	Lincoln, Me.	1000
WRKD	Rockland, Maine	250
WKTQ	South Paris, Maine	1000
WTBO	Cumberland, Md.	1000
WTHU	Thurmont, Md.	100
WMAS	Springfield, Mass.	1000
WATZ	Alpena Township, Michigan	1000
WHTC	Holland, Mich.	1000
WMIQ	Iron Mtn., Mich.	250
WIBM	Jackson, Mich.	1000
WKLA	Ludington, Mich.	1000
WNBY	Newberry, Mich.	1000
WHLS	Port Huron, Mich.	1000
KATE	Albert Lea, Minn.	250
KBUN	Bemidji, Minn.	1000
KBMW	Wahpeton, N.D.-Breckinridge, Minn.	1000
WELY	Ely, Minn.	1000
KFAM	St. Cloud, Minn.	1000
WROX	Clarksdale, Miss.	1000
WCJU	Columbia, Miss.	250
WJXN	Jackson, Miss.	1000
WOKK	Meridian, Miss.	1000
WROB	West Point, Miss.	1000
KFTW	Fredericktown, Mo.	1000
WMBH	Joplin, Mo.	1000
KIRX	Kirksville, Mo.	1000
KOKO	Warrensburg, Mo.	1000
KWPM	West Plains, Mo.	1000
KXXL	Bozeman, Mont.	1000
KUDI	Great Falls, Mont.	1000
KGMY	Missoula, Mont.	250
KRBN	Red Lodge, Mont.	1000
KVCK	Wolf Point, Mont.	1000
KWBE	Beatrice, Nebr.	250
KONE	Reno, Nev.	250
WKXL	Concord, N.H.	1000
WFPG	Atlantic City, N.J.	1000
WCTC	New Brunswick, N. J.	1000
KRZY	Albuquerque, N.M.	250
KLMX	Clayton, N.Mex.	1000
KOBE	Las Cruces, N.Mex.	250
KENM	Portales, N.Mex.	1000
WCLI	Corning, N.Y.	1000
WWSC	Glen Falls, N.Y.	1000
WHDL	Olean, N.Y.	1000
WKIP	Poughkeepsie, N. Y.	1000
WKAL	Rome, N.Y.	1000
WATA	Boone, N. C.	1000
WGNC	Gastonia, N.C.	1000
WIZS	Henderson, N.C.	1000
WHKP	Hendersonville, N.C.	1000
WHIT	New Bern, N.C.	1000
WFBS	Spring Lake, N.C.	1000
KGCA	Rugby, N. D.	1000
WJER	Dover, Ohio	1000
WMOH	Hamilton, Ohio	1000
WLEC	Sandusky, Ohio	1000
KWHW	Altus, Okla.	1000
KGFF	Shawnee, Okla.	1000
KSIW	Woodward, Okla.	1000
KEED	Eugene, Ore.	1000
KFLW	Klamath Falls, Ore.	1000
KLBM	La Grande, Oreg.	1000
WWGO	Erie, Pa.	1000
KBPS	Portland, Ore.	250
WFRA	Franklin, Pa.	1000
WDAD	Indiana, Pa.	1000
WPAM	Pottsville, Pa.	1000
WMPT	S. Williamsport, Pa.	1000
WMAJ	State College, Pa.	1000
WJPA	Washington, Pa.	250
WCPR	Coamo, P.R.	
WWRI	W. Warwick, R.I.	1000
WQSN	Charleston, S.C.	1000
WCRS	Greenwood, S.C.	1000
WMYB	Myrtle Beach, S.C.	1000
WHSC	Hartsville, S.C.	1000
KBFS	Belle Fourche, S. Dak.	1000
KYNT	Yankton, S. D.	1000
WLAR	Athens, Tenn.	1000
WMOC	Chattanooga, Tenn.	1000
WDSG	Dyersburg, Tenn.	1000
WSMG	Greeneville, Tenn.	250
WLAF	LaFollette, Tenn.	1000
WGNS	Murfreesboro, Tenn.	1000
KAYC	Beaumont, Tex.	1000
KBEN	Carrizo Sprgs., Tex.	250
KCTI	Gonzales, Tex.	250
KMBL	Junction, Tex.	1000
KCYL	Lampasas, Tex.	1000
KMHT	Marshall, Tex.	1000
KNET	Palestine, Tex.	1000
KSNY	Snyder, Tex.	1000
KURA	Moab, Utah	1000
KEYY	Provo, Utah	250
KDXU	St. George, Utah	1000
WSNO	Barre, Vt.	1000
WTSA	Brattleboro, Vt.	1000
WFTR	Front Royal, Va.	1000
WENZ	Highland Springs, Va.	1000
WREL	Lexington, Va.	1000
WMVA	Martinsville, Va.	1000
WLPM	Suffolk, Va.	1000
KBKW	Aberdeen, Wash.	1000
KCLX	Colfax, Wash.	1000
KONP	Port Angeles, Wash.	250
KAYE	Puyallup, Wash.	1000
WPAR	Parkersburg, W. Va.	1000
KFIZ	Fond du Lac, Wis.	1000
WDLB	Marshfield, Wis.	1000d
WRCO	Richland Center, Wis.	1000
KBBS	Buffalo, Wyo.	250
KVOW	Riverton, Wyo.	1000

1460—205.4

WFMH	Cullman, Ala.	5000d
WPNX	Phenix City, Ala.	5000
KZOT	Marianna, Ark.	500
KCCL	Paris, Ark.	500d
KTYM	Inglewood, Calif.	5000
KDON	Salinas, Calif.	5000
KVRE	Santa Rosa, Calif.	1000d
KYSN	Colo. Sprgs., Colo.	1000
WBAR	Bartow, Fla.	1000d
WZEP	DeFuniak Springs, Florida	1000d
WMBR	Jacksonville, Fla.	5000
WOYZ	Buford, Ga.	5000d
WPNX	Columbus, Ga.	1000
WROY	Carmi, Ill.	1000d
WIXN	Dixon, Ill.	1000d
WRTL	Rantoul, Ill.	250d
WKAM	Goshen, Ind.	1000
WOCH	North Vernon, Ind.	1000d
KSO	Des Moines, Iowa	5000
KCRB	Chanute, Kans.	1000d
WRVK	Mt. Vernon, Ky.	500d
WXOK	Baton Rouge, La.	5000
KBSF	Springhill, La.	1000d
WEMD	Easton, Md.	1000
WBET	Brockton, Mass.	5000
WBRN	Big Rapids, Mich.	1000d
WPON	Pontiac, Mich.	1000
KOWA	Hastings, Minn.	1000d
KDMA	Montevideo, Minn.	1000
WELZ	Belzoni, Miss.	1000d
WCIS	Moss Point, Miss.	1000d
KIRL	St. Charles, Mo.	5000d
KRNY	Kearney, Nebr.	5000d
KENO	Las Vegas, Nev.	5000
WJJZ	Mt. Holly, N.J.	
WOKO	Albany, N.Y.	5000
WVOX	New Rochelle, N.Y.	500d
WHEC	Rochester, N.Y.	5000
WAKS	Fuquay Springs, N. C.	1000d
WRKB	Kannapolis, N.C.	500d
WMMH	Marshall, N.C.	500d
WBNS	Columbus, Ohio	5000
WPVL	Painesville, O.	1000d
KROW	Dallas, Oreg.	5000d
KELR	El Reno, Okla.	500
WMBA	Ambridge, Pa.	500d
WCMB	Harrisburg, Pa.	5000
WFBA	San Sebastian, P.R.	500
WBCU	Union, S.C.	1000
WJAK	Jackson, Tenn.	5000d
WEEN	Lafayette, Tenn.	1000d
KBRZ	Freeport, Tex.	500d
KRME	Hondo, Tex.	500d
KLLL	Lubbock, Tex.	1000d
WACO	Waco, Tex.	1000
WPRW	Manassas, Va.	5000
WRAD	Radford, Va.	5000
KYAC	Kirkland, Wash.	5000d
KIMA	Yakima, Wash.	5000
WBUC	Buckhannon, W.Va.	5000d
WRAC	Racine, Wis.	500d
WTMB	Wisconsin Rapids, Wis.	1000d

1470—204.0

WBLO	Evergreen, Ala.	1000d
KDEW	DeWitt, Ark.	500d
KOLI	Coalinga, Calif.	500d
KUTY	Palmdale, Cal.	5000d
KXOA	Sacramento, Calif.	5000
KKEP	Estes Park, Colo.	500d
WMMW	Meriden, Conn.	1000d
WRBD	Pompano Beach, Fla.	5000
WCWR	Tarpon Springs, Fla.	5000d
WAAG	Adel, Ga.	1000d
WDOL	Athens, Ga.	1000d
WCLA	Claxton, Ga.	1000
WRGA	Rome, Ga.	5000
WMPP	Chicago Heights, Ill.	1000d
WMBD	Peoria, Ill.	5000
WHUT	Anderson, Ind.	1000d
KTRI	Sioux City, Iowa	5000
KWVY	Waverly, Iowa	1000d
KARE	Atchison, Kans.	1000
KLIB	Liberal, Kans.	1000d
WSAC	Fort Knox, Ky.	1000d
KTDL	Farmersville, La.	1000d
KPLC	Lake Charles, La.	5000
WLAM	Lewiston, Maine	5000
WJDY	Salisbury, Md.	5000d
WTTR	Westminster, Md.	1000d
WSRO	Marlborough, Mass.	1000d
WNBP	Newburyport, Mass.	500d
WKMF	Flint, Mich.	5000
WKLZ	Kalamazoo, Mich.	500d
KANO	Anoka, Minn.	1000d
WCHJ	Brookhaven, Miss.	1000d
WNAU	New Albany, Miss.	500d
KGHM	Brookfield, Mo.	500d
KTCB	Malden, Mo.	1000d
WTKO	Ithaca, N.Y.	1000d
WPDM	Potsdam, N.Y.	1000d
WBIG	Greensboro, N.C.	5000
WPNC	Plymouth, N.C.	1000d
WTOE	Spruce Pine, N.C.	1000d
WOHO	Toledo, Ohio	1000
KVLH	Pauls Valley, Okla.	250d
KVIN	Vinita, Okla.	500d
KRAF	Reedsport, Oreg.	5000d
WSAN	Allentown, Pa.	5000
WFAR	Farrell, Pa.	1000d
WWML	Portage, Pa.	500d
WQXL	Columbia, S.C.	5000d
WINH	Georgetown, S.C.	1000d
WEAG	Alcoa, Tenn.	1000d
WVOL	Berry Hill, Tenn.	5000
KRBC	Abilene, Tex.	5000
KDHN	Dimmitt, Tex.	500d
KWRD	Henderson, Tex.	500d
KCNY	San Marcos, Tex.	250d
WTZE	Tazewell, Va.	1000d
KELA	Centralia-Chehalis, Wash.	5000d
KSEM	Moses Lake, Wash.	5000
KAPS	Mount Vernon, Wash.	500d
WWHY	Huntington, W.Va.	5000d
WBZE	Wheeling, W.Va.	500d
WBKV	West Bend, Wis.	1000d

1480—202.6

WARI	Abbeville, Ala.	1000d
WLPH	Irondale, Ala.	5000d
WBTS	Bridgeport, Ala.	1000d
WABB	Mobile, Ala.	5000
KHAT	Phoenix, Ariz.	500
KGLU	Safford, Ariz.	1000
KTHS	Berryville, Ark.	1000
KWUN	Concord, Calif.	500d
KRED	Eureka, Cal.	
KYOS	Merced, Calif.	5000
KWIZ	Santa Ana, Calif.	5000
KSEE	Santa Maria, Calif.	1000
KCMS	Manitou Springs, Colo.	500
WEHW	Windsor, Conn.	500d
WAPG	Arcadia, Fla.	1000d
WGNE	Panama City Beach, Fla.	500d
WVCF	Windermere, Fla.	1000d
WYZE	Atlanta, Ga.	5000d
WRDW	Augusta, Ga.	5000
KOFE	St. Maries, Ida.	
WGSB	Geneva, Ill.	1000
WJBM	Jerseyville, Ill.	500d
WTHI	Terre Haute, Ind.	5000
WRSW	Warsaw, Ind.	1000
KLEE	Ottumwa, Iowa	500d
KBEA	Mission, Kan.	1000
KLEO	Wichita, Kans.	5000
WKOA	Hopkinsville, Ky.	1000d
WNKY	Neon, Ky.	1000d
WTLO	Somerset, Ky.	1000d
KCKW	Jena, La.	500d
KANV	Jonesville, La.	500d
KJOE	Shreveport, La.	1000d
WSAR	Fall River, Mass.	5000
WAFT	Grand Rapids, Mich.	5000d
WIOS	Tawas City-E. Tawas, Mich.	1000d
WYSI	Ypsilanti, Mich.	500d
KAUS	Austin, Minn.	1000
KEHG	Fosston, Minn.	5000d
WECP	Carthage, Miss.	500d
KGCX	Sidney, Mont.	5000
KLMS	Lincoln, Nebr.	1000
KWEW	Hobbs, N. Mex.	5000
WLEA	Hornell, N.Y.	1000d
WHOM	New York, N.Y.	5000
WADR	Remsen, N.Y.	5000d
WWKO	Fair Bluff, N. C.	1000d
WWOK	Charlotte, N.C.	5000
WYRN	Louisburg, N.C.	500d
WMSJ	Sylva, N.C.	5000d
WYDK	Yadkinville, N.C.	1000d
WHBC	Canton, Ohio	5000
WCIN	Cincinnati, Ohio	5000
WTRA	Latrobe, Pa.	500d
WDAS	Philadelphia, Pa.	5000
WISL	Shamokin, Pa.	1000
WSHP	Shippensburg, Pa.	500d
WMDD	Fajardo, P.R.	5000
KSDR	Waterton, S.D.	1000d
WJFC	Jefferson City, Tenn.	500d
WMQM	Memphis, Tenn.	5000d
WJLE	Smithville, Tenn.	1000d
KBOX	Dallas, Tex.	5000
KLVL	Pasadena, Tex.	1000
KAPE	San Antonio, Tex.	500d
KONI	Spanish Fork, Utah	1000d
WCFR	Springfield, Vt.	1000d
WBBL	Richmond, Va.	5000
WLEE	Richmond, Va.	5000
WBLU	Salem, Va.	5000d
KOOD	Lakewood Center, Wash.	1000d
KVAN	Vancouver, Wash.	1000d
WISM	Madison, Wis.	5000
KRAE	Cheyenne, Wyo.	1000d

