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DECEMBER, 1964
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December, 1964

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USE PROFESSIONAL EQUIPMENT

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Sound has a new Shape

Celesta... in harmony with the wonderful world of music

Exciting CELESTA creates a new shape for sound! Chassis are cast under extremely high pressure to assure you of perfect, lasting alignment of critical moving parts. Functional, high styling is the key to CELESTA's sound story... which captures the finest critic's ear.

You can take off to new heights of listening enjoyment with the CELESTA. Small wonder, connoisseurs of audio pleasure, surround their rooms with UTAH sound.

OTHER CELESTA FEATURES:
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Huntington, Indiana

December, 1964
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POSITIVE FEEDBACK

Julian M. Sienkiewicz, Editor
WA2CQL/2W5115

Docket 14843 is the fancy name for an item in the FCC files which has been hovering over the heads of all CB'ers for almost two years. It is, specifically, an FCC proposal for a major revamping of the FCC's rules and regulations governing citizens radio service. We should say, it was an FCC proposal, because this past summer the FCC finally took action on the proposal and pushed through a number of changes in the rules which they scheduled for a November 1 "in effect" date.

It has long been known that the Commission has been trying to discourage the strictly "hobby" use of CB, that is, using CB as if it was a poor man's ham radio service. This FCC discouragement has been despite the fact that a seemingly overwhelming majority of the CB users would prefer at least a little hobbying mixed in with their other uses for the service. Regardless of this, the new rules would seem to be a tightening of the former rules, however, upon close examination they are but a restating of the majority of the previous rules with only a few really BIG changes.

Channel Limitations. The major change is that CB'ers will be restricted to using only channels 9, 10, 11, 12, 13, 14, and 23 for communications between stations of different licenses. The remaining channels are to be used only for communications between units of the same license.

The following types of messages and transmissions are now specifically forbidden, under any circumstances, on CB, according to the new rules: activities in violation of law, carrying on communications for hire, communications containing obscene, indecent or profane words, language or meaning; communications in the nature of a broadcast or those not directed to specific persons; malicious interference; transmissions of music,
What Job Do You Want In Electronics?
Whatever it is, Cleveland Institute can help you get it!

Yes, whatever your goal is in Electronics, there's a Cleveland Institute program to help you reach it quickly and economically. Here's how:

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A comprehensive program covering Automation, Communications, Computers, Industrial Controls, Television, Transistors, and preparation for a 1st Class FCC License.

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If you want a 1st Class FCC ticket quickly, this streamlined program will do the trick and enable you to maintain and service all types of transmitting equipment.

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This exciting program includes many important subjects as Computers, Electronic Heating and Welding, Industrial Controls, Servomechanisms, and Solid State Devices.

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Cleveland, Ohio 44114

Please send FREE Career Information prepared to help me get ahead in Electronics, without further obligation.

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☐ Industrial Electronics ☐ Electronic Communications
☐ Broadcast Engineering ☐ Advanced Engineering

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Name____________________ (please print) Address__________________________

City____________________ State________ Zip__________________________

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DECEMBER, 1964

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Cleveland, Ohio 44114

Accredited Member
Positive Feedback

whistling, sound effects, etc.; communications to stations of other licensees relating to technical performance, capabilities, testing of any transmitter, including transmissions concerning signal strength or frequency stability of transmitters; communications advertising or soliciting the sale of goods or services; communications to another station of more than 150 miles; in addition to these rules, persons selling CB gear shall not allow customers to operate under the seller's station license.

Time Limit. Other significant portions of the new rules state that communications between stations of different licensees may not exceed five minutes, and that a five minute silent period must be observed before another transmission is permitted. The call sign shall be used on each frequency utilized, and the call sign of the station being called shall be included in the complete identification. If a contact is switched to another channel, the complete identification must again be given on the new channel.

The FCC spelled out in no uncertain terms that there is to be no further "loaning call signs to a friend," and that a call sign may be used only by the licensee himself and by members of his immediate family living in the same household, or by employees of the licensee acting within the scope of their employment.

The one exception to this rule is in the instance of certain organizations such as Civil Defense, volunteer fire departments, auxiliary police departments, etc., which are now authorized to take out a license for a large number of units and "loan out" the calls to participating stations which may already be licensed with their own call signs.

The other main change in the rules specifies that if you should have your license taken away from you by the FCC, you will not be permitted to operate another fellow's station until you are again issued your own license.

Those are the basic changes, and there are one or two things which may be guessed at by reading between the lines and by knowing something of the FCC's psychology. It is our opinion that any improper uses of CB on channels 1 through 8 and 15 through 22 will be dealt with severely. We also feel that the Commission may "tolerate" a limited amount of unauthorized communications on channels 9 through 14 and on 23, with the hopes that
Prepare At HOME or in our CHICAGO or TORONTO Laboratories

DeVRY TECH SUPPLIES ALL THIS AND MORE TO PREPARE YOU TO

Become an Electronics Technician

Would a career as an ELECTRONICS TECHNICIAN interest you? Perhaps you would like the Computer field . . . Instrumentation . . . Radio and Television . . . Automation or Control System work . . . a Space and Missile job. If so, READ ON.

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You don't have to be a "super type" to get started toward a career in electronics! Far more important to success are ambition, average education and intelligence, interest in mechanical or electrical things.

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DECEMBER, 1964
Positive Feedback

the operators will talk themselves out and either get a ham license or lose interest. If these transmissions, however, get too obnoxious the operators will wind up behind the Commission’s 8-ball.

FCC Steps In. Back in August of this year, the FCC (Federal Trade Commission) took what many believed to be a poke at the manufacturers of CB equipment. In the letter it was stated, “It is believed that much of this misuse of Citizens Radio Service equipment is due to widespread misunderstanding as to the permissible use of this equipment and that much of the misunderstanding flows from advertisements of such equipment which describe its use without setting forth the limitations imposed by law or which are placed, without any reference to use, in publications which present the use of equipment as a hobby in and of itself.”

The above quote is quite a mouthful, but the FCC did not stop there; they want the manufacturers to include the following paragraph as a part of their paid advertisements in periodicals:

“Transmitting equipment employed for voice communication in the Citizens Radio Service must be operated under a station license issued by the Federal Communications Commission and in accordance with the limitations on permissible communications contained in Part 95, (formerly Part 19) Citizens Radio Service, of its rules. The operation of such equipment as a hobby, in and of itself, or for the exchange of aimless small talk is not permitted.”

Who’s At Fault? The FCC is bearing down on CB equipment manufacturers, however, your editor believes that the pressure is not justified. As one manufacturer said to me, “They are asking me to put more words in my ads than I use to describe the product itself, and I am asked to use print as large as the type used to describe the unit.” Further, he claimed that he would be very happy to spell out the legal uses of the equipment in his catalogs and mailing leaflets. His views were shared by several other CB manufacturers.

Why should the FCC bear down on manufacturers when the magazines are to blame? Today, you can walk to a newsstand and find a few electronic periodicals which either dedicate their complete editorial content to CB as a hobby, or include a featured column

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Positive Feedback

and an article or two on “hobbying it up on CB.” It is these magazines that misinform their readers as to the proper use of CB more so than the advertisements in them. If magazines, through their editorial content, encourage misuse of the CB service, then it is these magazines that should be called to task before the FTC.

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How TV Works. You would be surprised of the number of experimenters who know next to nothing about the innards of the TV

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Readers of Radio-TV EXPERIMENTER have read many of the author’s magazine articles and have enjoyed his clear concise style which he uses successfully in his book. If you are one of those experimenters who calls a serviceman to fix your TV set, or if you are unable to draw a block diagram of a TV set and show input and output wave forms, then Len’s book is for you. This Howard W. Sans publication fits neatly in your pocket and makes good reading during your idle hours.

Mathematics & Electronics. Far too often it is the lack of a good understanding of mathematics used in computations related to electronic circuits that separates the good technician from so-so types. The key to applying electronics technology is in knowing how to use electronic math. An electronic technician must be able to rapidly and accurately evaluate circuit parameters by applying related mathematical formulas and laws. Becoming familiar with the applications of electronics math and learning how to manipulate the various formulas requires a working knowledge which can only be achieved by extensive practice. Two recently
Practice Problems in Electronic Calculations by Alan Andrews, the first of its kind, is a "workbook" designed to provide working technicians with experience in analyzing electronic circuit requirements. The author's previous two-volume effort, Electronics Math Simplified, serves as the basic study text for the new volume. The chapters in the new volume include: Working with Numbers, Algebra and Trigonometry, Units of Measurements, DC Circuits, Alternating Current, AC Circuits, Power Supplies, Amplifiers and Oscillators, Transmitting Equipment, Receivers, Measurements, and Logarithms and their Applications. You will find the material in this book serve three major needs—they are to provide (1) a more fluent understanding of electronics; (2) supplementary study material needed to pass FCC exams; and (3) practice in solving problems as part of a study course.

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<tr>
<td>5-TVE CHEATER BARS</td>
<td>Complete with lights and switches</td>
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<tr>
<td>5-TVE POWER CONTROLLER</td>
<td>Complete with lights and switches</td>
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<td>215-00-TVE VU METER</td>
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<td>5-TVE ALIGNMENT TOOL</td>
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**MARKET SCOOP COLUMN**

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<tr>
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**SHIPPING**

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**IMMEDIATE DELIVERY**

- Scientific light packing for safe delivery at minimum cost.
- Handy way to order: pencil mark or write amounts wanted in each box, place letter.
- F in box for Free $1 BUY. Envelope with cash or money order, add extra for shipping.
- Tissue sheets will be returned as packing slips in your order, plus list of new offers.

Please specify refund on shipping overpayment desired: 
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- □ POSTAGE STAMPS 
- □ MERCHANDISE (our choice) with advantage to customer

**TOTAL**

Cost of goods

Shipping estimated
The "Messenger III", one of the smallest full-power Citizens Radio transceivers manufactured to date, has just been introduced by the E. F. Johnson Company of Waseca, Minnesota. Extremely compact in its design, the all transistor "Messenger III" has 18 transistors and 9 diodes—measures less than 2 1/4" high; less than 6 1/4" wide; and just 8 3/4" deep. The "Messenger III" has been designed as a multi-purpose unit with almost instantaneous adaptability for its use in 4 different types of two-way radio applications. As a mobile unit, the "Messenger III" easily fits under the dashboard of any vehicle—and with the available accessories, is immediately interchangeable for use in a base station: as a self-contained public address amplifier; or as a full, 5-watt battery powered, portable pack set. By simply switching to the "PA" position on the front panel control, and using the microphone along with an accessory weatherproof speaker, the "Messenger III" becomes a full 3-watt Public Address System, still retaining its full capability to receive in-coming radio calls. This feature is especially useful for businesses engaged in field work and construction projects, or for use by marinas or in other out-of-doors applications. The
"Messenger III" is also designed for use with a companion transistor "Tone Alert" selective calling system. This unique accessory completely mutes the speaker on the "Messenger III" until one unit calls another —then, automatically, the stations hear an audio note and an indicator light flashes "on", remaining lighted until the call is answered. Priced at $189.95, the "Messenger III" is furnished complete with crystals for one channel and dynamic microphone with "full-grip" push-to-talk bar and coiled cord. 

(For further information and detailed specifications, write directly to E. F. Johnson Company, Dept. RT 14, Waseca, Minnesota.)

AUTOMOBILE HEADLIGHT-ON ALARM

The Gerole people have designed an inexpensive and easy to install safety alarm that sounds when you leave your parking or headlights on after parking for the night. No longer will you let your battery run down because you hastily departed. Installation is simple and the unit can be installed in any 6- or 12-volt car, negative or positive ground. Built with rugged long-life solid

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NEW products

state controlled components, the Gerole Safety Alarm encourages the use of head- lights to provide safer driving conditions during sunrise and sunset—the periods when drivers are most apt to leave their lights on after parking. Priced at $2.49 postpaid, the unit weighs only 3 ounces. (Order direct from Gerole products, Dept. 14, West Milton, Ohio.)

TINY TAPE RECORDER WITH BUILT-IN MIKE

Add extra fun to your home movies or slide showings with sound effects by the tiny new Craig TR-490 tape recorder, the first “Electronic Notebook” with a built-in mike. Weighing only two pounds, this mighty midget may be used to record descriptions while taking pictures or immediately after, is so compact it can be operated with one hand, and records up to 30 minutes of data. Cartridge loaded, the TR-490 has VU meter for monitoring sound level and battery life, push-button control for starting and stop-
The latest addition to the Heathkit test instrument line is a new FM stereo generator, Model IG-112, designed to provide all the signal facilities required in monophonic and stereo FM servicing. This completely self-contained instrument generates an audio or composite stereo signal for multiplex adapter adjustments or an RF carrier modulated by these same signals to produce an on-the-air signal similar to those transmitted by an FM station. Instant selection is featured for either right or left channels as well as a special phase test for accurate adjustment of stereo subcarrier transformers. No balancing is required for equal right and left channel modulation or separate use include 400 cps, modulation. Switch-selected frequencies for 1000 cps, 5000 cps, 19 kc, 38 kc, and two special SCA (Subscription service) frequencies of either 65 kc or 67 kc. A crystal-controlled 19 kc (±2 cps) pilot signal adjustable in level from 0 to 10 percent is provided to check the lock-in range of stereo receivers. The generator also provides a sweep function for over-all RF and IF alignment with marker frequencies at 90.95 mc, 96.30 mc, 101.65 mc, and 107 mc, for checks of dial calibration. The 100 mc, sweep signal is adjustable ± 2 megacycles to allow alignment on a clear portion of the band. A three-step (20 db-per-step) RF attenuator prevents overloading of tuner input. Output of the

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Insure Accuracy—Full-size patterns on the "Minimax" duplicate the originals used by the designer when he built the first "Minimax". Each component can be cut to exact size for a perfect fit in final assembly.

Convenient—With full-size patterns on the Moth Class "Sun Fun Sailer" you don't incur the extra expense and time that is spent acquiring the necessary drawing tools and making the drawing on extra large sheets of paper.

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☐ #346—Sun Fun Sailer  ☐ #347—Minimax
☐ #348—Sea Flea

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DECEMBER, 1964
NEW products

A unique 2 Transistor Phono Oscillator which plays through any broadcast band. Radio will operate mike or phono pickup. Originally designed to add Stereo to regular monaural system and priced at $16.75 each.

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Radio is specifically designed as a reliable receiver to alert off-duty or volunteer fire or policemen, emergency squads, or private ambulance crews. Claimed to be a first in this type of special-purpose radio, the user is provided with 1 microvolt sensitivity in a completely transistorized unit—18 transistors and 7 diodes, when equipped with all options. Also new to the industry is a 3-way power supply which permits operation on 117 VAC, 12 VDC or with an optional battery pack. The fail-safe emergency battery is automatically activated if there is a power line failure. Nickel-Cadmium rechargeable batteries are used in the built-in pack. Emergency Tone Alert is available on an optional basis. It is incorporated in the Regency Monitoradio to alert special groups in an emergency. For example, the members of a special volunteer emergency squad can

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be alerted by receiving a tone signal from the fire department transmitter. They would not have to listen to all fire calls unless they wished to. Four basic models of the Model TM are offered; single channel crystal or multi-channel with up to six crystals. Either variation may be in the high (150 to 175 mc.) or low (30 to 50 mc.) range. Special frequencies are available on request. The Tone Alert or battery pack options may be added to any of the four basic models. All models have blue vinyl laminated steel cabinets measuring 11" long by 43/4" wide by 71/2" deep; weight, 51/2 pounds. Each unit is sold with a 12 month warranty. Price of the basic model starts at $99.95. Delivery is off-the-shelf. (For further information, write Regency Electronics, Inc., Dept. 714, 7900 Pendleton Pike, Indianapolis, Indiana.)

HI-FI IN A SUITCASE
If you want your high fidelity in a small, compact package and your standards compel you to seek out the best regardless of price, you are exactly the person for whom a new premium-quality high fidelity stereo phono system has been produced. It is called the M100 Maximum Performance Phono System. Shure engineers designed it especially for music loving perfectionists who want the quality reproduction available only from a component system, but who have neither the time, inclination nor technical

$36.95 IN KIT FORM
Here is a precision instrument that meets the highest standards of any meter available today. The S&M A-3 uses the newest cadmium sulfide light cell to measure light levels from 0 to 10,000 foot lamberts at ASA speeds of 3 to 25,000. It is successfully used with movie or still cameras, microscope, telescope—as well as densitometer.

The computer gives F stops from .7 to 90 and lists exposure time from 1/15,000 sec. to 8 hours. 43° angle of acceptance, 4 range selection; EV-EVS-LV settings. Large (4 1/2") illuminated meter, paper speed control knob for use with enlargers and now has a new battery test switch.

SCIENCE & MECHANICS — KIT DIVISION
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Enclosed is $_____. Please send me the Supersensitive Darkroom Meter, as checked below. I understand that if I am not completely satisfied, I may return the meter within 10 days for a complete refund.

☐ No. A-3 in kit form—$36.95
☐ No. A-3 assembled—$41.95
☐ A-3 Carrying Case—$5.00

Add 10% for Canadian and foreign orders.
New York City residents add 4% for N.Y.C. sales tax.

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knowledge to assemble components themselves. The M100 is a complete stereo-phono system requiring no extra parts or components. It is ready for immediate enjoyment. Two highly compact models of the M100 are available. One is a portative unit completely self-contained in two fine Samsonite luggage-style cases. It is designed for music lovers on-the-go, college dorms, summer cottages, boats and for school and institutional use where a music system that may be conveniently moved about is desirable. Two models of the M100 are being introduced. One is a portative model completely self-contained in fine Samsonite luggage-style cases. The second is the Library Model finished in impressive solid walnut cabinetry. The portative version is priced at approximately $400.00; the Library Model $450.00, making either model perhaps the most expensive stereo system for its size and style on the market. (For more information write to Shure Brothers, Inc., 222 Hartrey Avenue, Evanston, Illinois, or see your local hi-fi dealer.)