1490—201.2

WANA	Anniston, Ala.	250
WAJF	Decatur, Ala.	1000
WRLD	Lanett, Ala.	1000
WHBB	Selma, Ala.	1000
KYCA	Prescott, Ariz.	1000
KAIR	Tucson, Ariz.	250
KXAR	Hope, Ark.	1000
KDRS	Paragould, Ark.	1000
KOTN	Pine Bluff, Ark.	1000
KXRJ	Russellville, Ark.	1000
KWAC	Bakersfield, Calif.	1000
KPAS	Banning, Calif.	250
KICO	Calexico, Calif.	250
KRKC	King City, Calif.	1000
KTOB	Petaluma, Calif.	1000
KBLF	Red Bluff, Calif.	1000
KDB	Santa Barbara, Calif.	1000
KQWL	So. Lake Tahoe, Cal.	250
KSYC	Yreka, Calif.	1000
KBOL	Boulder, Colo.	1000
KGUC	Gunnison, Colo.	250
KCMS	Manitou Springs, Colo.	500
KOLR	Sterling, Colo.	250
WGCH	Greenwich, Conn.	250
WTRL	Bradenton, Fla.	250
WJBS	De Land, Fla.	1000
WCOF	Immokalee, Fla.	250
WMBM	Miami Beach, Fla.	250
WSRA	Milton, Fla.	1000
WPXE	Starke, Fla.	1000
WTTB	Vero Beach, Fla.	1000
WSIR	Winter Haven, Fla.	500
WMOG	Brunswick, Ga.	1000
WMJM	Cordele, Ga.	1000
WMRE	Monroe, Ga.	1000
WSFB	Quitman, Ga.	250
WSNT	Sandersville, Ga.	500
WSYL	Sylvania, Ga.	250
KCID	Caldwell, Idaho	1000
WKRO	Cairo, Ill.	250
WDAN	Danville, Ill.	1000
WAMV	East St. Louis, Ill.	1000
WOPA	Oak Park, Ill.	1000
WZOE	Princeton, Ill.	1000
WKBV	Richmond, Ind.	1000
WNDU	South Bend, Ind.	1000
KBUR	Burlington, Iowa	1000
WDBQ	Dubuque, Iowa	1000
KBAB	Indianola, Ia.	500
KRIB	Mason City, Ia.	1000
KKAN	Phillipsburg, Kans.	250
KTOP	Topeka, Kan.	1000
WFKY	Frankfort, Ky.	1000
WKAY	Glasgow, Ky.	1000
WOMI	Owensboro, Ky.	1000
WSIP	Paintsville, Ky.	1000
WIKC	Bogalusa, La.	1000
KEUN	Eunice, La.	1000
KJIN	Houma, La.	1000
KRUS	Ruston, La.	1000
WPOR	Portland, Maine	1000
WTVL	Waterville, Maine	1000
WARK	Hagerstown, Md.	1000
WHAV	Haverhill, Mass.	1000
WMRC	Milford, Mass.	1000
WTXL	W. Springfield, Mass.	1000
WABJ	Adrian, Mich.	1000
WMDN	Midland, Mich.	1000
WLRC	Whitehall, Mich.	1000
KXRA	Alexandria, Minn.	250
KOZY	Grand Rapids, Minn.	1000
KLGR	Redwd. Falls, Minn.	1000
WLOX	Biloxi, Miss.	1000
WCLD	Cleveland, Miss.	1000
WHOC	Philadelphia, Miss.	1000
WTUP	Tupelo, Miss.	1000
WVIM	Vicksburg, Miss.	250
KDMO	Carthage, Mo.	250
KTTR	Rolla, Mo.	1000
KRDO	Sedalia, Mo.	1000

kHz	Wave Length	W.P.
KDBM	Dillon, Mont.	1000
KBON	Omaha, Nebr.	1000
WENJ	Laconia, N.H.	1000
WLDB	Atlantic City, N. J.	1000
KRSN	Los Alamos, N.Mex.	1000
KRTN	Raton, N.Mex.	1000
WCSS	Amsterdam, N.Y.	1000
WBTA	Batavia, N.Y.	250
WKNY	Kingston, N.Y.	1000
WICY	Malone, N.Y.	1000
WDLC	Port Jervis, N. Y.	1000
WOLF	Syracuse, N. Y.	1000
WSSB	Durham, N. C.	1000
WFLB	Fayetteville, N.C.	1000
WLOE	Leaksville, N.C.	1000
WRNB	New Bern, N.C.	1000
WRMT	Rocky Mount, N. C.	1000
WSTP	Salisbury, N. C.	1000
WSVM	Valdese, N.C.	1000
WHSL	Wilmington, N. C.	1000
KNDC	Hettinger, N.D.	1000
KOVC	Valley City, N. Dak.	1000
WBEX	Chillicothe, Ohio	1000
WJMO	Cleveland Hghts., O.	1000
WOHI	E. Liverpool, Ohio	250
WMOA	Marietta, Ohio	1000
WMRN	Marion, Ohio	1000
KWRW	Guthrie, Okla.	100
KBIX	Muskogee, Okla.	1000
KBKR	Baker, Oreg.	1000
KRNR	Roseburg, Oreg.	1000
KBZY	Salem, Oreg.	1000
WESB	Bradford, Pa.	1000
WAZL	Hazleton, Pa.	1000
WARD	Johnstown, Pa.	1000
WGAL	Lancaster, Pa.	1000
WBCB	Levittown, Pa.	1000
WMRF	Lewiston, Pa.	1000
WMGW	Meadville, Pa.	1000
WNBT	Wellsboro, Pa.	1000
WSIB	Beaufort, S.C.	500
WGCD	Chester, S.C.	1000
WMRB	Greenville, S.C.	1000
KORN	Mitchell, S.Dak.	1000
WOPI	Bristol, Tenn.	1000
WDXB	Chattanooga, Tenn.	1000
WRDL	Fountain City, Tenn.	1000
WJJM	Lewisburg, Tenn.	1000
WDXL	Lexington, Tenn.	1000
KNOW	Austin, Tex.	250
KIBL	Beeville, Tex.	250
KBST	Big Spring, Tex.	1000
KHUZ	Borger, Tex.	250
KNEL	Brady, Tex.	1000
KWMC	Del Rio, Tex.	
KSAM	Huntsville, Tex.	250
KVOZ	Laredo, Tex.	250
KZZN	Littlefield, Tex.	1000
KPLT	Paris, Tex.	1000
KDOK	Tyler, Tex.	1000
KVWC	Vernon, Tex.	250
KVOG	Ogden, Utah	1000
WKVT	Brattleboro, Vt.	1000
WFAD	Middlebury, Vt.	1000
WIKE	Newport, Vt.	1000
WCVA	Culpeper, Va.	1000
WVEC	Hampton, Va.	1000
WAYB	Waynesboro, Va.	1000
KBRD	Bremerton, Wash.	1000
KVAC	Forks, Wash.	500
KLOG	Kelso, Wash.	1000
KENE	Toppenish, Wash.	1000
KTEL	Walla Walla, Wash.	1000
WGKV	Charleston, W.Va.	1000
WTCS	Fairmont, W.Va.	1000
WLOH	Princeton, W. Va.	1000
WSGB	Sutton, W.Va.	1000
WGEZ	Beloit, Wis.	1000
WLCX	LaCrosse, Wis.	1000
WIGM	Medford, Wis.	1000
WOSH	Oshkosh, Wis.	1000
KLME	Laramie, Wyo.	500
KRTR	Thermopolis, Wyo.	250
KGOS	Torrington, Wyo.	1000

1500—199.9

WVSM	Rainsville, Ala.	1000d
KGMR	Jacksonville, Ark.	1000d
KBBQ	Burbank, Cal.	10000
KXRX	San Jose, Cal.	10000
WFIF	Milford, Conn.	5000d
WTOP	Washington, D.C.	50000
WKIZ	Key West, Fla.	250
WGUL	New Port Richey, Fla.	250d
WSEM	Donaldsonville, Ga.	1000d
WDEN	Macon, Ga.	
WTHN	Thomaston, Ga.	1000d
KUMU	Honolulu, Hawaii	5000
WGEN	Geneseo, Ill.	250d
WPMB	Vandalia, Ill.	250
WZBN	Zion, Ill.	250d
WBRI	Indianapolis, Ind.	5000d
WAKE	Valparaiso, Ind.	1000d
WMJL	Marion, Ky.	
KWRG	New Roads, La.	1000d
WVOC	Battle Creek, Mich.	1000d
WJBK	Detroit, Mich.	50000d
KSTP	St. Paul, Minn.	50000
WBFN	Quitman, Miss.	1000d
KDFN	Doniphan, Mo.	1000d
WKER	Pompton Lakes, N.J.	500
WGMF	Watkins Glen, N.Y.	
WKBX	Winston-Salem, N.C.	1000d
WGIC	Xenia, O.	500d
KOSG	Pawhuska, Okla.	5000d
WMNT	Manati, P.R.	250
WEAC	Gaffney, S. C.	1000d
WDEB	Jamestown, Tenn.	1000d
WTNE	Trenton, Tenn.	250d
KWFA	Merkle, Tex.	250d
KTXO	Sherman, Tex.	1000d
KANI	Wharton, TeX.	500

1510—199.1

KALF	Mesa, Ariz.	10000d
KSDM	Ontario, Cal.	10000
KIRV	Fresno, Cal.	500d
KTIM	San Rafael, Calif.	1000d
KDKD	Littleton, Colo.	1000
WNLC	New London, Conn.	10000
WWBC	Cocoa, Fla.	250d
WINU	Highland, Ill.	250d
WJRC	Joliet, Ill.	500d
WKAI	Macomb, Ill.	1000d
KIFG	Iowa Falls, Iowa	1000d
KANS	Larned, Kan.	1000d
KPBC	Port Sulphur, La.	1000d
WMEX	Boston, Mass.	50000
WJCO	Jackson, Mich.	5000d
WLKM	Three Rivers, Mich.	500
WKPD	Prentiss, Miss.	1000
KCCV	Independence, Mo.	1000d
KTTT	Columbus, Nebr.	500d
WRAN	Dover, N.J.	10000
WJIC	Salem, N.J.	250d
WPUT	Brewster, N. Y.	1000d
WEAL	Greensboro, N.C.	1000d
WBZB	Selma, N. C.	500d
WLGN	Logan, O.	
WLKR	Norwalk, O.	
WAHT	Annville-Cleonal Pa.	5000d
WPSL	Monroeville, Penn.	250d
WVAP	Burnettown, S.C.	
WSJW	Woodruff, S.C.	
WLAC	Nashville, Tenn.	50000
KCTX	Childress, Tex.	250d
KABH	Midland, Tex.	500d
KMOO	Mineola, Tex.	250d
KROB	Robstown, Tex.	500d
KSTV	Stephenville, Tex	250d
KURB	Mountlake Terrace, Wash.	
KGA	Spokane, Wash.	50000
WAUK	Waukesha, Wis.	10000d

1520—197.4

WAOA	Opelika, Ala.	5000d
KMPG	Hollister, Cal.	500
KMFB	Mendocino, Cal.	1000d
KACY	Port Hueneme, Calif.	10000
WTLN	Apopka, Fla.	
WGNP	Indian Rocks Beach, Fla.	1000d
WIXX	Oakland Park, Fla.	1000d
WXPQ	Eatonton, Ga.	1000d
WNMT	Garden City, Ga.	
WHOW	Clinton, Ill.	5000d
WLUV	Loves Park, Ill.	500d
WSVL	Shelbyville, Ind.	1000
KSIB	Creston, Iowa	1000d
WHIC	Hardinsburg, Ky.	250d
WRSL	Stanford, Ky.	500d
KXKW	Lafayette, La.	10000
WVOB	Bel Air, Md.	250d
WTRI	Brunswick, Md.	500d
WKJR	Muskegon Hts., Mich.	1000d
WYNZ	Ypsilanti, Mich.	250d
KOLM	Rochester, Minn.	10000d
KMPL	Sikeston, Mo.	5000
WSLT	Ocean City-Somers Pt., N. J.	1000d
WKBW	Buffalo, N.Y.	50000
WTHE	Mineola, N.Y.	1000d
WDSL	Mocksville, N.C.	5000
KMAV	Mayville, N. D.	250d
WBNO	Bryan, Ohio	500d
WINW	Canton, O.	1000d
WKNT	Kent, O.	1000d
WTTO	Toledo, O.	1000
KOMA	Okla. City, Okla.	50000
KYXI	Oregon City, Ore.	10000
WCHE	West Chester, Pa.	250d
WRAI	San Juan, P. R.	10000
WTGR	Myrtle Beach, S.C.	250d
WKMG	Newberry, S. C.	1000d
WSLV	Ardmore, Tenn.	1000d
WBHT	Brownsville, Tenn.	250d
WCSV	Crossville, Tenn.	
WIDD	Elizabethton, Tenn.	1000d

1530—196.1

WAAO	Andalusia, Ala.	
WLCB	Moulton, Ala.	1000d
WCTR	Chestertown, Mo.	1530
KCAT	Pine Bluff, Ark	250d
KTMN	Trumann, Ark.	250d
KFBK	Sacramento, Calif.	50000
KRYT	Colorado Springs, Colo.	1000d
WDIZ	Bridgeport, Conn.	
WENG	Englewood, Fla.	1000
WTTI	Dalton, Ga.	10000d
KDSN	Denison, Iowa	500d
KYMN	Northfield, Minn.	1000d
KNBI	Norton, Kan.	1000d
KWLA	Many, La.	1000d
WPNO	Auburn, Me.	
WCTR	Chestertown, Md.	250d
WRPM	Poplarville, Miss.	10000d
WTHM	Lapeer, Mich.	5000d
WERX	Wyoming, Mich.	500d
KSMM	Shakopee, Minn.	500d
KPCR	Bowling Green, Mo.	250d
KMAM	Butler, Mo.	500d
KLOL	Lincoln, Neb.	5000d
WELA	Elizabeth, N.J.	
WCKY	Cincinnati, Ohio	50000
KWLG	Wagoner, Okla.	
WHYP	North East, Pa.	1000d
WMBT	Shenandoah, Pa.	250d
WUPR	Utuado, P.R.	1000d
WASC	Spartanburg, S.C.	250d
KGTN	Georgetown, Tex.	1000d
KGBT	Harlingen, Tex.	50000
KCLR	Ralls, Tex.	5000d
WQVA	Quantico, Va.	250
KCHY	Cheyenne, Wy.	10000