**CALL FOR FISH CALLER**

As fishermen know, there are fish in most waters, the problem is in getting the fish on the hook. Now, with a device known as the TR-Sonic fish call you can attract fish right up to the hook. The TR-Sonic is a transistorized device which plays low frequency sounds under water, and as ichthyologists (fish experts) know, low frequency sounds are the pied pipers of fishdom. Using universally available penlight batteries, the TR-Sonic feeds low frequency sounds in the range of 75 to 300 cycles to a waterproof transducer which couples the sound to the water. While the TR-Sonic is not going to put a fish on a hook, it will attract them to the immediate vicinity, and no longer need you fish an "empty hole." (The TR-Sonic Fish Call is distributed by Custom Electronics Co., 2929 Fulton St., Brooklyn, 7, N.Y. Price is $12.95 postpaid.)

---

**GROOVE JUMPER**

A remotely operated attachment for your record player — Repetez — makes your player repeat as many times as desired, from 1 to 75 record grooves. Principal use of Repetez is for language study, but it may also be used for study of music, English enunciation, shorthand, etc. Pressing the remote control's bulb causes repeat playing.
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Not a listing of cameras—not a puff sheet—not a directory, but a detailed report, including ratings. All 35 mm cameras on the market are tested and rated. Ratings are labelled Recommended, Intermediate or Not Recommended. All tests are carried out by Consumers' Research, Inc., the original independent non-profit testing organization.

Other major features of this amazing magazine are Blue Book of Used Camera Values • How to Buy a Camera • How to buy a Used Camera • How to Buy a Second Camera • Lens Guidance • How to Select A Processor Filter Section 35 mm Accessory Kits

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DECEMBER, 1964
NEW products

100 MILLIWATT CB TRANSCEIVER

A completely American made 100 milliwatt two-way radio is now available from Cadre Industries Corp. The new Model C-60 offers license-free dual channel communications in the 27 mc band. The battery powered transceiver provides advanced solid-state circuitry with extra power and sensitivity at just $59.95 user net. Leading features are two crystal controlled channels, provision for either penlight cells or nickel cadmium batteries, low impedance earphone jack, built-in antenna and speaker-microphone, and high impact plastic cabinet. Extended range results from over 70 milliwatts output and less than 1.0 microvolt sensitivity. Weight is less than two pounds and dimensions are 8” x 4” x 2”. Ten matched accessories are available for all applications. An application bulletin is available from Cadre at no charge. (Write to Cadre Industries Corporation, Dept. RTE4, 20 Valley Street, Endicott Street, New York 13761.)

NEW KIT FOR BOATERS

A new rudder position indicator, Model MI-14, that’s designed to be used on large water craft where the rudder position is not readily visible has been introduced by the Heath Company. The new unit continuously shows rudder position up to 40 degrees both port and starboard, and it greatly simplifies close maneuvering at the dock. Although the kit can be used on both single and dual-engine boats, it’s particularly useful on dual-engine craft since it allows you to compensate for current and wind by adjusting the engines rather than the rudder to maintain proper heading. As a result, “rudder drag” and excessive fuel consumption are eliminated. Simple circuitry coupled with circuit board construction makes assembly fast, fun and easy even for the novice who’s never attempted kit-building before. The new kit sells for $27.50. Shipping weight is 4 lbs. (Order from the Heath Company, Benton Harbor, Michigan.)

COPPER-CLAD CB

New citizens band transceiver combines crystal-controlled 23-channel operation with 5-watt input for both base-station and mobile use. Called “Genie-Fone”, the compact
LOW-COST SPEAKER
HIGH ON QUALITY

Bookshelf speakers have become the main diet for economy-minded audiophiles. With this market in mind, Acoustic Research, Inc., has come up with the little brother to the AR-3. Tabbed the AR-4, it is an acoustic suspension speaker like all others in the AR line. It has an 8-inch woofer and a 3½-inch wide-dispersion tweeter. Acoustic Research states that the AR-4 design achieves the highest quality per dollar of all its speaker models, and that aside from its necessarily narrower frequency range its musical quality may be compared to the AR-3, AR's best speaker system. You can pick up an AR-4 at your local Hi-Fi dealer for only $51 in unfinished pine (dimensions are 19" x 10" x 9" deep), or for $57 in an oiled walnut enclosure. (Frequency response and distortion curves are available by writing directly to Acoustic Research, Inc., Department 714, 24 Thorndike Street, Cambridge, Mass. 02141.)

In the next issue of Radio-TV EXPERIMENTER the New Products column will be devoted entirely to products introduced for the first time at the New York Hi-Fi Show.

2 BIG DIRECTORIES

FIRE!

Nowadays when the dread cry of "Fire!" rings out, a fleet of amazing new fire engines is available to battle the blaze. There are engines that can blast holes in concrete buildings with a stream of water; engines that can raise a rescue platform 85 ft. into the air; engines that could dismember a man with their incredible hose pressure! Read all about "Our Exciting New Fire Engines!" in the JANUARY

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DECEMBER, 1964

ASK ME another

By Leo G. Sands

Radio-TV Experimenter brings the know-how of electronics experts to its readers. If you have any questions to ask of this reader-service column, just type it on the back of a 4¢ postal card and send it to "Ask Me Another," Radio-TV Experimenter, 505 Park Avenue, New York, New York 10022. The experts will try to answer your questions in the available space in up coming issues. Sorry, the experts will be unable to answer your questions by mail.

Q. Why is it that I receive San Francisco stations clearly during the day, but very poorly at night? Sometimes they sound all garbled.

—I. W., Sacramento, Calif.

A. Poor night time reception is due to cancellation of the signal, or partial cancellation, by the sky wave which is received in addition to the ground wave. During the day, the sky wave does not reach Sacramento. When the two signals arrive at your receiver out-of-phase, or one later than the other due to one taking the longer refected sky wave path, the audio may sound garbled.

Q. If I get a Business Radio license, can I operate my CB set on the five channels above the Citizens Band (27.235, 27.245, 27.255, 27.265, 27.275 Mc/s)?

—J. S. Paramus, N. J.

A. On these five channels, only "type accepted" equipment may be used. This means that the manufacturer of the

Here is the NEW S&M Supersensitive PHOTO METER

NOW complete with carrying case

Every photographer knows that the high quality of his photos depends on the accuracy of his equipment. Here is a precision instrument that meets the highest standards of any meter available. Modern Photography says "This is certainly one of the most unusual, most versatile and most sensitive exposure meters at any price today." U. S. Camera wrote "It is as sensitive as anything on the market. It's so adaptable—those 4 separate ranges of sensitivity have the effect of spreading the meter's scale."

Now, the S&M Supersensitive Photo Meter is better than ever! A new plastic cap protects the probe and permits diffuse light to be read with the cap on. The probe can still be used to read direct light with the cap removed. A new positive meter-lock in the OFF position protects the meter's needle.

The S&M Supersensitive Photo Meter uses the newest cadmium sulfide light cell to measure light levels from 0 to 10,000 foot lamberts at ASA speeds of 3 to 25,000. It is successfully used with movie or still cameras, microscope, telescope—as well as a densitometer. The computer gives F stops from .7 to 90 and lists exposure time from 1/15,000 sec. to 8 hours. 43° angle of acceptance; 4 range selection; EV-EVS-LV settings; weighs only 10 ounces.

And yet—this all-inclusive kit can be assembled with soldering iron and screw driver in less than 2 hours. Step by step instructions make it easy—or, order your S&M Supersensitive Photo Meter, fully assembled and fully tested. Complete with attractive carrying case.

$24.95 $29.95 $2.00 Additional Calculator $1
No. 101 In No. 102 No. 103 To affix to inside of Kit Form Assembled assembled carrying case as shown
w/carrying w/carrying in photo above case

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Enclosed is $ Please send me the new S&M Supersensitive Photo Meter as checked below, complete with carrying case. I understand that if I am not completely satisfied, I may return the meter within 10 days for a complete refund.

No. 101— No. 102— No. 103
in kit form assembled assembled Calculator
$24.95 with $29.95 with $2.00 Additional $1.00
w/carrying w/carrying w/carrying case case case only

Add 10% for Canadian and foreign order. New York City residents add 4% for N.Y.C. sales tax.

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 Piper's Wharf

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equipment has satisfied the FCC that it meets the technical standards of the Business Radio Service. Most CB sets are not type accepted. When licensed in the Business Radio Service, the transmitter may be used for communicating only with stations controlled by the same licensee. However, a CB set can be used on 27.255 Mc/s which is CB Channel 23, but only when the set has been type accepted or when licensed as a Citizens Radio Station.

Q. How can I use an AC-DC radio as a tuner with a hi-fi amplifier?
—R. M. S., Auburn, Calif.

A. Since an AC-DC radio has no power transformer, the common ground circuit of the receiver is connected to one side of the AC line and, depending upon the way the power plug is inserted in the AC outlet, it can be hot by 117 volts above ground. Therefore, it is not recommended that the audio be tapped at the set’s volume control. Instead, the audio can be taken at the secondary of the output transformer as shown in the diagram. Install a DPDT toggle switch at the back of the set and connect it as shown. When in one position, the audio is fed to the radio speaker. In the other switch position, the audio is fed to the input of the external amplifier and a dummy load is connected across the radio’s output transformer. Make sure the shield of the cable to the amplifier does not make contact with the radio chassis since it may be hot with respect to ground.

Q. In a boating magazine, I recall reading about Weather Bureau broadcasts but forget the details. Can you enlighten me?
—S. M., Linden, N. J.

A. The U. S. Weather Bureau transmits weather information on 162.55 Mc/s over narrow band FM (± 5 kc/s) stations in New York, Chicago, St. Louis, Kansas City and Los Angeles. The broadcasts can be heard about 50 miles. A VHF/FM monitor receiver is required.

Q. I am looking for a career job in electronics that offers good fringe benefits. Do you have any suggestions?

A. Railroads are seeking electronics technicians who hold a second class radiotelephone operator license. Starting pay is quite good and fringe benefits include a pension, paid vacations and travel with expenses paid. Communications equipment maintainers service two-way radio, carrier telephone equipment, teletypewriters and data equipment. Contact the superintendent of communications of the railroads that interest you. Their names can be found in the Official Guide of the Railways which almost any railroad ticket clerk will let you look over. Or, write to Mr. L. Kearney, Communications Engineer, Association of American Railroads, 59 East Van Buren Street, Chicago, Illinois 60605, who usually knows of job openings. Besides getting to ride in Pullman cars free while on the job, railroad (continued on page 35)
employees can get tickets for their families at reduced rates. While it might seem that the airlines have taken over, there are still many trains and you may have to wait as long as a month to get a reservation on one of the western name trains if you’re a paying passenger.

Q. Can I remotely control my Citizens Band transceiver?
   —E. L., Everett, Wash.

A. The FCC rules state that a Class A CB transmitter (450-470 Mc/s band) may be remotely controlled. While the rules do not specifically prohibit remote control of Class D (27 Mc/s band) stations, the use of remote control is not intended. When a CB set is installed in a car trunk and is controlled from a control head under the dash, the station is still classed as one that is locally controlled.

Q. I used to have a two-letter ham call. I have been told that I can get a two-letter call if I apply for a new amateur radio license. Is this true?
   —P. B., Ridgewood, N. J.

A. Yes, if a two-letter call in your district is available. But, you must apply for a general class license.

Q. The alternator in my car has an AC outlet. Can I use it to operate a CB set or television receiver?
   —F. G., Santa Clara, Calif.

A. No. The frequency of the AC from the alternator varies with the speed of the car’s engine. If the frequency gets too low it can burn out the power transformer of the CB or TV set. This AC outlet can be used to operate lights or a soldering iron or other resistive load.
**Q.** What is the best radio to buy for medium wave DXing and what does it cost?

—J. B. Basking Ridge, N. J.

**A.** "Best" is a very strong term and often interpreted differently. In the "best" category are such deluxe receivers as the Hammarlund SP-600 which costs more than $1000. But, the Hammarlund people say that their HQ-180 which costs much less is actually more sensitive. National and Hallicrafters also make receivers in this class. Compare the specs with regard to sensitivity and selectivity and then buy the one that has the features you like best personally.

**Q.** Since I am so far away from broadcasting stations, I get little use out of my transistor radio during the day time. How can I connect it to an outside antenna to increase its pick up?

—L. C., Mont Tremblant, Quebec

**A.** Wrap the antenna lead-in around the set. Two turns will do. And, ground the far end of the lead-in as shown in the diagram. The ground is important. The wire wrapped around the set acts as an antenna coil which is inductively coupled to the loopstick antenna inside the radio.

**Q.** Could you please tell me where I can get some information on how to become a disc jockey and where I can get a copy of Broadcasting-Telecasting?


**A.** Many disc jockeys are also radio station operators which means that they need a first class radiotelephone operator license. Why don't you call on the managers of your local broadcasting stations and tell them of your interest? You can get information about Broadcasting-Telecasting magazine by writing to the publisher at 1735 De Sales Street N. W., Washington, D. C.

**Q.** When our television set is on, whining and buzzing sounds are heard in our radio. How can this interference be stopped without turning off the TV?

—M. S., Appleton, Wis.

—T. C., St. Helens, Ore.

**A.** Some early model TV sets are notorious generators of radio interference. Modern TV sets must be certified to the effect that they do not radiate interference above a specified level. The trouble is usually caused by inadequate shielding of the TV set's horizontal sweep circuits and high voltage power supplies. The 15,750-cycle sweep frequency and its many harmonies are radiated. Make sure all the shields are tightly in place. Look particularly for the wire that grounds the shield coating around the picture tube. It may be necessary to line the inside of the TV cabinet with metal foil or screening and grounding it to the chassis.

**Q.** A powerful radar station nearby causes much interference to electronic equipment in the surrounding area. In audio equipment it causes an annoying beep. What do you suggest to reduce or eliminate this interference short of closing down the radar?

—W. A. M., Winston-Salem, N. C.

**A.** An RFI (radio frequency interference) expert said that the government is working on this problem. Until something is done to reduce the interference at its source, you might try preventing the interference from getting into your equip-
ment. Such interference can often be eliminated in telephone systems by carefully balancing the lines so that interference is cancelled out. In the case of audio equipment, try grounding the chassis with the shortest possible lead. Check all amplifier input leads to make sure they are shielded all the way and that there are no exposed unshielded plugs or splices. You might try a power line filter, grounding the filter's ground post to the amplifier chassis or external ground.

Q. How can I reduce the bass response of my radio receiver in order to get more crisp speech reproduction?

—R. P., Chicago, Ill.

A. Connect two 16 uf electrolytic capacitors back-to-back, as shown in the diagram, in series with the voice coil lead. The reactance of the capacitors is high at low frequencies and will cut bass response. By connecting the capacitors as shown, since they are polarity sensitive, they can be used in AC circuits such as audio.

Q. How can I convert a military surplus radar for use on a boat?

—G. M., Chicago, Ill.

A. Take it apart and use the parts for experimenting. Only FCC type accepted radar equipment can be licensed for use on a boat. To get a home-modified radar type accepted might cost more than a brand new type accepted radar.

Q. What would happen to the transmitting frequency when a pair of crystals is connected in parallel in the circuit? What would happen if they were connected in series?

—B. LeB., Houma, La.
Q. Can I use a scrambler on my CB set and where can I get a scrambler?

_A._ While the FCC rules do not mention scramblers, a telephone call to the Commission revealed that the use of scramblers with CB sets is not prohibited. However, the station call letters must be announced without scrambling.

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**Diagram:**

- **Existing transmit-receive switching circuitry**
- **To press-to-talk circuit**
- **To microphone circuit**
- **Receiver**
- **Microphone**
- **Press-to-talk switch**
- **SPKR**
- **Break circuit here**
- **Output transformer**
- **Add this switch**

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_A._ Several manufacturers sell through independent dealers. You might write to Fred Macklin, Communications Company, Inc., 300 Greco Avenue, Coral Gables, Florida; Walter Shapiro, Outercom Electronics Corp., 725 Providence Road, Charlotte, North Carolina; or Robert Hartman, Hartman Marine Electronics Corp., 30-30 Northern Boulevard, Long Island City 1, New York.

Q. How can I reduce reverberation in a room in which I make tape recordings?

_A._ You can cover the walls and ceiling with sound absorbent acoustical tile or panels and put a rug on the floor. Or, you can cover the walls with carpeting as has been done in the foyers of the New York State Theatre Lincoln Center in New York City. It looks fine. The same idea was used to good effect at Brown's Theatre in Snohomish, Washington when talking movie equipment was first installed in 1928.
"Let it ring until he gets down and then hang up again."

"Your shack and tower certainly look a helluva lot bigger on your QSL card, Ed."

"I'm not complaining about the $2.15 for the antenna tower ... it's the FOB charges from Hong Kong."

"You see, it's not over seventy feet ... from the ground."

"Put it in the car yourself."
Anyone Can Build These High Quality
Precision S&M Kits
At a Substantial Savings

**Precision Decade Resistance Box**
Designed so the electronic experimenter can get any value of resistance at 1% accuracy. Made of precision components, this decade box offers such advantages as fast fingertip switching from any resistance value from 1 ohm to 1,111,110 ohms within seconds. Add or subtract as little as 1 ohm with 1% accuracy. And ordinary hand tools are all that's needed to assemble it in less than 2 hours.

**All Purpose Shop Tachometer**
This tachometer is guaranteed to outperform any $50 tach available today or your money will be refunded. This tach belongs in the tool chest of every machinist, electrician, model maker, motor serviceman and inventor. A six position rotary switch enables you to select three speed ranges in either forward or reverse rotation. Three ranges—0—500, 5000 and 15,000—cover the gamut of rpms in the home workshop or laboratory on machine tools, such as lathe cutting speeds, motor rpm, drilling speeds and other motor driven tools where rpm is an important factor.