1540—195.0

WANL	Lineville, Ala.	
WAYD	Ozark, Ala.	
KASA	Phoenix, Ariz.	10000d
KMPG	Hollister, Cal.	
KPOL	Los Angeles, Calif.	50000
WBSR	Pensacola, Fla.	1000
WJGA	Jackson, Ga.	
WOGA	Sylvester, Ga.	1000d
WSMI	Litchfield, Ill.	1000d
WBNL	Boonville, Ind.	250d
WADM	Decatur, Ind	250d
WLOI	LaPorte, Ind.	250d
WCBK	Martinsville, Ind.	250d
KXEL	Waterloo, Iowa	50000
KNEX	McPherson, Kans.	250d
KLKC	Parsons, Kans.	250d
KCTO	Columbia, La.	1000d
KGLA	Gretna, La.	
WDON	Wheaton, Md.	1000d
WLEF	Greenwood, Miss.	1000d
KBXM	Kennett, Mo.	250d
WKXR	Exeter, N.H.	
WPTR	Albany, N.Y.	50000
WPAW	E. Syracuse, N.Y.	1000d
WKYK	Burnsville, N.C.	1000d
WRPL	Charlotte, N.C.	1000d
WIFM	Elkin, N.C.	1000d
WBCO	Bucyrus, Ohio	500d
WABQ	Cleveland, Ohio	1000d
WNIO	Niles, Ohio	500d
WBTC	Uhrichsville, O.	250d
KZEL	Eugene, Ore.	1000d
WRCP	Philadelphia, Pa.	50000d
WPTS	Pittston, Pa.	1000d
WPME	Punxsutawney, Pa.	1000d
WADK	Newport, R.I.	1000d
WKKR	Pickens, S.C.	1000d
WBFJ	Woodbury, Tenn.	500d
KBUY	Ft. Worth, Tex.	50000d
KGBC	Galveston, Tex.	1000
KEDA	San Antonio, Tex.	
WRGM	Richmond, Va.	10000d
KFKF	Bellevue, Wash.	1000
WTKM	Hartford, Wis.	500d

1550—193.5

WAAY	Huntsville, Ala.	5000d
WMOO	Mobile, Ala.	50000d
KUAT	Tucson, Ariz.	50000d
KXEX	Fresno, Calif.	500d
KKHI	San Fran., Calif.	10000
KQXI	Arvada, Colo.	10000d
WEXT	W. Hartford, Conn.	1000d
WRIZ	Coral Gables, Fla.	10000d
WOGO	New Smyrna Beach, Fla.	250
WYOU	Tampa, Fla.	10000d
WTHB	Augusta, Ga.	5000d
WYNX	Smyrna, Ga.	10000
WJIL	Jacksonville, Ill.	1000d
WCSJ	Morris, Ill.	250d
WPDF	Corydon, Ind.	250d
WCVL	Crawfordsville, Ind.	250
WCTW	New Castle, Ind.	250
WKQV	Sullivan, Ind.	250d
KIWA	Sheldon, Iowa	500d
KEDD	Dodge City, Kans.	1000d
KNIC	Winfield, Kan.	250d
WIRV	Irvine, Ky.	1000d
WMSK	Morganfield, Ky.	250d
WLUX	Baton Rouge, La.	5000d
KOKA	Shreveport, La.	10000
WSER	Elkton, Md.	1000d
WNTN	Newton, Mass.	10000d
WSHN	Fremont, Mich.	1000d
WOKJ	Jackson, Miss.	50000
WSAO	Senatobia, Miss.	5000d
KGMD	Cape Girardeau, Mo.	5000d
KKJO	St. Joseph, Mo.	5000
KICS	Hastings, Neb.	500
WCGR	Canadaigua, N.Y.	250
WBAZ	Kingston, N.Y.	500d
WBVM	Utica, N.Y.	1000
WPXY	Greenville, N.C.	1000d
WYNA	Raleigh, N.C.	1000d
WTYN	Tryon, N.C.	1000d
WFCM	Winston-Salem, N.C.	1000d
KQWB	Fargo, N.D.	5000d
WDLR	Delaware, Ohio	500d
KMAD	Madill, Okla.	250
KREK	Sapulpa, Okla.	500d
WLOA	Braddock, Pa.	1000d
WTTC	Towanda, Pa.	500d
WKFE	Yauco, P.R.	250
WBSC	Bennetsville, S.C.	10000
KCAN	Canyon, Tex.	1000
KWBC	Navasota, Tex.	250d
WKYE	Bristol, Tenn.	1000d
WPTN	Cookeville, Tenn.	250d
WTPI	Cookville, Tenn.	250d
WKPT	Kingsport, Tenn.	10000d
KCOM	Comanche, Tex.	250d
KRGO	Salt Lake City, Utah	10000d
WKBA	Vinton, Va.	10000d
WVAB	Virginia Bch., Va.	5000d
WXVA	Charlestown, W.Va.	500d
KOQT	Bellingham, Wash.	1000d
KGAR	Vancouver, Wash.	1000d
WMIR	Lake Geneva, Wis.	1000d
WMAD	Madison, Wis.	5000d

1560—192.3

WAGC	Centre, Ala.	1000d
KDDA	Dumas, Ark.	
KBIB	Monette, Ark.	250d
KPMC	Bakersfield, Calif.	10000
KIQS	Willows, Calif.	250d
WTAI	Eau Gallie, Fla.	5000d
WYSE	Inverness, Fla.	1000
WCIK	Gordon, Ga.	5000d
WBYS	Canton, Ill.	250d
WVAK	Paoli, Ind.	250d
WRIN	Rensselaer, Ind.	1000d
KRCB	Council Bluffs, Iowa	1000d
KABI	Abilene, Kan.	250d
WKDO	Liberty, Ky.	250d
WDXR	Paducah, Ky.	10000
WBGS	Sidell, La.	1000d
WSMD	La Plata, Md.	1000d
WTPS	Portage, Mich.	1000d
WMIC	Sandusky, Mich.	1000d
KBEW	Blue Earth, Minn.	1000
KQYX	Joplin, Mo.	250d
KLTI	Macon, Mo.	250d
KTUI	Sullivan, Mo.	1000d
WQXR	New York, N.Y.	50000
WBKC	Chardon, O.	
WTNS	Coshocton, Ohio	1000d
WCNW	Fairfield, O.	5000d
WTOD	Toledo, Ohio	5000d
KWCD	Chickasha, Okla.	1000
KRBB	Sallisaw, Okla.	1000d
WRSJ	Bayamon, P.R.	5000
WAGL	Lancaster, S.C.	10000d
WWGM	Nashville, Tenn.	10000d
WBOL	Bolivar, Tenn.	250d
KCAO	Abilene, Tex.	500d
KEGG	Daingerfield, Tex.	1000d
KHBR	Hillsboro, Tex.	250d
KGUL	Port Lavaca, Tex.	500d
KGHO	Hoquiam, Wash.	1000d
KDFL	Sumner, Wash.	250d
WFSP	Kingwood, W. Va.	1000d
WGLB	Port Washington, Wis.	250d

1570—191.1

WCRL	Oneonta, Ala.	1000d
WTQX	Selma, Ala.	5000d
KBRI	Brinkley, Ark.	250d
KBJT	Fordyce, Ark.	250d
KRSA	Alisal, Calif.	250d
KCVR	Lodi, Cal.	5000d
KACE	Riverside, Cal.	5000d
KLOV	Loveland, Colo.	250d
WTWB	Auburndale, Fla.	5000d
WFBF	Fernandina Bch., Fla.	1000d
WOKC	Okeechobee, Fla.	1000d
WJOE	Ward Ridge, Fla.	250
WMES	Ashburn, Ga.	1000d
WGHC	Clayton, Ga.	1000d
WBAD	College Park, Ga.	1000d
WGSR	Millen, Ga.	250d
WOKZ	Alton, Ill.	1000d
WELL	Freeport, Ill.	5000d
WBEE	Harvey, Ill.	5000d
WTAY	Robinson, Ill.	250d
WIFF	Auburn, Ind.	250d
WILO	Frankfort, Ind.	250d
WHEL	New Albany, Ind.	1000d
KMCD	Fairfield, Iowa	250d
KJFJ	Webster City, Iowa	250d
KNDY	Marysville, Kans.	250d
WKKS	Vanceburg, Ky.	250d
WABL	Amite, La.	500d
KLLA	Leesville, La.	1000d
KMAR	Winnsboro, La.	1000d
WPEP	Taunton, Mass.	1000d
WMLO	Beverly, Mass.	500d
WDEW	Westfield, Mass.	1000d
WMRP	Flint, Mich.	1000d

WHITE'S RADIO LOG

kHz	Wave Length	W.P.
WFUR	Grand Rapids, Michigan	1000d
KUXL	Golden Valley, Minn.	1000d
WONA	Winona, Miss.	1000d
KLEX	Lexington, Mo.	250d
WKOL	Amsterdam, N.Y.	1000d
WFLR	Dundee, N.Y.	1000d
WBUZ	Frednnia, N.Y.	250d
WHRF	Riverhead, N. Y.	1000d
WTLK	Taylorsville, N.C.	500d
WNCA	Siler City, N.C.	1000d
WCLW	Mansfield, O.	1000d
WPTW	Piqua, Ohio	250d
KTAT	Frederick, Okla.	250d
KOLS	Pryor, Okla.	1000d
KOHU	Hermiston, Oreg.	1000d
WPGM	Danville, Penn.	1000d
WRUX	Doylestown, Pa.	5000d
WQTW	Latrobe Pa.	1000d
WFGN	Gaffney, S.C.	250d
WJES	Johnston, S.C.	250d
WLSC	Loris, S.C.	1000d
KVRA	Vermillion, S.D.	
WHLP	Centerville, Tenn.	1000d
WCLE	Cleveland, Tenn.	1000d
WTRB	Ripley, Tenn.	1000d
KZOL	Farwell, Tex.	250d
KVLG	La Grange, Tex.	250d
KTER	Terrell, Tex.	250d
WSWV	Pennington Gap, Va.	1000d
WYTI	Rocky Mount, Va.	1000d
WAPL	Appleton, Wis.	1000d

1580—189.2

WEYY	Talladega, Ala.	1000d
KTUF	Tempe, Ariz.	50000d
KPCA	Marked Tree, Ark.	250d
KFDF	Van Buren, Ark.	1000d
KMRE	Anderson, Cal.	1000d
KWIP	Merced, Calif.	500d
KDAY	Santa Monica, Cal.	50000
KHUM	Santa Rosa, Calif.	500d
KPIK	Colorado Sprgs., Colo.	5000d
WSBP	Chattachoochee, Fla.	1000d
WSRF	Ft. Lauderdale, Fla.	1000d
WVGT	Mount Dora, Fla.	1000d
WCCF	Punta Gorda, Fla.	1000d
WCLS	Columbus, Ga.	1000
WNRJ	Gainsville, Ga.	10000d
WKIG	Glenville, Ga.	1000d
WKKO	Aurora, Ill.	250d
WDQN	DuQuoin, Ill.	250d
WBBA	Pittsfield, Ill.	250d
WKID	Urbana, Ill.	250d
WCNB	Connersville, Ind.	250d
WJVA	South Bend, Ind.	1000d
WAMW	Washington, Ind.	250d
KCHA	Charles City, Iowa	500d
KWNT	Davenport, Iowa	500d
KDSN	Denison, Iowa	500d
WAXU	Georgetown, Ky.	10000d
WMTL	Leitchfield, Ky.	250d
WPKY	Princeton, Ky.	250d
KLUV	Haynesville, La.	250d
KLOU	Lake Charles, La.	1000
P6C	Bradbury Hts., Md.	10000d
WTOW	Towson, Md.	5000d
WRBJ	St. Johns, Mich.	1000d
KDOM	Windom, Minn.	250d
WAMY	Amory, Miss.	5000d
WLBS	Centreville, Miss.	250d
WESY	Leland, Miss.	1000d
WPMP	Pascagoula-Moss Point, Mississippi	1000d
KTGR	Columbia, Mo.	250d
KESM	El Dorado Springs, Mo.	500d
KNIM	Maryville, Mo.	250d
KAMI	Cozad, Neb.	1000d
WNJH	Hammonton, N.J.	250d
WCRV	Washington, N.J.	1000d
KZIA	Albuquerque, N. M.	1000d
WPAC	Patchogue, N.Y.	10000d
WZKY	Albemarle, N.C.	250d
WPYB	Benson, N.C.	500d
WVKO	Columbus, Ohio	1000d
KLTR	Blackwell, Okla.	1000d
WCOY	Columbia, Pa.	500d
WEND	Ebensburg, Pa.	1000d
WANB	Waynesburg, Pa.	250d
WORG	Orangeburg, S.C.	1000d
WBBR	Travelers Rest, S. C.	1000d
WSKT	Colonial Village, Tenn.	250d
WHHM	Henderson, Tenn.	250d
WLIJ	Shelbyville, Tenn.	1000d
WSKT	Knoxville, Tenn.	5000d
KKAL	Denver City, Tex.	250d
KGAF	Gainesville, Tex.	250d
KIRT	Mission, Tex.	1000d
KTLU	Rusk, Tex.	500d
KWED	Seguin, Tex.	1000d
KBYP	Shamrock, Tex.	250d
KBGO	Waco Tex.	1000
WILA	Danville, Va.	1000d
WPUV	Pulaski, Va.	5000d
WTTN	Watertown, Wis.	1000d

1590—188.7

WATM	Atmore, Ala.	5000d
WVNA	Tuscumbia, Ala.	5000
KVSL	Show Low, Ariz.	
KPBA	Pine Bluff, Ark.	1000d
KSPR	Springdale, Ark.	500d
KLIV	San Jose, Cal.	5000
KUDU	Ventura, Cal.	10000
KCIN	Victorville, Calif.	500d
WBRY	Waterbury, Conn.	5000
WILZ	St. Petersburg Beach, Florida	1000d
WELE	S. Daytona Bch., Fla.	1000d
WALG	Albany, Ga.	5000
WLFA	Lafayette, Ga.	5000d
WTGA	Thomaston, Ga.	500d
WNMP	Evanston, Ill.	1000d
WAIK	Galesburg, Ill.	5000d
WGEE	Indianapolis, Ind.	5000d
WPCO	Mt. Vernon, Ind.	500d
KWBG	Boone, Iowa	1000
KVGB	Great Bend, Kans.	5000
WLBN	Lebanon, Ky.	1000d
KEVL	White Castle, La.	1000d
WISZ	Glen Burnie, Md.	500
WETT	Ocean City, Md.	1000
WTVB	Coldwater, Mich.	5000
WSMA	Marine City, Mich.	1000d
WMIC	St. Helen, Mich.	500d
KRAD	E. Grand Forks, Minn.	1000d
WWUN	Jackson, Miss.	5000
KDEX	Dexter, Mo.	1000d
KPBS	Kansas City, Mo.	1000d
KCLU	Rolla, Mo.	1000d
KTCH	Wayne, Neb.	500d
WSMN	Nashua, N.H.	5000
WERA	Plainfield, N.J.	500d
WAUB	Auburn, N.Y.	500d
WEHH	Elmira Heights-Horseheads, N.Y.	500d
WGGO	Salamanca, N.Y.	5000d
WBHN	Bryson City, N. C.	500d
WCSL	Cherryville, N.C.	500d
WVOE	Chadbourn, N.C.	1000d
WNOS	High Point, N.C.	1000d
WAKR	Akron, Ohio	5000
WSRW	Hillsboro, Ohio	500d
KHEN	Henryetta, Okla.	500d
KZYX	Weatherford, Okla.	
KTIL	Tillamook, Ore.	5000
WZUM	Carnegie, Pa.	1000d
WCBG	Chambersburg, Pa.	5000
WEEZ	Chester, Pa.	1000
WXRF	Guayama, P.R.	1000
WARV	Warwick-E. Greenwich, R.I.	1000d
WABV	Abbeville, S.C.	1000d
WACA	Camden, S.C.	1000d
WJES	Johnston, S.C.	
WPIP	Collierville, Tenn.	500d
WJSO	Jonesboro, Tenn.	5000d
WOBL	Springfield, Tenn.	1000d
KGAS	Carthage, Tex.	1000d
KERC	Eastland, Tex.	500d
KINT	El Paso, Tex.	1000d
KYOK	Houston, Tex.	5000
KCBD	Lubbock, Tex.	1000
KBUS	Mexia, Tex.	500d
KTOD	Sinton, Tex.	1000
WGOE	Richmond, Va.	5000d
KSND	Seattle, Wash.	5000d
WIXK	New Richmond, Wis.	5000d
WSWW	Platteville, Wis.	5000
WQTC	Two Rivers, Wis.	1000d
WAWA	West Allis, Wis.	1000d
KCGO	Cheyenne, Wyo.	