**Pocket-Size Hearing Aid**
New hearing aid design provides a minimum of 42 decibels of gain and is adequate for 75% of all cases of partial deafness. The aid weighs only three ounces and is smaller than a king-size cigarette pack. Uses latest electromagnetic earphone and miniature crystal microphone. Powered by a 10¢ pen light flashlight battery and has a switch for turning power off when not in use and a control that lets you adjust the volume to a comfortable sound level.

---

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□ Enclosed $3.00 deposit, ship balance C.O.D., plus postage and C.O.D. charges.

40 RADIO-TV EXPERIMENTER
Satellites, radiosondes, radar and digital computers have replaced the dancing Indian rain maker.

**MAN** has too done something about the weather! He has sacrificed pretty maids and other men to appease the thunder gods, Hopi-danced to woo the skies, set rain fires and beat the drums to Dale-Carnegie the clouds, ascribing his weather fortunes to the good gods and the bad gods.

For weather has always ruled the fate of man. Napoleon met his “Waterloo” before Waterloo on the stormy steppes of Russia. A single Texas hurricane in 1900 tolled 6,000 human lives, $20,000,000 in property loss. A typhoon that swept the Bay of Bengal in 1737 left 300,000 persons dead while sunny climes foster happy and prosperous civilizations.

**Weather Affects Your Byline.** Man has always been so under the influence of the

*By Katherine Kirkbride*
ELECTRONICS STEALS THE THUNDER

weather that some experts say your chances of seeing your name in "Who's Who" increase if you choose a January or February birthday. Another claims folks born in March average four more years with the earth's weather than those born in warm July.

This dependence upon the whims of the skies long ago led men to start doing something about the weather.

As long ago as 350 B.C., Aristotle dreamed up man's first theory of forecasting. Galileo cooked up a thermometer in the early 1600's; his protege, Torricelli, a barometer in 1643. H. W. Brandes a weather map in 1820. The U. S. Army Signal Corps set up its first weather service in 1870, later renamed it the U. S. Weather Bureau. But progress snail-paced until modern engineers vied with one another contriving ingenious electronic means to temper the tyrant above them.

Tiros. On April 1, 1960, a 42-inch diameter, 300-pound hatbox satellite named Tiros soared 400 miles into space to achieve man's first decisive win in his long war with the weather.

RCA engineers in their laboratories at Hightstown, New Jersey, built Tiros to track storms, clouds, and news of the skies with half-inch vidicon cameras, magnetic tape its pictures and automatically release them as Tiros passed over weather stations on earth.

The first seven Tiros satellites relayed over 330,000 pictures to earth, saved thousands of lives; millions in property values, spotted 1961's Esther hurricane two days before land stations and cited Typhoon Ruth off the coast of Japan.

Engineers Add APT. The ingenious RCA men were anxious for each Tiros to learn from the Tiros before it, added probably their most dramatic improvement to Tiros the Eighth. Naming it APT, for automatic picture transmission, the Eighth Tiros facsimile'd its pictures, released them to major ground stations and small ones as well. For the new APT Tiros would release its weather pictures to low-cost $30,000 receiving stations, even turn on the ground station's facsimile as it passed over the station. This meant that any small nation, purchasing a low-priced receiving station could tune in Tiros for pictures of its own local cloud formations.

But the early Tiros series had one major limitation. Fixed in orbit, Tiros could "see" the earth only one-fourth its time in the skies. RCA engineers now plan a new turn. They hope to tip the next hatbox over on its side and wheel it through space in polar orbit.

The Wheel Gets a Better Deal. Turned on its side, Tiros is expected to photograph cloud formations every half-minute. And the RCA men predict the new wheel will be able to photograph an area of 500,000 square miles with one "look," photograph every area of the earth at least once a day.

After Tiros the Eighth, Nimbus. On August 28, 1964, man won his second decisive battle in his war against the weather. Next-generation and more sophisticated satellite Nimbus took to the skies in 600-mile orbit, preceding Big-Wheel-Tiros and replacing Tiros the Eighth.

Built by General Electric engineers, Nimbus packs three one-inch RCA vidicon cam-

In order to study and learn more about our weather, Tiros, the first space weather reporter, was set in orbit about 400 miles up to snoop on the world's weather with two TV eyes and send back pictures to earth.

42 Radio-TV Experimenter
Satellite Tiros received countless electronic and mechanical tests before being launched. Here, Abraham Schnapf (left), Tiros Project Manager, and Thomas Tilton, Leader, Integration area, eyeball latest modifications.

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ELECTRONICS STEALS THE THUNDER

Air even though it may seem a clear day. RCA's new radar spots this tricky maneuver, warns the pilot there's a whirlpool ahead.

**An Eager-Beaver Drone.** To warn pilots, airfields and weather stations, Bendix men in Ann Harbor, Michigan, fashioned a miniaturized "pod" they call their weather pod. Rocket-shaped and weighing only 1834 pounds, it will report pressure, temperature and precise dewpoint, all vital to weather prediction.

This Bendix "pod" can ride into the skies attached to a plane, relay its findings to earth receivers by UHF telemetering radio band. Or it will travel in a subsonic drone, fly straight into the heart of a storm, report back to earth as long as two hours on its own battery power.

**Flying High in the Sky.** Bendix engineers at Bendix-Friez at Towson, Maryland, build balloons six feet tall to "weather" the skies. With radio transmitting instruments attached, these king-sized "radiosondes" will fly higher than planes, sail 100,000 feet into the clouds to tell on the weather. Another Bendix balloon, one shaped like a rocket and named "rocketsonde" will soar 300,000 feet.

**Good Fellows Get Together.** While balloons, radar, pods and satellites report weather news from the skies, it takes the earthly computer to sift and relay warnings of storms and news of good weather to airfields, newspapers, radio and TV stations.

In a large white sprawling building in Suitland, Maryland, the world's largest weather center, the National Meteorological Center houses a giant 7094 IBM computer. This know-it-all takes it all in from the country's weather stations and electronic reporters, processes the information through teletypewriter circuits onto tape rolls, then onto IBM 7094 tape.

**But it's a Breeze for the Computer**—The giant machine then condenses, edits, predicts and speeds its deductions to local weather outlets to report blue skies or stormy weather. It has to think fast—for thunderstorms alone cost the United States more than $150,000,000 every year. A single bolt of lightning can carry five million volts, a real hep hurricane travel five hundred miles an hour, pack the power of thousands of H-bombs.

Yet nature's frightening, often savage power doesn't deter the brave Navy flyers of Project Stormfury from flying straight into the heart of storms.

When Beulah hurricaned across the Atlantic in late 1963, a Navy plane spliced into the storm, dropped yard-long canisters of silver iodide into the eye. Alongside, radar

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**Tiros supplies our space weather men with photographic reports on happenings at remote spots on earth where there are no weather reporting stations, or where reports are not reliable. These space reports coupled with accurate ground reports enable our scientists to understand the world's weather and to make very accurate forecasts we can depend on. The map at left shows reports from Tiros circled with heavy black line.**
Shown above is an artist concept of the Nimbus Meteorological Satellite in earth orbit. Note that solar array panels are illuminated by the sun providing the energy to power the satellite’s electronic circuits. Compare the appearance of the satellite to the drawing at right—here the solar array is folded to take up minimum space in the nose of its launch rocket. Photo at upper right shows Nimbus being lowered into an environmental test chamber that will duplicate hazards the satellite will experience in space.

“Shooting” weather, is function of this Ber-dix rocket-like pod designed to take weather measurements while mounted on planes.

planes and one U-2 photographed the storm’s reactions for the U. S. Weather Bureau and the National Science Foundation.

Pity the Unhappy Hurricane. An Air-Force U-2 photographed Esther at 65,000 feet in 1961, as silver iodide flares ignited the eye of the storm. The U-2 cameras and the radarscopes of planes flying nearby “saw” definite changes in the eye wall of the hurricane within twenty minutes after the seeding.

The “scopes” registered ice crystals and
snow where they had seen water droplets before the seeding. And weather scientists speculated the temporary slowing of the storm might have been caused by the heat of fusion released when the droplets seeded to form crystals!

These beginning but significant efforts at taming the fury of the hurricane are based on the early work of General Electric’s renowned Dr. Irving Langmuir and Dr. Vincent J. Schaefer. In the forties, the GE scientists first prompted rain and snow from the skies by seeding clouds with water, dry ice and silver iodide.

But when these experiments are applied to hurricanes, the results are appraised differently by weather scientists. Some believe we have made definite headway toward weakening and diverting hurricanes from populated areas. Others, that we may one day completely conquer man’s enemy, the hurricane. Still others warn that tampering with nature’s vast generator upstairs may prove dangerous unless we first learn more about what makes it tick.

(Continued on page 111)
By Ron Michaels

Build a Stroboscope

A specialized laboratory test instrument that freezes motion

The stroboscope has made possible the speed measurement of rotating, reciprocating, and oscillating machines and moving parts. For example, if you wanted to show someone how the loudspeaker in your hi-fi set is driven in and out, the strobe will do the job. First, connect a signal generator to the amplifiers AUX jack and supply a 400 cycle signal at a volume level that is bearable. Next, adjust the strobe frequency to 400 cycles and illuminate the speaker cone with the xenon flashtube light. Now, fine tune the strobe until the speaker cone just barely moves in and out. If you set the strobe at 399.9 cycles, the speaker cone will move in and out 6 times a minute—slow enough to visually observe.