1600—187.5

WEUP	Huntsville, Ala.	5000d
WAPX	Montgomery, Ala.	1000
KVIO	Cottonwood, Ariz.	1000d
KXEW	Tucson, Ariz.	1000
KGST	Fresno, Cal.	5000d
KWOW	Pomona, Cal.	5000
KZON	Santa Maria, Cal.	500d
KUBA	Yuba City, Calif.	5000
KLAK	Lakewood, Colo.	5000
WKEN	Dover, Del.	1000
WKTX	Atlantic Beach, Fla.	1000d
WKWF	Key West, Fla.	500
WHEW	Riviera Beach, Fla.	1000
WPRV	Wauchula, Fla.	500d
WOKB	Winter Garden, Fla.	5000d
WACX	Austell, Ga.	
WNGA	Nashville, Ga.	1000d
WRBN	Warner Robins, Ga.	1000d
WCGO	Chicago Hgts., Ill.	1000d
WMCW	Harvard, Ill.	500d
WBTO	Linton, Ind.	500d
WARU	Peru, Ind.	1000d
KLGA	Algona, Iowa	5000d
KCRG	Cedar Rapids, Iowa	5000
KMDO	Ft. Scott, Kans.	500d
WSTL	Eminence, Ky.	500d
KFNV	Ferriday, La.	1000d
KLEB	Golden Meadow, La.	1000d
KNCB	Vivian, La.	5000d
WINX	Rockville, Md.	1000
WBOS	Brookline, Mass.	5000
WTYM	East Longmeadow, Mass.	5000d
WAAM	Ann Arbor, Mich.	5000
WTRU	Muskegon, Mich.	5000
WKDL	Clarksdale, Miss.	1000d
WFFF	Columbia, Miss.	500d
KATZ	St. Louis, Mo.	5000
KTTN	Trenton, Mo.	500d
KNCY	Nebraska City, Nebr.	500d
KRFS	Superior, Nebr.	500d
WWRL	New York, N. Y.	5000
WMCR	Oneida, N.Y.	1000d
WLNG	Sag Harbor, N.Y.	500
WXKW	Troy, N.Y.	500d
WGIV	Charlotte, N.C.	1000
WIDU	Fayetteville, N.C.	1000d
WHVL	Hendersonville, N.C.	1000d
WFRC	Roldsville, N.C.	1000
WKSK	W. Jefferson, N.C.	1000d
KDAK	Carrington, N.Dak.	500d
WAQI	Ashtabula, Ohio	1000d
WBLY	Springfield, Ohio	1000d
WTTF	Tiffin, Ohio	500d
KUSH	Cushing, Okla.	1000d
KASH	Eugene, Oreg.	5000
KOHI	St. Helens, Ore.	1000d
WHOL	Allentown, Pa.	500d
WHRY	Elizabethtown, Pa.	500d
WFIS	Fountain Inn, S.C.	1000d
WFNL	No. Augusta, S.C.	500d
WHBT	Harriman, Tenn.	5000d
WKBJ	Milan, Tenn.	1000d
KBBB	Borger, Tex.	5000d
KBOR	Brownsville, Tex.	1000
KWEL	Midland, Tex.	1000d
KCFH	Cuero, Tex.	500d
KYAL	McKinney, Tex.	5000d
KOGT	Orange, Tex.	1000
KBBC	Centerville, Utah	1000d
WCPK	Chesapeake, Va.	1000d
WHLL	Wheeling, W.Va.	5000d
WCWC	Ripon, Wis.	5000

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!

Frank E. Aden, Boise, Idaho
Michael Ames, Cortland, N.Y.
Jean Pierre Bedard, Charlesbourg, Quebec
William Boerner, Massillon, Ohio
David L. Buda, Fort Walton Beach, Florida
David Butler, Lombard, Ill.
James E. Carter III, Augusta, Georgia
Ralph Chapman, Buffalo, N.Y.
Tom Czaja, Milwaukee, Wis.
Brian Egan, No Address
Gary Emenitove, Council Bluffs, Iowa
Clayton Farrell, Southeast Asia
Lucien Filiatrault, Islip, N.Y.
Willis Geo. Frahm, Boise, Idaho
Arthur Frederick, New Kensington, Pa.
John Garofano, Framingham, Mass.
Walter M. Gilday, Brockton, Mass.
W. Granderath, Albany, N.Y.
Glenn Groenewold, Davis, Calif.
William F. Hanson, Aurora, Colo.
Peter Keller, Hillsboro, Ore.
Ken Knecht, Oneonta, N.Y.
Robert Locke, Winnipeg, Manitoba
Grant MacDonald, Islington, Ontario
Michael E. Martin, Cincinnati, Ohio
Dan McQuade, Omaha, Nebr.
J. B. Martin, Chicago, Ill.
John M. Meier, Woodward, Iowa
O. E. Millett, Toronto, Ontario
Thomas Mount, Red Bank, N.J.
Marke Paise, North Surrey, B.C., Canada
Johnny Parks, Portland, Ore.
Peter Pelland, Chicopee, Mass.
Jim Petersen, Yorktown Heights, N.Y.
Robert F. Post, Upland, Calif.
Richard Powers, Fredericton, N.B., Canada
John N. Ramsey, West Hartford, Conn.
Bob Raymond, Bradford, Mass.
Richard Ringenback, Fair Lawn, N.J.
John Robertson, Port Huron, Mich.
Carl Rosell, Kearny, N.J.
Peter Salant, Park Ridge, N.J.
George Schwenk, San Pedro, Calif.
Sheldon Swartz, Sharon, Mass.
Jimmie Thinnes, Nampa, Idaho
Robert White, Chanhassen, Minn.
C. M. Wilkinson, Riverdale, Ill.
John Vanderplough, Bloomington, Ind.

☐ This time our big contest (the one without prizes or awards, that is) is going to be a bit different. It seems, from the mail we receive, that too few monitors know some of the basic rules of the road for DX'ing. That gave us the idea to ask you some questions on the hobby itself along with our usual demands for you to listen for off-beat DX stations. Scoring info at the end of the quiz.

1. What basic information bits should be sent to stations when you are submitting a reception report with the hopes of getting a QSL card in return?

2. When, after as many as three tries on your part, a station refuses to acknowledge your signal reports with a QSL card, you should: A—Notify all radio clubs that this station is a non-QSL'er and should be blacklisted; B—Send them a carbon copy of your original report every two months until they come through with a QSL card; C—Forget them and give up; D—Give them a few more chances before giving up, possibly with a more detailed or different approach to the report you send; E—Write to the station and let them know that they are being "unfair" to the DX'ing hobby.

3. *True* or *False*: The longer the wire for the receiving antenna, the better the chances you will have for pulling in those far away stations.

4. *True* or *False*: 26 or 27 mHz is about the upper limit of the radio spectrum insofar as the DX hobbyist is concerned.

5. Here's a rarie from out in the Pacific; it's the station of the Fiji Broadcasting Commission on 6005 kHz, heard around 0300 GMT. They are hard to hear in the Eastern half of the States and Canada but will QSL promptly. The address is Box 334, Suva, Fiji Islands.

6. A clandestine (secret location) station calling itself "Radio Free Russia" is now being heard on 6368 and 6376 kHz around 1900 GMT. Can you hear this one?

7. Anybody for Nepal? Don't all scramble at once to hear Radio Nepal on 4795 kHz now that their new higher powered rig is installed. Loom for them on from 1320 to 1620 GMT. Also heard testing on 9590 kHz.

8. Yeah man, here's a chance to hear Yemen, that little kingdom in the middle east which has been in the news during the past few years. A station calling itself "Yemeni Royalist Radio," and thought to really be in Yemen, is being heard at 1640 GMT on a frequency somewhere between 9972 and 9985 kHz.

9. New Korean station is the "Voice of Hope," operated from Seoul by the S. Korean Army. Look for it on 6170 kHz at 1200 and 0815 GMT.

10. Guess what? That old pirate Radio Libertad is back (according to many reporters) and guess where they are; you betcha—right on 6000 kHz, the frequency formerly used by Radio Americas from Swan Island. This was predicted some time ago — that when Radio Swan/Americas closed down its functions would be taken over by Radio Libertad. Check the channel in the evenings.

Scoring. Take 10 points per question or DX challenge, with 1 point deducted for each thing you forgot to include in your answers to question 1.

Here are the answers to the questions:

1. Send them a *detailed report* listing *all announcements* and *musical selections* monitored during a period of not less than *15 minutes* duration, information on their signals (*fading, strength, interference, modulation quality*), the *time* you heard them (in GMT), the *date*, the *details* of your receiving equipment, and an *International Reply Coupon* to pay the return postage for your QSL.

2. The answer is *D*. Never try to blacklist a station or send them a nasty letter. QSL cards are a courtesy to the hobby and not a necessary part of the station's obligation to

This Issue's Shortwave Contributors

Dale G. Wilson, Jr., McHenry, Ill., Harvey Eckhaus, Milwaukee, Wisc., Mel Baird, Lewiston, Fla., Richard McInnes, Vancouver, B.C., Hal Farnsworth, Chicago, Ill., William R. Arnold, Lancaster, Pa., Sp/3 Grover Thompson, APO San Francisco, Calif., Dick Barest, S. Miami, Fla., Helen Parker, New York, N.Y., Irving Blockman, Nashville, Tenn., Jack Lipman, New York, N.Y., Sid Sontag, Denver, Colo., George Sax, Santa Ana, Calif., Tom Kneitel, New York, N.Y., Terry Miner, Dallas, Texas, Joe Vasquez, San Juan, P.R., Gladys Sienkiewicz, Brooklyn, N.Y., Enrique Delon, Paris, France, Michael Schmol, Dover, Del., G. W. Moody II, Dillon, S.C., Rick Slattery, Key West, Fla., Gerald Belmont, Kansas City, Kans., Howard Reglander, Covington, Ky., Morty Golden, Montreal, Que., and Richard Flanagan, Union City, N.J. ■

WHITE'S RADIO LOG

the world public. Your reception report has only minimal value from a technical standpoint and if the station never received it, they would really be just as happy. Maybe your report got lost in the mail, or maybe the station personnel are busy, maybe they are slow answerers, or maybe your report was inadequate. Don't lose patience, just send them a more detailed report—possibly in their own language.

3. *False!* The most efficient antenna is a directional one which is cut for the specific band you are monitoring. A long, long, long, zig-zagging random length wire may actually be very poor for hearing certain frequencies or in certain directions.

4. *False!* It may be the upper frequency limits of International Broadcasting, but it is the bottom edge of a whole new world of so-called "utilities" DX which consists several ham bands, police, fire, business, and emergency communications. With an inexpensive VHF receiver and a small antenna you can receive more thrills and excitement than you ever dreamed possible. See our new listing following the World-Wide Shortwave section.

kHz	Call	Identification	Location	GMT
3985	HCER5	Escuelas R. Populares	Riobamba, Ecuador	2345
4765	—	R-TV Congolaise	Brazzaville, Congo	0430
4795	HIAS	S. Dominro R.	Santo Domingo, D.R.	0400
4820	HRVC	HRVC	Tegucigalpa, Honduras	0315
	—	Emis. Oficial	Luanda, Angola	0500
4880	—	R. Yaracuy	Yaracuy, Venezuela	0300
4890	—	R. Dakar II	Dakar, Senegal	0630
	YVKB	R. Venezuela	Caracas, Venez.	0245
4895	—	R. RSA	Johannesburg, S. Afr.	0510
4900	YVNK	R. Juventud	Barquisimeto, Venez.	0045
4920	VLM4	A.B.C.	Brisbane, Australia	0910
4940	—	R. Mil	Santo Domingo, D.R.	0430
4953	HRRZ	R. Jutigalpa	Tegucigalpa, Honduras	1045
4955	HJCQ	R. Nacional	Bogota, Colombia	0010
4965	HJAF	R. Santa Fe	Bogota, Colombia	0515
4990	YVMQ	R. Barquisimeto	Barquisimeto, Venez.	0115
5005	OAX2S	V. de Frontera	Lima, Peru	0340
5010	OAX8V	R. Eco	Iquitos, Peru	0430
6025	—	Southern Cross R.	La Paz, Bolivia	0130
5048	—	R. Togo	Lome, Togo	0545
5875	HRN	V. de Honduras	Tegucigalpa, Honduras	0135

60-Meter Band—5950-6200 kHz

5960	HRRH	V. de Occidente	Santa Rosa, Honduras	1210
5970	HJVN	HJVN	Bogota, Colombia	0315
5975	ZYT44	R. Globo	Florianapolis, Braz.	0925
5985	LRS2	R. Splendid	Buenos Aires, Argentina	1010
5990	—	RAI	Rome, Italy	0415
	—	BBC	London, England	0345
6000	—	R. Inconfidencia	Belo Horizonte, Braz.	0945
6005	CFCX	CF Radio	Montreal, Que.	1900
6010	CJCX	CJCX	Sydney, N.S.	0950
6025	HCJB	V. de los Andes	Quito, Ecuador	0715
6030	—	R. Baghdad	Baghdad, Iraq	0250
6035	TIFC	Faro del Caribe	San Jose, C.R.	0320
6045	—	RRI	Jakarta, Indonesia	1215
	—	R. Santa Rosa	Lima, Peru	0150
6070	CFRX	CFRX	Toronto, Ont.	1000
6075	—	R. RSA	Johannesburg, S. Afr.	2345
6110	—	BBC	London, England	0315
6120	4VEH	V. Evangelique	Cap Haitien, Haiti	1015
6130	—	R. Nacional	Madrid, Spain	0315
	CHNX	CHNX	Halifax, N.S.	0400
6135	—	R. Habana	Havana, Cuba	0300
6137	—	R-TV Francaise	Papeete, Tahiti	0510
6140	—	R. El Sol	Cali, Colombia	1020
6155	—	Far East Net	Tokyo, Japan	1000
	ZAA	R. Tirana	Tirana, Albania	0150
6160	HJKJ	E. Nueva Granada	Bogota, Colombia	0300
6165	XEWW	XEWW	Mexico City, Mex.	0110
6185	ZYR77	R. Bandeirantes	Bandeirantes, Brazil	1000

41-Meter Band—7100-7300 kHz

7110	—	BBC	London, England	0250
7115	—	R. Peking	Peking, China	0245
7125	ETLF	R. V. Gospel	Addis Ababa, Ethiopia	0330
7155	—	R. Peking	Peking, China	1140
7165	—	V. America	Okinawa	1100
7295	ZAA	R. Tirana	Tirana, Albania	2330
7345	—	R. Prague	Prague, Czech.	2215
9490	ZAA	R. Tirana	Tirana, Albania	0140

31-Meter Band—9500-9775 kHz

9505	HISD	HISD	Santo Domingo, D.R.	0315
	—	R. Japan	Tokyo, Japan	1130
9510	—	BBC	London, England	0610
	OAX4V	R. America	Lima, Peru	0730
9520	ZL1B	R. New Zealand	Wellington, N.Z.	0700
	OAX4J	R. LaCronica	Lima, Peru	0310
	—	Danish BC	Copenhagen, Denmark	0150
9525	—	R. Warsaw	Warsaw, Poland	0745
	—	R. Habana	Havana, Cuba	0745
9530	—	NHK	Tokyo, Japan	0945
	—	R. Moscow	Moscow, USSR	0700
9540	ZL2	R. New Zealand	Wellington, N.Z.	0545
9545	DMQ9	Deutsche Welle	Cologne, W. Germany	0240
9560	—	NHK	Tokyo, Japan	1915
	—	R. Australia	Melbourne, Australia	0730
9580	—	R. Portales	Santiago, Chile	0530
9590	PCJ	R. Nederland	Hilversum, Neth.	0145
9595	JOZ3	Japan BC	Tokyo, Japan	0945
9600	—	BBC	London, England	0745
9605	—	R. Prague	Prague, Czech.	2245
9610	—	A.B.C.	Perth, Australia	1045
9615	ORU	Belgian Radio	Brussels, Belg.	2230
9620	—	R. Belgrade	Belgrade, Yugo.	2210
9625	—	R. Canada	Montreal, Que.	0630
9630	—	R. Prague	Prague, Czech.	0115
9635	—	R. Prague	Prague, Czech.	2315
	ZYR83	R. Aparaceida	Rio de Janeiro, Brazil	0930
9640	HLK5	V. Free Korea	Seoul, Korea	0815
9660	VLQ9	R. Australia	Melbourne, Australia	0910
9665	—	R. Malaysia	Kuala Lumpur, Malaysia	1230
9675	—	NHK	Tokyo, Japan	1100
9685	BED73	V. Free China	Taiwan, Repub. China	0945
	—	R-TV Algerienne	Algiers, Algeria	0950
9710	—	Trans World R.	Bonaire, Neth. Ant.	0300
9725	—	BBC—Far East	Tebrau, Malaysia	1030
9730	—	R. Berlin Int'l.	Berlin, E. Germany	0200
9740	—	R. Moscow	Moscow, USSR	0940
9750	—	R. Soc. Nacional	Santiago, Chile	0100
9770	—	R. Austria	Vienna, Austria	0400

kHz	Call	Identification	Location	GMT
9860	—	R. Peking	Peking, China	1030
11290	—	R. Peking	Peking, China	1100

25-Meter Band—11750-11975 kHz

11710	—	R. Australia	Melbourne, Australia	0715
11715	—	Swiss BC	Berne, Switzerland	2315
	—	V. America	Manila, Philippines	0940
11750	—	BBC	Malaysia	1245
	—	Far East Net.	Tokyo, Japan	0930
11760	—	R. Habana	Havana, Cuba	1350
	HVJ	R. Vatican	Vatican City	0100
11795	DMQ11	Deutsche Welle	Cologne, W. Germany	1920
11805	—	R. Globo	Rio de Janeiro, Brazil	0915
11825	—	R-TV Francaise	Papeete, Tahiti	0745
11835	—	R-TV Algerienne	Algiers, Algeria	2230
11850	—	R. Ghana	Accra, Ghana	2000
11860	—	R. Norway	Oslo, Norway	0315
11875	—	R. Japan	Tokyo, Japan	0945
	—	R. Bucharest	Bucharest, Rumania	0145
	VUD	AIR	Delhi, India	1130
11890	—	Far East BC	Manila, Philippines	0930
11900	—	R. RSA	Johannesburg, S. Afr.	2030
11905	DMQ11	Deutsche Welle	Cologne, W. Germany	0530
11920	—	Far East BC	Manila, Philippines	1145
11930	—	R. Habana	Havana, Cuba	0730
11975	—	R. Brazzaville	Brazzaville, Congo	0530
12000	—	R. Kiev	Kiev, USSR	0045
12095	—	BBC	London, England	2200
15030	—	R. Peking	Peking, China	1230
15044	—	R. Hanoi	Hanoi, N. Vietnam	1400
15060	—	R. Peking	Peking, China	0030
15075	—	R. Euzkadi	(clandestine)	2145

19-Meter Band—15100-15450 kHz

15105	—	BBC Relay	Ascension Island	1445
	—	R. Japan	Tokyo, Japan	1600
15110	XERR	XERR	Mexico City, Mex.	0300
15115	—	R. de Senegal	Dakar, Senegal	2300

kHz	Call	Identification	Location	GMT
15120	HVJ	R. Vatican	Vatican City	1430
15125	—	V. West	Lisbon, Portugal	1545
15140	—	BBC	London, England	0605
15155	ELWA	R. Village	Monrovia, Liberia	1700
15160	—	R. Ankara	Ankara, Turkey	2200
15170	—	R. Norway	Oslo, Norway	1530
15180	—	R. Australia	Melbourne, Australia	0230
15190	—	R. Brazzaville	Brazzaville, Congo	0545
15210	—	R. Berlin Int'l.	Berlin, E. Germany	0245
15220	—	R. Nederland	Bonaire, Neth. Ant.	2130
15230	—	Ceylon BC	Colombo, Ceylon	0130
15235	VUD	All India R.	Delhi, India	2300
15240	—	R. Australia	Melbourne, Australia	0600
15250	DMQ15	Deutsche Welle	Cologne, W. Germany	0615
15260	ETLF	R. V. Gospel	Addis Ababa, Ethiopia	1315
15265	—	R. Kabul	Kabul, Afghanistan	1800
	VUD	All India R.	Delhi, India	0030
15270	—	R. Habana	Havana, Cuba	0445
15275	—	R. Sweden	Stockholm, Sweden	0430
15285	HVJ	R. Vatican	Vatican City	2245
15300	—	BBC	London, England	0415
	—	NHK	Tokyo, Japan	1330
15310	—	V. de Revolucion	Conakry, Guinea	1445
	—	RAI	Rome, Italy	0230
15325	HCJB	V. Andes	Quito, Ecuador	1915
15345	—	R. Athena	Athens, Greece	2200
	—	R. Norway	Oslo, Norway	0100
15350	—	R. Nederland	Bonaire, Neth. Ant.	0115
17715	—	Viennese R.	Vienna, Austria	0430
17720	BED39	V. Free China	Taiwan, Rep. China	0230
17790	DMQ17	Deutsche Welle	Cologne, W. Germany	1900
17825	—	R. Norway	Oslo, Norway	1500

13-Meter Band—21450-21750 kHz

21465	—	R. Berlin Int'l.	Berlin, E. Germany	0630
21495	CSA67	V. West	Lisbon, Portugal	1845
21550	—	BBC	London, England	1600
21555	—	BBC	London, England	1700
21570	PCJ	R. Nederland	Hilversum, Neth.	1900
21610	—	BBC	London, England	1500

Emergency Radio Station Listings for Chicago and Surrounding Areas

Including all of Cook, DuPage, and Lake Counties in Illinois and northern Lake County, Indiana

☐ RADIO-TV EXPERIMENTER 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 will be publishing similar lists devoted to different metropolitan areas in forthcoming issues of RADIO-TV EXPERIMENTER so in the months ahead you'll be able to accumulate a sizable array of this difficult-to-obtain data.

All frequencies shown are in MHz unless otherwise noted. Communities not shown in our listing are serviced by an adjoining community, or by county or state agencies. Check county and state listings in this section for this data. When the word "mobiles" is used instead of a callsign, it is because the agency either has no base station and its mobiles use the base station of another agency, or the frequency shown is used for mobile-to-mobile communication only. When the frequency 155.37 is shown along with another one for a police station, the other frequency is usually the main dispatching channel for patrol cars.

Section 605 of the Communications Act of 1934 provides severe penalties for unauthorized divulging or making use of information obtained by monitoring non-broadcast communications. All readers are hereby cautioned that the data contained herein is to be used solely for hobby listening, private, non-commercial, and/or other purposes which are not in violation of federal, state, county, or local laws. Publisher assumes no further responsibility.

Our listings were compiled and condensed from the well-known series of *Emergency Radio Service Monitoring Bulletins*, by special arrangement with their publisher, Communications Research Bureau, Box 56,

WHITE'S RADIO LOG

Commack, N. Y. 11725. Their series of directories includes police, fire, and other emergency radio station listings for all large cities, many counties, and all states. A complete catalog of these directories is available by sending your name and address and a 6¢ stamp directly to the Communications Research Bureau (*not* to RADIO-TV EXPERIMENTER). No portion of this bulletin may be reproduced in any manner whatsoever without the express written permission from the Editor. Coded listings have been included to check copyright violations.

CHICAGO POLICE DEPT.

KAZ299	453.80	KSC765	155.37
KAZ996	453.60		453.10
KAZ997	453.30	KSF382	158.85
KAZ998	453.35		159.15
KBA200	453.40	KSJ745	453.25
KBA201	453.90	453.45	"City Wide 2"
KBA636	453.20	453.50	"City Wide 1"
		453.75	

CHICAGO FIRE DEPT.

KSC711 153.77, 154.13, 154.22

ILLINOIS MUNICIPAL POLICE & FIRE DEPTS.

City	Police Call	Police Freq.	Fire Call	Fire Freq.
Addison	KSF311	155.01	KDT230	154.31
		155.37	KJS849	155.31
Alsip	KFG448	155.19		
		155.37		
Arlington Hts.	KSA861	155.13		
		155.37		
Barrington Hills	KSH426	155.37		
		155.43		
Bartlett	KFZ748	155.37		
		155.43		
Bedford Park	KSB268	155.37	KSF481	154.43
		155.43	KSG325	154.43
Bellwood	KSA423	155.37	KDU506	154.37
		155.49	KDU507	154.37
Bensenville	KSA282	155.01	KDS610	154.31
		155.36		154.37
Berkeley	KGJ757	155.37	KDU535	154.37
		155.49		
Berwyn	KSA972	155.31	KDS613	154.19
Bloomingdale	KDG325	155.37	KBG635	154.31
		155.43		
Blue Island	KBS579	155.19		
		155.37		
Bolingbrook	KJK731	155.37		
		155.43		
Bridgeview	KAY733	155.37	KAY846	154.43
		155.43		
Broadview	KSE464	155.37	KAR459	154.37
		155.49	KAS618	154.37
Brookfield	KSA870	155.07	KBJ644	154.25
Burbank Manor			KSD732	154.43
Butterfield			KSG300	154.31
Calumet City			KEL353	153.89
				154.34
Calumet Park	KBG803	155.19	KDN561	154.07
		155.37		
Carol Stream	KJV235	155.37		
		158.79		
Carpentersville	KSF256	155.37	KAR790	154.43
		155.43		
Cary	KSD554	159.21	KSI321	154.25
Central Stickney			KBZ280	154.43
Chicago (U. Ill.)	KSJ236	155.37		
		155.43		
Chicago Heights	KSB381	155.19	KBS471	154.37
		155.37		
Chicago Ridge	KIZ346	155.19	KAU713	154.37
	KSD572	155.19		
		155.37		
Cicero	KSA425	155.31	KCT636	154.19
		155.37		
Clarendon Hills	KSG480	155.01	KDY296	154.25
		155.37	KSG432	154.25
Cloverdale			KDZ463	154.31
Country Club Hills	KBG527	155.37		
Countryside	KBQ800	155.07	KAR790	154.43
		155.37		
Crest Hill	KCQ308	155.37		
		155.73		
Crestwood	KSG280	155.19	mobiles	154.07
Des Plaines	KSA962	155.13	KBU640	154.34
		155.37		
Dixmoor				
Dolton	KSI824	155.19	KBS977	154.07
		155.37	FGS433	153.89
Downers Grove	KSA850	155.01		
		155.37	KFS985	154.25
			KFS986	154.25
Downers Grove Estates			KSC985	154.25
			KDJ551	154.25
East Chicago Hts.	KJW463	155.19		
		155.37		
East Hazel Crest			mobiles	153.89
Elk Grove	KAY240	155.37	KAZ658	154.34
		155.55		
Elmhurst	KSA551	155.01	KAV709	155.31
		155.37	KJL667	154.31
Elmwood Park	KSB251	155.37	KDN933	154.37
		155.49		
Evanston	KSA580	155.25	KSC732	154.19
		155.37	KSC733	154.19
			KSC734	154.19
			KSC735	154.19
			KSD841	154.19
Evergreen Park	KSB943	155.19	KSH936	154.43
		155.37		
Flossmoor	KSE513	155.37	KSG585	153.89
		155.67		
Forest Park	KSA785	155.37	KBJ207	154.19
		155.49		
Forest View	KSD382	155.07	KDL861	154.25
		155.37		
Fox Lake	KSG715	155.37	KSD805	154.37
Fox River Grove	KSD532	159.21	KSI514	154.25
Franklin Park	KSB241	155.37	KSJ636	154.37
		155.49		
Glencoe	KSA439	155.25		
		155.37		
Glendale Heights	KEP641	154.89		
		155.01		
		155.37		
Glen Ellyn	KSA904	155.01	KCX395	154.31
		155.37		
Glenview	KSA860	155.25	KSD486	154.43
		155.37		
Glenwood	mobiles	154.68		
Grayslake			KDN443	153.89
Hanover Park	KSJ432	155.37	KSJ472	154.31
		155.43		
Harvey	KSA963	155.37	KSE454	153.89
		155.67		154.28
Harwood Hts.	KAV740	155.37		
		155.49		
Hazel Crest	KJA930	155.19	KCJ414	153.89
Hickory Hills	KSD738	155.19	KSG484	154.43
		155.37		
		155.43		
		155.73		
Highland Park	KSA418	155.37	KSE745	154.43
		155.73		
Highwood	KJE944	155.37		
		155.73		
Hillside	KSF856	155.37	KDQ239	154.37
		155.49		
Hinsdale	KSA668	155.01	KCI528	154.25
		155.37		
			KSD739	154.25
Hoffman Estates	KSJ646	155.37	KAP370	154.43
		155.43		