Most professional stroboscopes cost upwards of several hundreds of dollars. Here’s a built-it-yourself strobe that combines the accuracy of the professional jobs with a price tag the home builder can afford. Total cost of parts is about $40. However, a well stocked parts box and some astute purchasing can reduce the price to about $30.00.

How It Works. The stroboscope circuit is a kissing cousin to the photographer’s electronic flash. In fact, it’s basically an electronic flash hooked to an oscillator that makes it flash at an adjustable rate of between about 4 and 120 flashes per second.

The circuit can be split into four sections: flashtube and energy storage capacitor (C2); trigger circuit; variable frequency oscillator; and power supply.

In operation, the power supply charges the energy storage capacitor to about 185 volts DC, storing a large quantity of electrical energy. General Electric’s flashtube FT-30 is a thin glass tube filled with xenon gas. It is connected directly across the charged capacitor C2. Initially, no current flows through the flashtube since xenon is a good insulator.

Silicon controlled rectifier (D5), capacitor C3 and trigger transformer T2 make up the trigger circuit. Whenever an input pulse (from the oscillator) fires the SCR, the SCR discharges C3 through the primary of T2, generating a high voltage spike in the secondary of T2. This high voltage spike is carried to the flashtube via a trigger wire—a few turns of bare tinned copper wire wrapped around the flashtube. The spike ionizes the xenon gas suddenly turning it into a conductor. C2 discharges rapidly through the flashtube, producing a short, intense, burst of blue-white light. Immediately after discharge, the xenon gas becomes an insulator again, permitting C2 to recharge, and the cycle to begin again.

The number of times-per-second the SCR is fired—and hence, the number of times per second the flash tube is triggered—is
controlled by a variable frequency oscillator built around unijunction transistor Q1. Potentiometer R8 is the frequency control; switch S2 selects high or low frequency ranges. Meter M1, inserted in the “emitter” lead of Q1 reads the oscillator frequency directly. Q1 is either a 2N2160 (preferred) or 2N1671 type.

The power supply has two output voltages: 185 volts DC for the flashtube circuit and trigger circuit, and 18 volts DC to power the unijunction oscillator.

**Building It.** The stroboscope is built into a 13” x 5½” x 2½” aluminum case. Start by drilling and punching required holes. Use the accompanying photographs as parts placement guides. Follow placement of parts carefully—do not try to redesign.

The power supply circuitry is mounted directly on the top half of the aluminum case, using terminal strips as wiring points. Make sure that you don’t accidentally reverse the polarity of the silicon rectifiers D1, D2 and D3, or the electrolytic capacitors and try not to overheat the rectifiers when soldering them in place.

The flashtube, the oscillator circuit and the trigger circuit (with the exception of the meter M1, potentiometer R8, resistor R7 and switch S2) are mounted on a small piece of perforated phenolic chassis board (Vectorboard). Vectorboard push-in terminals make excellent soldering points and should be used. Be very careful when soldering unijunction transistor Q1 into place—grip its leads with needle nose pliers during soldering. The pliers act as a heat sink and protect the heat-sensitive transistor from overheating.

Fasten trigger transformer T2 to the circuit board with a 6-32 machine bolt passed through its center. Mount the flashtube FT-30 by pressing its electrodes gently into push-in terminals. Note that the end of the flashtube marked with a small red dot goes to the positive side (hot side) of capacitor C2. Connect the flashtube backwards and you will be buying a replacement in short order.

Capacitors C8 and C9 are wired in parallel.
PARTS LIST

C1—100-mf., 200-volt electrolytic capacitor
C2—2-mf., 200-volt paper capacitor
C3—22-mf., 200-volt paper capacitor
C4—1-mf., 200-volt paper capacitor
C5, C6—100-mf., 15-volt electrolytic capacitor
C7—500-mf., 25-volt electrolytic capacitor
C8—2-mf., 100-volt paper capacitor
C9—1-mf., 100-volt paper capacitor
D1, D2, D3, D4—5A40 (International Rectifier) or 1N2069 (Sylvania, Texas Instrument)
D5—Silicon controlled rectifier, 200-volt reverse rating (Sarkes Tarzian 3TCRE)
D1—Pilot lamp assembly, 6.3-volt bulb, red jewel
M1—0.1 ma. DC milliammeter (Lafayette TM-60)
Q1—2N2160 or 2N1671 transistor (GE)
R1—10-ohm, 2-watt resistor
R2—100,000-ohm, 2-watt resistor
R3—1,000-ohm, ½-watt resistor
R4—6,900-ohm, ½-watt resistor
R5—30-ohm, ½-watt resistor, ±5%
R6—270-ohm, ½-watt resistor
R7—47,000-ohm, ½-watt resistor
R8—50,000-ohm potentiometer with linear taper (Clarostat Series A47)
R9—4,700, ½-watt resistor
R10—200-ohm "Humdinger" hum-adjust potentiometer (Clarostat Series 39)
R11—220-ohm, ½-watt resistor
R12—470-ohm, ½-watt resistor
(RAll fixed resistors are +10% unless otherwise specified)
S1, S2,—S.p.d.t. toggle switch (Lafayette SW-21 or equiv.)
T1—Power transformer; primary 115-v; secondary 125-volt, 55 ma. and 6.3-volt, 2 amp. (Knight 61G 411 or equiv.)
T2—Trigger coil for flashtube (Stancer P-6426 or General Electric 86G41)
1—Flashtube (General Electric Company FT-30) (Available from Edmund Scientific Company, Barrington, New Jersey 08007 for $5.20 postpaid)
1—Aluminum chassis 13"x5/8"x2 5/8" (Bud MS-2150 or equiv.)
1—Misc. Perforated phenolic board (Vectorboard), push-in terminals, wire, solder, hardware, line cord, etc.

Estimated cost: $40.00
Estimated Construction time: 8 hours
Stroboscope

to make a 3 microfarad, 100 volt DC capacitor. If you wish, substitute a single 3 microfarad capacitor for the pair provided you can find one available.

Before mounting the flashtube, wrap about 4 turns of bare #22 tinned copper wire around it, to form the trigger wire. Fashion a simple reflector from a tiny piece of tin-can stock. The reflector may touch the trigger wire, but it must not touch the tube's electrodes.

Mount the completed circuit board by securing it directly to the meter M1's terminal connection. Now's the time to probe and peak for shorts and bad soldering joints. Parts are too expensive to proceed blindly ahead by plugging in the power cord and throwing the power switch on.

**Calibration.** The RPM reading on the meter face is linear, so only a single calibration is necessary. Operation of the high-low switch, S2, doesn't affect the calibration—the meter always reads the exact flashing rate. Full scale on the meter corresponds to 166.66 flashes per second, or 10,000 rpm. This was done even though the circuit won't operate above 120 flashes per second, to avoid drawing a new dial on the meter face.

Use a phonograph and paper "stroboscope disc" as a frequency standard to make the single required calibration. Switch the phonograph to 33⅓ rpm, point the stroboscope at the 33⅓ band on the disc, and adjust frequency control R8 until the motion of the band is frozen. Now, adjust potentiometer R10 until the meter reads .36 ma—corresponding to 3600 rpm, or 60 flashes per second. If you wish, you can connect up a test setup with a loudspeaker and signal generator as mentioned at the beginning of this article. This way you can check the accuracy of the metering circuit throughout its entire range. Remember, multiply cycles per second by a factor of 60 to obtain readings in revolutions per minute.

There are several ways you can improve on the construction of the xenon flashtube strob. If accurate frequency indication is required (better than the meter indication), you can add a vernier dial such as Lafayette's 2⅞" F-346, and calibrate the dial settings against an accurate audio signal generator and loudspeaker hookup. You may want to improve on the xenon flashtube reflector and add a collimator/lens assembly to efficiently beam the light to confined areas. Whatever changes you make, avoid repackaging the unit until you have bread-boarded the circuit. The trigger transformer, T2, should always be close to the flashtube so that the trigger wire is as short as possible.
How many times have you stood ringing someone’s doorbell again and again not knowing if they were asleep, down in the basement, or out shopping for 10 minutes or the rest of the day? Visitors to your home need not have this problem . . .

By Homer L. Davidson

Hello! Sorry we missed you—we’ve gone to Harrison Park for the day—we should be home about seven o’clock.” To the folks who figured they would just drop in, or to unexpected delivery people, or even the Western Union man who rings your doorbell, this message is both a cordial greeting and an explicit answer to the questions they don’t get a chance to ask—“Where’ve they gone now?” “Not a soul home, wonder when they’ll be back?” When the caller pushes the front door button, a little battery operated tape recorder, called the Minicorder, is energized and the message comes from a speaker mounted near the bell button. A 20-second message can be recorded on the Minicorder’s endless loop tape and will be repeated three times using a 60-second delay relay.

How It Works. The Minicorder, the heart of the Greeter, can be obtained from Mission Liquidators of California for under nine dollars. The complete cost of building the Electronic Greeter is about twenty-two dollars. You can record and set the Minicorder to play back through the outdoor speaker when the doorbell is pressed or first
play back your message through a one-inch speaker contained in the recorder chassis for test purposes. After you record your message, turn the switch to Test and listen to the playback. If you don’t like it, record another and listen again. When the message is satisfactory, throw the switch to the Play position and the message is ready for either the front or back door. In most cases only the front door need be used for messages. The present front or back door bell buttons can be used with the Electronic Greeter. Simply disconnect the wiring from the door bell power transformer and bell. Run the two wires from the button directly to the Greeter chassis. The Minicorder operates on two standard size, easily obtainable batteries. One a 9-volt transistor radio battery that runs the electronic section, and the other a 1½-volt “C” battery that powers the tape drive motor.

Construction. Using a 5”x7” aluminum chassis lay out the required holes as shown in the chassis layout. Mount all the larger components except the Minicorder which should be mounted after all the wiring has been completed. Be careful when turning the chassis over, the small tape can easily be torn. Before mounting the one-inch speaker, place a wire screen between it and the chassis. The mike input transistor circuit is mounted as parts are wired into the circuit. Since the small recorder has only two transistors, more volume can be obtained by using a transistor input stage and crystal microphone.

Wiring The Unit. Wire the AC cord directly to the primary side of the filament transformer T1. Solder and tape all connections. This transformer is in the circuit all the time, but almost no current is drawn from it until the secondary is used. It may seem that when you wire up the two relay circuits that the relay wiring is complicated, but it is very simple if each section is wired individually.

The small 2½-inch speaker that is included with the Minicorder can be mounted in a metal minibox. If there is no door bell button, mount the button in the same box. Run a four wire cable from the front or back door to the door announcer and connect to terminal on the terminal board.

Mount all of the small transistor input parts as they are wired into the circuit. Be sure to use lead sinks on the transistor leads. The input stage gives the volume necessary for the outdoor installation. Wire the output condenser to terminal 1 of switch S2. All of the parts, including the transistor, are mounted on an insulated 3-terminal lug. Run all wires direct keeping them as short as possible. Twist the switch, speaker, and battery leads on longer runs. Check the wiring over once more and make sure there are no mistakes.

Testing The Unit. Now is the time you have been waiting for. First test the 6-volt...
The rear door button and rear door speaker can be mounted in a single aluminum chassis box as the author did. However, both parts can be mounted on a metal plate and flush mounted in the door panel. If you wish, add a jewel lamp to illuminate the panel at night.

relay to see if it is closing by listening for a loud click. Plug in the AC cord to an outlet and flip switch 1 to TEST position. The relay will close and become energized.

Test the Minicorder by sliding the arm switch to **Play** position and switch 2 to **Test** position. Flip switch 1 to **Test** position and the recorder will turn and play. The slide arm switch on the tape unit can be left in **Play** position and will not be changed unless recording a new message. Switch S1 should be left in **Auto** position and flipped to **Test** only when a test is to be made from inside the house. In this case you will like to hear what you have just recorded.

To record a message turn switch S2 to **Mic.** position and plug in the crystal microphone. Flip switch S1 to **Test** position. Now hold the slide arm switch to **Talk** position. It is best to repeat a message at least twice and several messages can be recorded at the same time. The message that is now recorded will erase the previous message.

The recorder can now be mounted in a cabinet or placed in a case where dust cannot get onto the tape. Label all controls and terminals with a label maker or lettering material.

**Trouble Shooting.** If the tape runs too slow replace the 1½-volt battery. Squeals and low volume are a sign of a weak 9-volt battery. If the unit double talks, the unit is not erasing the tape normally erased automatically as you record. Sometimes there will be a buildup of sounds that did not erase completely. You can clean the tape electronically by disconnecting the 9-volt battery and running the tape unit through a complete cycle. If the small erase magnet is not up against the tape when recording, double talk will also result. Sometimes this mounting screw will come loose in shipment and will not erase on the tape. To correct this, slide the arm to talk position and loosen the set screw. Make sure the magnet is now against the mounting tape and tighten the set screw.

If the tape runs backwards, the flashlight battery is connected backwards. If the tape breaks or becomes raveled, rethread with regular ¼-inch recording tape. Be sure to check
that the contact points on the 6-volt relay close when energized and break when the relay is open.

The batteries will last a long time with intermittent service. For longer life, parallel another battery with each of the 1½- and 9-volt batteries.

The practical applications of the Electronic Greeter are quite numerous but it is not at all limited to the practical. After the few hours construction time involved, those close friends you expect might receive a somewhat dubious greeting—"Go away, there's no one home, go away, there's no one home, go away, ther....."

Installed on the kitchen worktable, the lady of the house can tape messages for expectant callers and others before she leaves to shop.

Schematic diagram for the Electronic Greeter. Wire Q1's circuit close to Minicorder

**PARTS LIST**

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>1½-volt battery (Eveready 635 or equiv.)</td>
</tr>
<tr>
<td>B2</td>
<td>9-volt battery (Eveready 216 or equiv.)</td>
</tr>
<tr>
<td>C1</td>
<td>50-mf., 12-VDC electrolytic capacitor</td>
</tr>
<tr>
<td>C2</td>
<td>10-mf., 12-VDC electrolytic capacitor</td>
</tr>
<tr>
<td>J1</td>
<td>Jack to match the microphone used</td>
</tr>
<tr>
<td>K1</td>
<td>60-second delay relay with normally closed contacts (Amperite 6C60T-60)</td>
</tr>
<tr>
<td>K2</td>
<td>4-p., d.t., 6-VAC relay (Potter and Brumfield 3RY208 coil and 3RY219 contacts)</td>
</tr>
<tr>
<td>Q1</td>
<td>2N107 transistor (General Electric)</td>
</tr>
<tr>
<td>R1</td>
<td>100,000-ohm, 1/2-watt resistor</td>
</tr>
<tr>
<td>R2</td>
<td>47,000-ohm, 1/2-watt resistor</td>
</tr>
<tr>
<td>R3</td>
<td>15,000-ohm, 1/2-watt resistor</td>
</tr>
<tr>
<td>R4</td>
<td>270-ohms, 1/2-watt resistor</td>
</tr>
<tr>
<td>S1</td>
<td>5-p.d.t. toggle switch</td>
</tr>
<tr>
<td>S2</td>
<td>5-p. 3-position rotary switch (Lafayette SW-95 or equiv.)</td>
</tr>
<tr>
<td>T1</td>
<td>Filament transformer; 115-v primary, 6.3-v secondary at 1.2 amperes (Stancor P6134 or equiv.)</td>
</tr>
<tr>
<td>TBI</td>
<td>6-post terminal barrier strip</td>
</tr>
<tr>
<td>1</td>
<td>1-inch PM speaker</td>
</tr>
<tr>
<td>2</td>
<td>2½-inch PM speaker</td>
</tr>
<tr>
<td>1</td>
<td>Aluminum chassis box, 5&quot;x7&quot;x2&quot; (Bud AC-402)</td>
</tr>
<tr>
<td>2</td>
<td>Aluminum chassis box(es) 5½&quot;x3&quot;x2 1/2&quot; (Bud 2106A)</td>
</tr>
<tr>
<td>1</td>
<td>Minicorder (available for $8.99 from Mission Liquidators, 735 Celis Street, San Fernando 82, California)</td>
</tr>
<tr>
<td>MISC.</td>
<td>AC Power cord, 9-prong wafer tube socket, nuts, bolts, rubber grommets, wire, etc.</td>
</tr>
</tbody>
</table>

Estimated construction time: 5 hours
Estimated cost: $22.00
The most experienced electronics experimenter usually ends up at the local garage to service and repair the electrical and electronic equipment or parts in his car. In many cases he does not perform simple preventive maintenance checks such as checking the generator or alternator regulator, battery, lights, switches, relays, stop and tail lights, turn signals and accessory motors. The exact reasons for this reluctance to work on a car’s electrical system is two fold: (1) the lack of suitable test instruments, and (2) almost no knowledge of how many of the car’s electrical circuits work. Both these reasons can be virtually eliminated with the purchase Gen-Reg-Tester—a kit especially designed for the home auto mechanic.

Engineered for automotive applications, the Model G-R tester has a two range voltmeter (0-10 and 0-20) and -5-0-50 ampere meter. The unit can be wired in one and a half hours. It is rugged and dependable as commercial units costing many dollars more.

The instruction sheets supplied with the kit Gen-Reg-Tester tells you how to make important operating tests on your car. For example, you can check to see whether the current limiter coil in the regulator prevents excessive generator currents from being drawn as well as measuring the regulator’s reverse current cutout setting. But most important, the tester permits rapid troubleshooting on all 6- and 12-volt cars. The Gen-Reg-Tester can be had for $15.95, postpaid, from Auto-Kits Products Inc., Dept. 22, 1244 So. Grand Avenue, Los Angeles, California 90015.