City	Police		Fire	
	Call	Freq.	Call	Freq.
Hometown	KSD695	155.19 155.37	KBN821	154.28 154.43
Homewood	KSF242	155.37 155.67	KSG487	153.89
Itasca	KSG745	155.01 155.37	KDP367	154.31
Justice	KBR236	155.37 155.43	KCN973	154.43
Kenilworth	KSA757	155.25 155.37		
La Grange	KSA871	155.07 155.37	KBJ232	154.25
La Grange Park	KSB391	155.07 155.37	KBW798	154.25
Lake Bluff	KSI245	155.73	KSE581	154.43
Lake Forest	KSC344	155.37 155.73	KSE500	154.43
Lake Villa			KSH764	154.37
Lansing	KSC258	155.37 155.61	KDK798	153.89
Lemont	KCL516	155.37 155.43	KSG477	154.25
Libertyville			KCS574 KCS575	153.89 153.89
Lincolnwood	KSA859	155.25 155.37		
Lisle	KFB927	155.01 155.37	KSD937	154.31
Lockport	KSI517	155.37 155.43	KSD442 KSI290	154.40 154.40
	mobiles	42.50 42.66		
Lombard	KSA308	155.01 155.37	KDJ477 KSE489 KSF818 KSH361	154.31 154.31 154.31 154.31
Lyons	KBZ309 KSC331	155 07 155.07 155.37	KDA740 KSI248	154.25 154.25
McCook	KSB614	155.07 155.37	KQA221	154.25
McHenry			KSI513	154.25
Markham	KSD913	155.19 155.37	KSG898	153.89
Matteson	KDY400	155.19	KSG591	154.37
Maywood	KSB411	155.49	KCR943	154.37
Melrose Park	KSA458	155.37 155.49	KBF838	154.37
Merrionette Park	KFG449	155.19 155.37	KCU393	154.07
Midlothian	KSB414	155.13 155.19 155.37	KCX434	154.07 154.28
Morton Grove	KSD621	155.13 155.37	KDC325	154.265 154.34
Mount Prospect	KSD985	155.13 155.37	KBU290	154.34
Mundelein			KSB339	154.43
Naperville	KSA759	155.01 155.37	KCI635	154.25
New Lenox	KEM608	155.67	KDN532	154.40
Niles	KSB603	155.37	KCJ688	154.34
Norridge	KEX221	155.37 155.49	KSG348	154.37
Northbrook	KSF474	155.25 155.37	KSC805	154.43
North Chicago			KCR319	153.89
Northfield	KSD361	155.25 155.37	KBW433	154.19
Northlake	KSC966	155.37 155.49	KSH539	154.37
North Riverside	KSB681	155.07 155.31	KCI529	154.25
	KSH586	155.07		
Norwood Park			KSG348	154.37
Nottingham Park			KBE344	154.43
Oak Brook	KCL501	155.01 155.37	KSI385	154.31
Oak Brook Terr.	KAY228	155.01 155.37		
Oak Forest	KBY354	155.19 155.37	KSJ505	153.89
Oaklawn	KJI386	155.19 155.37	KBE824	154.28 154.43
	KSA462	155.37	KJI387	154.38
	KSB541	155.19 155.37		154.43
Oak Park	KSA462	155.37	KBW971	154.19
Olympia Fields	KFG447	155.19 155.37		

City	Police		Fire	
	Call	Freq.	Call	Freq.
Orland Park	KBW805	155.19 155.37	KSG346	154.07
Palatine	KJB252	155.13 155.37	KCJ687	154.34
	KSE657	155.13 155.37		
Palos Heights	KDD995	155.19 155.37	KSE230	154.07
Palos Hills	KBB995	155.19 155.37		
Palos Park	KSE748	155.19 155.37	KSE516 KSE768	154.07 154.43
Park Forest	KSB646	155.19 155.37	KDN584	154.37
Park Ridge	KSB359	155.13 155.37	KBW819	154.34
Phoenix	KUA748	155.37 155.67	mobiles	153.89
Posen			mobiles	154.07
Prospect Heights			KSD839	154.43
Richton Park			K8R657	154.43
Riverdale	KSB409	155.19 155.37	KSG991	153.89
River Forest	KSA942	155.37 155.49	KSI510	154.19
River Grove	KSB413	155.37 155.49	KDT324	154.37
Riverside	KSB281	155.07 155.37	KCI712	154.25
Robbins	KSD852	155.19 155.37		
Rolling Meadows	KSF461	155.13 155 37	KBZ953	154.34
Romeoville	KBB997	155.37 155.43	KFG465	154.25 154.40
Roselle	KAY934	155.37 155.43	KSI294	154.31
Rosemont	KBV796	155.13 155.37	KCU287	154.37
Round Lake	KSJ460	155.31 155.37	KDN450	153.89
Sauk Village			KBK405 KGU981	154.37 154.37
Schaumberg			KJP463	154.265 154.31
Schiller Park	KSE707	155.37 155.49	KCV419	154.37
Skokie	KSA886	155 37 155 565	KDB493	154.34
South Chicago Hts.	KBY373	155.19	KBX615	154.37
South Holland	KSI631	155.37 155.67	KCW691	153.89
Steger	KSA544	155.19	KFN459	154.37
Stickney	KSE480	155.37	KBV780 KSD732	154.25 154.43
Stone Park	KSD754	155.37 155.49	KBT206	154.37
Streamwood	KSG774	155.37 155.43		
Summit	KSA544	155.19	KDJ597	154.25
Thornton			mobiles	153.89
Tinley Park	KSI906	155.19 155.37	KCJ826	153.89
Villa Park	KSA382 KSA383	155.01 155.37	KJR326 KSI633 KSG300	154.31 154.31 154.31
Warrenville			KBK845	154.31
Waukegan	KSA508	155.37		
Westchester	KSD461	155.37 155.49	KDC335	154.37
West Chicago	KSE459	155.01 155.37	KBN831	154.07
Western Springs	KSA944	155.07 155.37	KSE200	154.25
Westhaven	KJR337	155.19 155.37		
Westmont	KSH531	155.01 155.37	KSH468	154.25
Wheaton	KSA921	155.01 155.37	KDC256	154.31
Wheeling	KSF200	155.13 155.37	KBG289	154.43
Willowdale	KSI668	155.01		
Willow Springs	KJL628	155.37 155.43	KAS303	154.43
Wilmette	KSB218	155.25	KBP403	154.19 154.265
Winfield	mobiles	158.79	KSJ433	154.31

WHITE'S

RADIO LOG

Winnetka	KSA591	155.25 155.37	KBQ217	154.19 mobiles 154.265
Wood Dale	KSI668	155.01 155.37	KBH777	154.31
Woodridge	KAZ417	155.01 155.37	KGW780	154.31
Worth	KSD226	155.19 155.37	KCZ472	154.28

INDIANA MUNICIPAL POLICE & FIRE DEPTS.

City	Police Call	Police Freq.	Fire Call	Fire Freq.
East Chicago	KSA499	155.37 155.73	KSC252	154.31
East Gary	KSD539	155.13 155.37	KJJ456	154.28 154.31
			KSD468	154.28 154.43
Gary	KSA441	155.01 155.37	KSB939 KFZ781	154.19 154.31
Griffith	KSI570	155.37		
Hammond	KSA455	155.37 155.61	KAZ894	154.34
Highland	KSE473	155.37		
Hobart	KSC288	155.13 155.37	KSC286	154.28 154.37
Munster	KSE425	155.13 155.37	KSC758	153.89
Ogden Dunes	KSE514	155.13 155.37	KSH760	154.31
Portage	KSI420	155.13 155.37	KGW668	154.31
Schererville	KSG984 KSA547	155.37 155.13	KGL509	154.31
Valparaiso		155.37		
Whiting	KSA784	155.13 155.37	KFG523	154.34

COUNTY AGENCIES

Cook Co. Sheriff: 154.68 155.37 155.535 155.595 159.09
Note—Mobile units of municipal police departments can operate on 154.68 in order to contact Cook Co. Sheriff or Ill. State Police. Main Cook Co. channel is 159.09.
DuPage Co. Sheriff: 155.37 158.79
Lake Co. (Ill.) Sheriff: 156.21 158.97
Note—158.97 is main channel.
Lake Co. (Ill.) Fire Dept.: 153.89 154.40
Note—153.89 is main channel.
Lake Co. (Ind.) Sheriff: 155.37

STATE POLICE

Illinois: 39.46 42.50 42.52 42.56 42.60 154.68 154.92 155.37
Narcotics Control Div. (mobiles) 39.06 154.71
Public Welfare PD (mobiles) 155.43
Indiana: 42.42 155.37
Ind. Toll Road Comm. 154.755 155.415 156.03

FORESTRY

City of Chicago: 159.45 DuPage Co. 31.86

PUBLIC UTILITIES

Chicago Dept. Water & Sewers	158.25
Commonwealth Edison Co.	153.59 153.71 158.13
Peoples Gas Lt. & Coke Co.	153.41 153.47
N. Indiana Public Service	37.78 158.16 451.10

HOSPITALS & MEDICAL

Chicago—Amer. Red Cross	KSH537	47.42
Chicago—Mercy Hospital	KJD851	47.62
Chicago—Michael Reese	KBK820	47.46
Chicago—State Hosp.	KDP359	155.34
Elmhurst—DuPage Co.	KDJ465	155.28
Harvey—Amer. Red Cross	KIZ501	47.42
Evergreen Pk.—L. C. Mary	KCP524	155.28
Lake County Home	KCW438	155.28
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Park Ridge—Am. Red Cross	KBG640	47.42
Waukegan—Lake Co. Gen.	KCW657	155.28
Waukegan—Lake Co. TB	KCW661	155.28
Waukegan—St. Therese	KCW658	155.28
Waukegan—Victory Mem.	KCW660	155.28
Zion—Benton Hosp.	KCW659	155.28

MARINE EMERGENCY COMMUNICATIONS, CHICAGO AREA

Calling and emergency: 2182 kHz 156.80
U.S. Coast Guard: 2003 2182 2662 2670 2678 2686 2694 2702 3241 3253 3402.5 4403 5320 6230 kHz 41.22
Continuous Weather Forecasts: KWO39 162.55

CHICAGO AREA AERO EMERGENCY COMMUNICATIONS

Emergency channel: 121.5
Air search & rescue: 121.6 (soon changing to 123.1)
Civil Air Patrol: 4468 4508 4603 4630 kHz 26.62 143.9 148.15

LAND TRANSPORTATION

Chicago Transit Auth.	KSA977	44.54	
Chicago Motor Club	KSA756	37.50	
	KSE512	452.55	457.55

CIVIL DEFENSE NETWORKS

Ill. State 45.44 Lake Co. Ill. 155.28

Everybody's a Salesman

"This one has the tape deck, 4-track tape and stereo but not the leather carrying case and deluxe mike of this model which has the stainless trim, spare reels and phono jack like this model except that it's fully transistorized, two inches wider and two pounds lighter with extra optional . . ."

Temptress, Towers & Gold

Continued from page 75

"The Universe and everything in it, even you, repeats each 82 billion years. With our help you can escape this purposeless cycle and live continuously forever outside the Universe. Come to Titan and be saved!" The message coming out of my computer was being read by a sexy female voice. Once each hour she identified herself as Titana.

Like I said, yours truly is a fanatic DXer and logging a moon of Saturn was about the rarest catch I could imagine. So what really persuaded me to go on the mission wasn't Montalban's 50 grand (though I never turn down money); it was the Titan QSL I'd be able to bring back for my collection.

I logged the date, time, exact frequency, and Titana's message word for word to prove my reception, then got a good night's sleep. We blasted off at 5:00 a.m.

Traveling at 300,000 mph, the flight took a little over three months. Throughout the journey Titana's voice kept urging us on with descriptions of those delights to be found on her "planet." Sunlight, of course, is definitely on the dim side by the time it reaches Titan (Saturn blocks it completely at times), so the whole sphere is lit artificially in Disneyland-at-night fashion.

Titana also pointed out that the ground was strewn with rubies, emeralds, and diamonds which we could have for the taking. This excited Rinaldo almost as much as their cosmic knowledge. Meanwhile, I checked those giant portable towers every day for possible vibration damage. Much to my surprise, there wasn't any. The ship Titana had designed for Montalban took the speed as coolly as though it were standing still.

As we passed Mars and Jupiter I tuned the bands in search of DX but all I could hear out there were Titana's seductive tones. And our first look at the place seemed to confirm her wildest claims. We landed in the central square of a crystalline city which was bathed in psychedelic blue-and-green light.

Though we landed at the spot designated by Titana, there was no one on hand to greet us. But when Rinaldo, myself, and Montalban's three security men stepped out of our space ship, the ground—exactly as she had promised—was covered with those precious stones. We bent down to pick up a few, and that was our mistake.

The moment we were distracted, Titana and an armed guard of about 40 stepped from the shadows with their laser guns trained on us.

"Welcome to Titan, moon of Saturn." Titana had long red hair, a 36-24-36 figure, and looked like a human save that she was almost transparent. Titana was a real looker if you dig spooks. She nodded and five of her "men" (who looked to be 100% human) boarded our ship and went straight to that compartment where my giant towers were kept. Titana assumed her most charming smile. "My soldiers aren't really human. They're androids designed to resemble you Earth people."

Rinaldo had become a little grim. "This is hardly the way to begin fruitful negotiations." He still gripped Titana's rocks tightly in his pudgy right fist.

One of her androids returned and bowed in Titana's direction. "Their portable antenna is on board and in good condition."

Titana walked past yours truly on her way to Rinaldo. "You're kind of cute for a human," she murmured, looking me straight in the eye. I'm going to keep you around a while."

I felt reassured in a creepy kind of way.

She faced Rinaldo. "There really is nothing to negotiate. We plan to take over your planet by infiltrating its power structures

(Concluded on next page)

"Albert took over the rest of the house for his electronics hobby shop!"

Temptress, Towers & Gold

Continued from previous page

with our androids. The only obstacle had been a means to control these androids at widely scattered points."

A crane-like device wheeled itself up to our ship and began to unload the towers.

"When you have finished with those, take this one and his bodyguards to my lab." Titana pointed to Rinaldo and the crane nodded. "Our computers have deduced that the secret alloy which makes towers of this size portable just happens to be the same one which will enable us to control our androids in your planet's particular magnetic field. All we have to do is transmit a radio signal near Earth's gyrofrequency from these towers and any android within range will then respond perfectly to our every command."

Rinaldo dropped his rubies and diamonds, one by one.

"Of course the first agency we'll infiltrate will be Montalban Electronics, by building an android in your likeness."

The crane swooped up Rinaldo along with the three security men, then carried them and my towers off toward Titana's lab.

Titana turned to me. "But I'm going to give *you* some of those lessons in cosmic knowledge I promised over the air." She motioned for me to follow her into the city. "I'll show you how to really escape the Universe."

So I knew all was not lost. And the way things are now, I still stand a pretty good chance of getting my QSL from the moon of Saturn—if, that is, I can figure out how an opaque Earthman can make out with a transparent Titan, name of Titana. ■

Ham Traffic

Continued from page 89

the equipment is imported, which most of it is, there's a 22½% import tariff!

See what I mean when I say it's surprising there are any hams in Canada!

I asked Ernie what effect all these taxes have on hams and experimenters, and he replied: "Quite simply to smother hobby electronics. Take the catalog price of anything in the U.S. and add 50% for the Canadian price. For example, the Heathkit HW-16 Novice transceiver costs $99.50 from Benton Harbor and $149.50 from Toronto (then there is an 8% currency difference, too). Little wonder we have such difficulty increasing the number of hams in Canada."

For Canadian hams, apparently the best bet is to join together and keep protesting in any effective way possible, in hopes government will someday respond. U.S. hams should keep a sharp eye peeled for any attempt to try the same thing here.

Are Phone Patches Legal? At this writing, the answer is still "no." But there is hope the good folks at Ma Bell may someday be forced to approve them if they meet reasonable technical standards.

An FCC decision a while back in what is known as the Carterphone case held that telephone companies may not arbitrarily stop their customers from connecting "a private radio system" to their telephones, as long as the radio doesn't interfere with the telephone company's equipment or other people's use of it.

However, Ma Bell is protesting that decision. So, a clear-cut, permanent answer may be delayed a while. Meanwhile, most phone companies probably will continue to look the other way if you're using a phone patch, as long as it doesn't create interference on the phone lines and as long as you use it for "public service" communications, not commercial purposes.

For example, not even the mighty voice of the Bell System can deny that ham radio phone patches linking overseas servicemen

"I missed about half of that . . . you must be on half wave!"

with their families is a noble, worthwhile service. While the diplomats are still carving up the world to suit their personal ambitions, it seems reasonable that those of us who are left should be allowed to talk to one another occasionally.

Here's Lookin' At Ya. Want to see the mug of that fellow you've been talking to on 40 Meters? Here's your chance. Television is now permitted on the ham fone bands!

You may have heard about some of those special experiments run by hams on 20-Meter fone a while back with special permission of the FCC. The results were so good, and so many technically-minded hams have shown an interest in TV, that picture transmissions are now permitted on all fone bands from 75 Meters through 225MHz.

No undue interference with regular fone operation should result, the FCC comments, for two reasons: 1) Operation is allowed only on those frequencies which are restricted to Advanced and Extra Class operators, and so these frequencies should be less congested than the rest of the fone bands; 2) Bandwidth of the TV signal should be no greater than a single sideband signal on bands below 6 Meters, or a double sideband signal on 6 Meters and above.

Actually, according to the FCC's official report, there's more chance for the fone signals to interfere with the TV signals than vice versa!

The type of picture transmitted will be what is called slow scan, which is capable of sending only still photos or stationary scenes. Fast-scan images, needed for so-called live TV, such as we're accustomed to seeing on the commercial boob tube, require a much wider bandwidth. And there just isn't room for this type of transmission, except on much higher frequency bands.

So, the ham TV signals on the lower bands will be basically still photos instead of moving images. But TV, they'll be nevertheless.

Sending photos of people, equipment, scenery, QSL cards, and possibly of schematic diagrams should be fairly routine before long for those who have the necessary equipment and the ability to use it. Most of the fellows build their own gear, incidentally. You don't have to be rich to enjoy ham TV —just have a little extra technical savvy.

Pictures have already been transmitted across the Atlantic on 20 Meters. With a bit of skip activity ahead of us for a year or two, we're bound to hear much more. ■

Ask Me Another

Continued from page 26

tell me how I might be able to accomplish this?
—R. S., Berkley, Mich.

The engineers who designed the amplifier indicate that increasing bass response could cause the amplifier to oscillate because of the feedback loop in the circuit. To get more bass, use bigger speakers in appropriate baffles. You might also place the baffles in corners of the room to improve efficiency.

On to mm Waves?

Do you know where I can buy a receiver that picks up 225 to 297 MHz frequencies? How much do they cost?

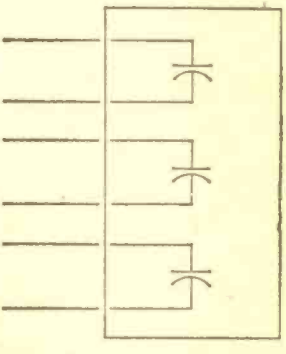
—E. D., Madison, Wis.

More than $1000, Charley! And what's to hear except *bloop-bleep* telemetering signals? Why not leave this sort of thing to vhf engineers?

What Is It?

While salvaging parts from an old 5-tube BCB receiver, I found a strange part which I have sketched (see diagram). On one side there is the number 21B4847. I would like to know what this thing is.

—A. K., Atlanta, Ga.



It's undoubtedly a circuit module—probably made by Centralab. To find out for sure, write to the manufacturer of the radio for the service manual for that particular model. Who knows, you may be in for a big surprise!

Dropout

I have a GE Model 260 portable radio and the power source is a 2-volt battery. It can be operated while it is on charge or on the battery alone. Is there any way I can modify it so I can use it mostly on AC current and not bother with a battery at all?

—R. E. H., Rock Hills, Ill.

Stay with the battery and charger, friend. The battery functions both as a hum filter and voltage regulator. ■

Poolroom in the Sky

Continued from page 56

Fascinating Failure. When the first results of the Homestake neutrino experiment were revealed by Dr. Raymond Davis Jr. of Brookhaven National Laboratory, an elite clique of solar physicists rushed to recheck and recalculate their mathematic models of the sun. Why? Because the neutrino trap had failed to catch even the few neutrinos predicted!

A layman might figure that the experiment was a bust. Not so the physicists who apparently continue to have complete faith in the reliability of the equipment. The generally accepted conclusion in scientific circles is that the high-energy neutrinos that the equipment was designed to catch simply aren't being generated in the amounts previously thought likely. This negative result may prove to have been a milestone in solar research because it brought about an intensive re-examination of existing theories about solar energy processes.

Neutrinos derived from the decay of boron-8 in the sun were expected to be observed; their absence now suggests that the flux of these neutrinos is less than 2 million per square centimeter per second. Also, if the sun were producing energy by the historically famous CNO cycle, neutrinos resulting from the decay of nitrogen-13 and oxygen-15 would have been observed. Since these also weren't detected, it is concluded that less than 9 percent of the sun's energy is produced by the CNO cycle.

It now appears that practically all of the sun's energy is created by the relatively simple proton-proton chain reactions shown in steps 1 and 2; the initial proton-proton fusions yields only low energy neutrinos, and the helium-3 fusion to form helium-4 yields *no* neutrinos. This conclusion is still tentative since one or two experiments of this complexity and delicacy can hardly be considered adequate for a firm decision.

The Davis experiment brought happy confirmation—even if tentative—of the deductions of those physicists who already had theoretical reasons for believing that the helium-3 fusion dominates in solar energy production. For example, in 1967 T. A. Tombrello of the California Institute of Technology reported that two groups at the institution had carried out laboratory experiments leading to the conclusion that the helium fusion process accounts for virtually all of the sun's energy, not merely half of it as had previously been supposed.

Drawing Boards Again. The Davis experiment sent other leading astrophysicists—including John Bahcall, associate professor of theoretical physics at Cal Tech, a leading solar theoretician who works in collaboration with his wife, Neta, Prof. William Fowler, and Dr. Giora Shaviv (now at Cornell University)—scurrying back to their drawing boards. Purpose: to rethink and redraw their mathematical solar models.

In 1967 Bahcall estimated that the flux of high-energy neutrinos that reach the earth from the sun is in the order of 16 million neutrinos per square centimeter per second. This estimate was derived through complex calculations based on what was then believed about the density, chemical composition, age, and temperature of the sun.

When, in February 1968, Davis announced the results of his first solar neutrino experiment, Bahcall went back to work using newer experimental values of nuclear reaction rates and new information about the composition of the sun. He wound up with a new estimate—a probable flux of 5 million neutrinos. But he conceded that his paper estimate might still be high because of uncertain factors in his equations, and that the flux could be as low as the 2 million indicated by the Davis experiment.

Bahcall concurs that the helium fusion process is almost surely the main energy system of the sun. But the scientist doesn't stop there. He offers other rather radical conclusions based on the Davis experiment.

1) The sun is composed of a smaller percentage of elements heavier than helium than had been expected—less than 2 percent of the total mass.

2) No more than 25 percent of the original primordial mass of the sun was composed of helium.

3) The central temperature of the sun is about 14.9 million degrees Kelvin, or 27 million degrees Fahrenheit.

4) The central density of the sun is about 150 grams of matter per cubic centimeter.

If these conclusions stand the test of time and of further neutrino experiments, a lot of textbooks will have to be re-written. Many a cosmologist will have to ponder where his theoretical speculations went wrong because some of the most popular scientific theories concerning the evolution of the universe de-

pend on the now seemingly refuted assumption that the primordial sun consisted of more than 25 percent helium.

The "facts" and figures contained in countless astrophysical texts will have to be revised. For example, most modern references report that the central temperature of the sun is in the order of 15 to 20 million degrees Centigrade (59 to 68 million degrees Fahrenheit), and that the central density of the sun is 100 grams per centimeter. These are significantly out of line with the new conclusions drawn by Bahcall.

It would apear that Dr. Davis, in his lonely vigil deep in the depths of a South Dakota goldmine, is leading the science of astrophysics into some new and exciting discoveries. And how is he doing it?

By looking for, and not finding, next to nothing! ■

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I certify that the statements made by me above are correct and complete.

V. C. Stabile, Business Mgr.

Lab Check—Injectoral Kit

Continued from page 71

20 minutes the excess copper was no longer evident, and the PC board was removed from the etchant and washed. A few strokes of the brush attached to the cap of the resist ink solvent bottle quickly removed the resist, and the board was ready for drilling.

We found that the 1/16-in. drill bit supplied with the kit is just about right for most standard components—transistor, capacitor, resistor, and diode leads.

Under An Hour. From start to finish, it took about 50 minutes to complete a 2½ x 4-in. PC board. Areas around the edges of the etched foil where the resist pen was used were sharp and unaffected by the etchant. Small fill-in areas protected by the resist pen were also unaffected. However, larger areas showed some etchant attack, indicating that we had not built up a sufficient layer of resist.

Unlike some use-up-and-gone kits, replacement supplies are available for the Injectorall 500. For additional information and prices, write Injectorall Electronics Corp., Dept. S, 4 North Rd., Great Neck, N.Y. 11024. ■

The CATV Caper

Continued from page 82

A second system, known as *Laser Link*, is still highly experimental. Again, an air signal is used to bypass costly underground cable runs. This one's similar to a microwave relay in that a signal bearing many channels is beamed at apartment buildings. However, at a frequency of about 42 GHz, the wave (in the millimeter range) approaches the visible-light or infrared portion of the spectrum. (The system does not use a laser, as the name would imply.) Since such signals often resemble light in certain transmission characteristics, it remains to be demonstrated how well the system will work during fog and other complications. The developer states that the *Laser Link's* range is unaffected by weather conditions at distances up to three miles.

Looking Ahead. The invasion of large cities is only one phase in cable TV's astounding development. Consider what some believe are CATV's possibilities:

A *wired city* concept sees a vast number of homes connected to the cable. With a capability of more than 30 channels, the system would not only bring TV into the home, but a variety of other services. Some examples: newspaper via wire, computer services, alarm systems, and banking facilities. One concept, the remote reading of gas and electric meters, has already been tried.

Also in the experimental stage are two-way communications via cable so a subscriber may transmit signals through the line *back* to the source. This would enable a student to query a computer, for example, and get help in his homework. Proponents of TV-by-wire thus point out that congested airwaves could be freed for use by hard-pressed mobile communications.

CATV has proved to be a runaway success almost any place it lays cable—even where channels are already receivable. A growing public seems more than willing to pay a monthly tab of about $4 to $5 for additional channels and the guarantee of clear reception (which is especially critical for color). If industry growth keeps up, it could live up to a prediction made by one of its leaders. That is, if all restrictions were lifted, 90% of all homes would be subscribing to CATV service within 10 years. ■

Autoguard

Continued from page 35

device. Switch S2 should be kept closed during long trips or whenever the alarm is out of commission for long periods of time.

You may notice on one of the photos the printed legend, "caution . . . do not use charger when engine running." After building the device, I decided to add this bit of camouflage. The alarm looks like a battery charger, so why not confuse anyone trying to find it? Only you and I know that this battery charger is really a *thief discharger*.

Building Hints. Autoguard fits inside a 4 x 4 x 2-in. aluminum chassis box. There's nothing critical about parts placement, but leave as much space as possible between components. Short circuits could be embarrassing when you're on the road.

The two SCRs are mounted at one end of the box. Use the mounting kit provided with the SCRs, and put some heat-sink compound underneath the mica washers to help transfer heat between the SCRs and the aluminum. Actually, the SCRs don't dissipate much power when they're conducting, so an additional heat sink isn't necessary. Insulate the SCRs from the metal box.

The circuit is designed for use with a 12-volt, negative-ground electrical system whenever a car battery is used as a power source. However, it can't be used in positive ground or 6-volt systems—for these installations, you'll need a separate 12-volt lantern battery. ■

BCB Booster

Continued from page 59

instability (using the proper shielded connections) install capacitor Cx across L1, as shown in the schematic; Cx should be a 500-VDC disc capacitor rated between 10 and 25 *uu*F.

AVC Masking. If it appears your BCB Booster has no effect make certain you are not tuned to a medium-to-strong station, as the receiver's AVC action will simply *compensate* for the booster's additional gain! The booster's gain will generally be noticed only on very weak signals, signals too weak to be received normally without using it. Tests indicate that the booster will literally *fill* dead spots on any BCB receiver's dial. ■

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Today there are over a million such stations on the air, and the number is growing constantly. And according to Federal law, no one is permitted to operate or service such equipment without a Commercial FCC License or without being under the direct supervision of a licensed operator.

This has resulted in a gold mine of new business for licensed service technicians. A typical mobile radio service contract pays an average of about $100 a month. It's possible for one trained technician to maintain eight to ten such mobile systems. Some men cover as many as fifteen systems, each with perhaps a dozen units.

Coming Impact of UHF

This demand for licensed operators and service technicians will be boosted again in the next 5 years by the mushrooming of UHF television. To the 500 or so VHF television stations now in operation, several times that many UHF stations may be added by the licensing of UHF channels and the sale of 10 million all-channel sets per year.

Opportunities in Plants

And there are other exciting opportunities in aerospace industries, electronics manufacturers, telephone companies, and plants operated by electronic automation. Inside industrial plants like these, it's the licensed technician who is always considered first for promotion and in-plant training programs. The reason is simple. Passing the Federal government's FCC exam and getting your license is widely accepted proof that you know the fundamentals of electronics.

So why doesn't everybody who "tinkers" with electronic components get an FCC License and start cleaning up?

The answer: it's not that simple. The government's licensing exam is tough. In fact, an average of two out of every three men who take the FCC exam fail.

There is one way, however, of being pretty certain that you will pass the FCC exam. And that is to take one of the FCC home study courses offered by the Cleveland Institute of Electronics.

CIE courses are so effective that better than 9 out of every 10 CIE-trained graduates who take the exam pass it. That's why we can afford to back our courses with the iron-clad Warranty shown on the facing page: you get your FCC License or your money back.

There's a reason for this remarkable record. From the beginning, CIE has specialized in electronics courses designed for home study. We have developed techniques that make learning at home easy, even if you've had trouble studying before.

In a Class by Yourself

Your CIE instructor gives his undivided personal attention to the lessons and questions you send in. It's like being the only student in his "class." He not only grades your work, he analyzes it. Even your correct answers can reveal misunderstandings he will help you clear up. And he mails back his corrections and comments the same day he receives your assignment, so you can read his notations while everything is still fresh in your mind.

It Really Works

Our files are crammed with success stories of men whose CIE training has gained them their FCC "tickets" and admission to a higher income bracket.

Mark Newland of Santa Maria, Calif., boosted his earnings by $120 a month after getting his FCC License. He says: "Of 11 different correspondence courses I've taken, CIE's was the best prepared, most interesting, and easiest to understand."

Once he could show his FCC License, CIE graduate Calvin Smith of Salinas, California, landed the mobile phone job he'd been after for over a year.

Mail Card for Two Free Books

Want to know more? The postpaid reply card bound-in here will bring you free copies of our school catalog describing opportunities in electronics, our teaching methods, and our courses, together with our special booklet, "How to Get a Commercial FCC License." If card has been removed, just mail the coupon at right.

THESE CIE MEN PASSED THE FCC LICENSE EXAM . . . NOW THEY HAVE GOOD JOBS

Matt Stuczynski, Senior Transmitter Operator, Radio Station WBOE

"I give Cleveland Institute credit for my First Class Commercial FCC License. Even though I had only six weeks of high school algebra, CIE's AUTO-PROGRAMMED® lessons make electronics theory and fundamentals easy. I now have a good job in studio operation, transmitting, proof of performance, equipment servicing. Believe me, CIE lives up to its promises."

Chuck Hawkins, Chief Radio Technician, Division 12, Ohio Dept. of Highways

"My CIE Course enabled me to pass both the 2nd and 1st Class License Exams on my first attempt...I had no prior electronics training either. I'm now in charge of Division Communications. We service 119 mobile units and six base stations. It's an interesting, challenging and rewarding job. And incidentally, I got it through CIE's Job Placement Service."

ENROLL UNDER NEW G.I. BILL: All CIE courses are available under the new G.I. Bill. If you served on active duty since January 31, 1955, OR are in service now, check box on reply card for G.I. Bill information.

2 NEW CIE CAREER COURSES

1. **BROADCAST (Radio and TV) ENGINEERING**...now includes Video Systems, Monitors, FM Stereo Multiplex, Color Transmitter Operation and CATV.

2. **ELECTRONICS ENGINEERING**...covers steady-state and transient network theory, solid state physics and circuitry, pulse techniques, computer logic and mathematics through calculus. A college-level course for men already working in Electronics.

CIE Cleveland Institute of Electronics
1776 East 17th Street, Cleveland, Ohio 44114

Cleveland Institute of Electronics
1776 E. 17th St., Cleveland, O. 44114

Please send me without cost or obligation:

Your 40-page book "How To Succeed In Electronics" describing the job opportunities in Electronics today, and how your courses can prepare me for them.

Your book on "How To Get A Commercial FCC License."

I am especially interested in:

- ☐ Electronics Technology
- ☐ Electronic Communications
- ☐ Broadcast Engineering
- ☐ Industrial Electronics
- ☐ First Class FCC License
- ☐ Electronics Engineering

Name _____ (PLEASE PRINT)

Address _____

City _____

State _____ Zip _____ Age ___

☐ Check here for G.I. Bill Information

EX-30

Better than 9 out of 10 CIE men win their "ticket" the very first time they try

(NATIONAL AVERAGE IS ONLY 1 OUT OF 3)

Cleveland Institute of Electronics

WARRANTY

of success in obtaining a Government FCC License

The Cleveland Institute of Electronics hereby warrants that upon completion of the Electronics Technology, Broadcast Engineering, or First-Class FCC License course, you will be able to pass the FCC examination for a First Class Commercial Radio Telephone License (with Radar Endorsement);

OR upon completion of the Electronic Communications course you will be able to pass the FCC examination for a Second Class Commercial Radio Telephone License;

AND in the event that you are unable to pass the FCC test for the course you select, on the very first try, you will receive a FULL REFUND of all tuition payments.

This warranty is valid for the entire period of the completion time allowed for the course selected.

G. O. Allen

Dr. G. O. Allen
President

BUILD 20 RADIO CIRCUITS AT HOME

with the New Improved PROGRESSIVE RADIO "EDU-KIT"®

A Practical Home Radio Course

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Training Electronics Technicians Since 1946

Now Includes

- ★ 12 RECEIVERS
- ★ 3 TRANSMITTERS
- ★ SQ. WAVE GENERATOR
- ★ SIGNAL TRACER
- ★ AMPLIFIER
- ★ SIGNAL INJECTOR
- ★ CODE OSCILLATOR

- ★ No Knowledge of Radio Necessary
- ★ No Additional Parts or Tools Needed
- ★ EXCELLENT BACKGROUND FOR TV
- ★ SCHOOL INQUIRIES INVITED
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YOU DON'T HAVE TO SPEND HUNDREDS OF DOLLARS FOR A RADIO COURSE

The "Edu-Kit" offers you an outstanding PRACTICAL HOME RADIO COURSE at a rock-bottom price. Our Kit is designed to train Radio & Electronics Technicians, making use of the most modern methods of home training. You will learn radio theory, construction practice and servicing. THIS IS A COMPLETE RADIO COURSE IN EVERY DETAIL.

You will learn how to build radios, using regular schematics; how to wire and solder in a professional manner; how to service radios. You will work with the standard type of punched metal chassis as well as the latest development of Printed Circuit chassis.

You will learn the basic principles of radio. You will construct, study and work with RF and AF amplifiers and oscillators, detectors, rectifiers, test equipment. You will learn and practice code, using the Progressive Code Oscillator. You will learn and practice trouble-shooting, using the Progressive Signal Tracer, Progressive Signal Injector, Progressive Dynamic Radio & Electronics Tester, Square Wave Generator and the accompanying instructional material.

You will receive training for the Novice, Technician and General Classes of F.C.C. Radio Amateur Licenses. You will build Receiver, Transmitter, Square Wave Generator, Code Oscillator, Signal Tracer and Signal Injector circuits, and learn how to operate them. You will receive an excellent background for television, Hi-Fi and Electronics.

Absolutely no previous knowledge of radio or science is required. The "Edu-Kit" is the product of many years of teaching and engineering experience. The "Edu-Kit" will provide you with a basic education in Electronics and Radio, worth many times the low price you pay. The Signal Tracer alone is worth more than the price of the kit.

THE KIT FOR EVERYONE

You do not need the slightest background in radio or science. Whether you are interested in Radio & Electronics because you want an interesting hobby, a well paying business or a job with a future, you will find the "Edu-Kit" a worth-while investment.

Many thousands of individuals of all ages and backgrounds have successfully used the "Edu-Kit" in more than 79 countries of the world. The "Edu-Kit" has been carefully designed, step by step, so that you cannot make a mistake. The "Edu-Kit" allows you to teach yourself at your own rate. No instructor is necessary.

PROGRESSIVE TEACHING METHOD

The Progressive Radio "Edu-Kit" is the foremost educational radio kit in the world, and is universally accepted as the standard in the field of electronics training. The "Edu-Kit" uses the modern educational principle of "Learn by Doing." Therefore you construct, learn schematics, study theory, practice trouble shooting—all in a closely integrated program designed to provide an easily-learned, thorough and interesting background in radio.

You begin by examining the various radio parts of the "Edu-Kit." You then learn the function, theory and wiring of these parts. Then you build a simple radio. With this first set you will enjoy listening to regular broadcast stations, learn theory, practice testing and trouble-shooting. Then you build a more advanced radio, learn more advanced theory and techniques. Gradually, in a progressive manner, and at your own rate, you will find yourself constructing more advanced multi-tube radio circuits, and doing work like a professional Radio Technician.

Included in the "Edu-Kit" course are Receiver, Transmitter, Code Oscillator, Signal Tracer, Square Wave Generator and Signal Injector Circuits. These are not unprofessional "breadboard" experiments, but genuine radio circuits, constructed by means of professional wiring and soldering on metal chassis, plus the new method of radio construction known as "Printed Circuitry." These circuits operate on your regular AC or DC house current.

THE "EDU-KIT" IS COMPLETE

You will receive all parts and instructions necessary to build twenty different radio and electronics circuits, each guaranteed to operate. Our Kits contain tubes, tube sockets, variable, electrolytic, mica, ceramic and paper dielectric condensers, resistors, tie strips, hardware, tubing, punched metal chassis, Instruction Manuals, hook-up wire, solder, selenium rectifiers, coils, volume controls and switches, etc.

In addition, you receive Printed Circuit materials, including Printed Circuit chassis, special tube sockets, hardware and instructions. You also receive a useful set of tools, a professional electric soldering iron, and a self-powered Dynamic Radio and Electronics Tester. The "Edu-Kit" also includes Code Instructions and the Progressive Code Oscillator, in addition to F.C.C. Radio Amateur License training. You will also receive lessons for servicing with the Progressive Signal Tracer and the Progressive Signal Injector, a High Fidelity Guide and a Quiz Book. You receive Membership in Radio-TV Club, Free Consultation Service, Certificate of Merit and Discount Privileges. You receive all parts, tools, instructions, etc. Everything is yours to keep.

Progressive "Edu-Kits" Inc., 1186 Broadway, Dept. 552NN, Hewlett, N. Y. 11557

FREE EXTRAS

• SET OF TOOLS

- SOLDERING IRON
- ELECTRONICS TESTER
- PLIERS-CUTTERS
- VALUABLE DISCOUNT CARD
- CERTIFICATE OF MERIT
- TESTER INSTRUCTION MANUAL
- HIGH FIDELITY GUIDE • QUIZZES
- TELEVISION BOOK • RADIO TROUBLE-SHOOTING BOOK
- MEMBERSHIP IN RADIO-TV CLUB: CONSULTATION SERVICE • FCC AMATEUR LICENSE TRAINING
- PRINTED CIRCUITRY

SERVICING LESSONS

You will learn trouble-shooting and servicing in a progressive manner. You will practice repairs on the sets that you construct. You will learn symptoms and causes of trouble in home, portable and car radios. You will learn how to use the professional Signal Tracer, the unique Signal Injector and the dynamic Radio & Electronics Tester. While you are learning in this practical way, you will be able to do many a repair job for your friends and neighbors, and charge fees which will far exceed the price of the "Edu-Kit." Our Consultation Service will help you with any technical problems you may have.

FROM OUR MAIL BAG

J. Stataitis, of 25 Poplar Pl., Waterbury, Conn., writes: "I have repaired several sets for my friends, and made money. The 'Edu-Kit' paid for itself. I was ready to spend $240 for a course, but I found your ad and sent for your Kit."

Ben Valerio, P. O. Box 21, Magna, Utah: "The Edu-Kits are wonderful. Here I am sending you the questions and also the answers for them. I have been in Radio for the last seven years, but like to work with Radio Kits, and like to build Radio Testing Equipment. I enjoyed every minute I worked with the different kits; the Signal Tracer works fine. Also like to let you know that I feel proud of becoming a member of your Radio-TV Club."

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

UNCONDITIONAL MONEY-BACK GUARANTEE

Please rush my Progressive Radio "Edu-Kit" to me, as indicated below:
Check one box to indicate choice of model

- ☐ Regular model $26.95.
- ☐ Deluxe model $31.95 (same as regular model except with superior parts and tools plus valuable Radio & TV Tube Checker).

Check one box to indicate manner of payment

- ☐ I enclose full payment. Ship "Edu-Kit" post paid.
- ☐ Ship "Edu-Kit" C.O.D. I will pay postage.
- ☐ Send me FREE additional information describing "Edu-Kit."

Name .....

Address .....

City & State ..... Zip .....

PROGRESSIVE "EDU-KITS" INC.

1186 Broadway, Dept. 552NN, Hewlett, N. Y. 11557

PRINTED CIRCUITRY

At no increase in price, the "Edu-Kit" now includes Printed Circuitry. You build a Printed Circuit Signal Injector, a unique servicing instrument that can detect many Radio and TV troubles. This revolutionary new technique of radio construction is now becoming popular in commercial radio and TV sets.

A Printed Circuit is a special insulated chassis on which has been deposited a conducting material which takes the place of wiring. The various parts are merely plugged in and soldered to terminals.

Printed Circuitry is the basis of modern Automation Electronics. A knowledge of this subject is a necessity today for anyone interested in Electronics.