You can assemble in one evening a handy tester for auto servicing that will pay for itself by eliminating repair bills.

Outline drawing shows location of parts in tester and ease in which it can be assembled.
Shake-proof steel rivets give your construction projects the "pro" look

One of the new hand tools on the electronic market place is the "Pop RiveTool"—a plier-like device that is used to install cold steel rivets in blind holes with just a squeeze of the hand. Pop rivets can be used to replace sheet metal screws and machine screws for fastening jobs on chassis, aluminum boxes, name plates, or even children's toys. If your local distributor does not have the "Pop RiveTool," you can obtain yours from Burstein-Applebee Co., 1012 McGee Street, Kansas City, Mo. 64106 for $5.44 plus postage. Start popping projects today!

Drill and punch a project chassis as you would normally for assembly with 6-32 machine or self-tapping screws.

Insert rivet with nail tip up (above) in hole where screw would normally be placed. Spot the RiveTool over the nail (right) and slip into place snugly against the chassis.

Now squeeze the RiveTool's handle (left); the nail is pulled out of the rivet at the same time it flattens the rivet's back making a tight fastening job. Above, the completed one-tube project looks like it was store-bought.
Long tape loops are easy to handle when contained in this compact, easily-constructed pack. Use it to capture elusive sounds, as a teaching aid for music or languages.

By Jorma Hyypia

Loop recording is basically a very simple procedure; all you do is splice a length of tape into an endless loop and slip it into the recorder to replay short duration sounds repeatedly without the need of rewinding the tape after each play.

The loop has many practical applications; yet most tape hobbyists seem to make very little use of the technique, probably because only the shortest of loops can be conveniently handled without fear of hopeless snarling.

But build the loop pack described in this article from scrap materials, and you can keep loops up to twenty feet long under full control and ready for instant use at home or in the field. Slip the pack on your recorder in a matter of seconds, and no sound, however elusive, can get by unrecorded.

Using the Loop. The most obvious application is the recording of sounds you know will occur, but whose precise time of occurrence you cannot predict. Thunder claps, bird calls, animal sounds, boat and train whistles—these are all good examples. With your loop pack operating, you can wait for minutes or all day if necessary until the sound occurs; the tape is constantly erased and re-recorded until you stop the machine to preserve the desired sound. You can, of course, use a recorder in the orthodox way to capture such sounds. But what happens? The sound is likely to be buried in the middle of the long tape mostly filled with unwanted sounds; or you have run out of tape, and the sound occurs just as you are in the process of rewinding another reel.
Once the wanted sound is recorded on a loop, you can either keep it in the pack for replay purposes, or you can remove it for splicing into other tapes. You can also transcribe the sound to another tape if you have two recorders to work with.

The same technique can be used to record interesting material from radio or TV broadcasts. Perhaps you like to collect unusual anecdotes, or the voices of celebrities; just keep the loop running while you listen to the broadcast, and turn it off when it picks up something you want to save.

The tape loop is an excellent educational aid in any project involving memorization. Foreign language phrases, for example, can be played over repeatedly while you go about other work; the constant repetition—revealing none of the fatigue that would be soon evident in constant human repetition—soon firmly impresses the words and subtle nuances into the learner's memory. In like manner, complex mathematical formulas or other technical information can be memorized easily with the aid of tape loops.

If you play a musical instrument, try recording difficult sections (from records or other tapes) onto a loop; then play along with the constantly repeated sound to improve your own instrumental technique. No need to rewind the tape recorder constantly to play the problem section over again.

As an electronics hobbyist, you can record the sound characteristics of your hi-fi equipment on tape loops in order to study the taped data with an oscilloscope or other test instrument.

Incidentally, you don't have to build the loop pack to test the usefulness of tape loops. Even a long tape can be stretched across the room with the far end hung over a doorknob—provided there are no children or pets running about. But how would you cope with such a free-swinging loop out in the field where there are no door knobs, but perhaps crowds of people or a heavy wind? A pack of some sort is then absolutely essential. This will serve well anywhere, any time.

**Base Panel.** Start construction of the loop pack by cutting two 4½” x 14½” panels from ⅛”-thick masonite. One of these will form the base panel, the other the pack cover.

On one end of the base panel (rough side) glue and nail securely a 4½” x ½” x ¼” block of wood. On the rear of this block screw a piece of rigid metal that has been bent to form a lip to hold down the rear end of the pack cover. This rear lock is easily fashioned from aluminum edging material used to trim the edges of formica-covered kitchen counters. The gap between the lock lip and the block to which it is fastened should be no wider than necessary to allow insertion of the cover edge.
Another block of wood is fastened to the opposite end of the base panel; this is shorter than the rear block, and has two notches cut into it through which the tape will run in and out of the pack. Round off sharp edges in the notch to prevent abrasion or snagging of the tape. Leave drilling of the bolt hole until later.

Near each end of the base panel drill eight \( \frac{3}{16} \)"-diameter holes spaced \( \frac{3}{8} \)" apart. Note that these holes are at slightly different distances from the two end blocks. Before drilling the holes, tape the cover panel underneath the base panel (smooth sides touching) so that the series of holes in both panels are drilled simultaneously. This will ensure perfect alignment of the holes. The tape guide pins will be glued into the base panel holes later.

**Tape Rack.** The frame of the tape rack consists of two \( 13\frac{3}{4} \)" x \( \frac{3}{8} \)" x \( \frac{1}{2} \)" strips of wood. On the inside of each strip cut a \( 5" \) groove \( \frac{1}{8} " \) wide and \( \frac{3}{16} " \) deep to hold the spacer panel.

The spacer panel may be of masonite, plastic, metal, or stiff \( \frac{1}{8} " \) thick cardboard. Its length—about 4 inches—is not critical, but the width should be accurately cut to

---

**FAR LEFT.** Paint dark bands on the spacer panel of the rack to facilitate loading of the tape (see text); at top of photo is front end of base panel, showing notched block and one set of tape spacer pins set in place.

**LEFT.** Component parts of the tape loop pack prior to final assembly: tape loaded rack, base panel with spacer pins, cover panel and the lock plate and securing nut.
TAPE LOOP PACK

ensure good alignment of the frame strips with the base panel edges when the spacer is pushed all the way into the grooves.

Near the ends of the frame strips, drill holes to take the roller bearings. Note differing positions of holes at opposite ends of each frame strip. Important: position these holes carefully, and drill straight.

Roller bearings are easily made from four hollow brass rivets, ¼" in diameter and 3½" long, with heads about ¾" in diameter. Using a drill that just fits into the rivet shank, drill the hole on through the rivet head; remove all burrs very carefully. The bearing holes in the frame strips should be just large enough to permit snug press-fitting of the rivet shanks into them. The rivet heads must be on the inside surfaces of the frame strips.

Roller construction is the most critical part of the pack construction; each roller must be perfectly straight and smooth and must turn freely without binding. Binding, or a slight warp in the roller, will cause uneven tape movement resulting in distortion.

(Continued on page 109)
Neither sunshine nor rain are required to sprout this less-than-postage-stamp-size crystal in the dark of your basement workshop lab.

In the years since semi-conductors first appeared on the scene, there has been a flood of informative literature describing the complexities of manufacture. Most of the articles have been a point of the extreme purity of the materials used and the minute traces of foreign elements with which they are doped. It's enough to make the most dedicated do-it-yourselfer cringe!

Actually, it's a relatively simple matter to make your own semi-conductor. Furthermore, it requires no exotic minerals with an exasperating degree of purity. Once you have accumulated the few simple materials required, you can turn one out in less than ten minutes. Then you can wire the galena crystal to a coil, two capacitors, ear phones, antenna, and ground and tell your friends, “Come! Listen to the crystal radio I grew.”

Xtal Recipe. You will need two ingredients. One is lead—either raid the fishing tackle box for some sinkers or beg a few ounces from a friendly plumber. The other ingredient is sulfur. A couple of generations ago it could be found in every medicine chest waiting to be mixed with molasses. Now, however, you’ll probably have to stop at the corner drugstore where you can get a small bottle or tin for a few cents.

The items of equipment you’ll need to go into the semiconductor manufacturing business consist of a short piece of ½” or ¾” copper tubing, a propane torch, and perhaps a little sand from the children’s sandbox or local beach.

By now the chemist and the old-timer have recognized the “semiconductor” by its ingredients. It is lead sulfide, otherwise known in its natural state as galena. A long time ago when solid state physics wasn’t even a gleam in someone’s eye, and germanium and selenium were merely names in the periodic table, the galena crystal was performing yeomen service in the infant radio industry as the detector element.

Nobody questioned how or why it worked.
grow your own crystal radio

The term “semiconductor” hadn’t yet been coined and “holes” were something found only in doughnuts and Swiss cheese. But the crystals worked and you can make some of your own if you follow the pictorial instructions.

**Duplicating Nature.** You won’t get the big, shiny crystals that nature took millenia to produce, but you will get a sparkling nugget loaded with sensitive spots just waiting for the catwhisker—pardon me—I should have said you will get a sensitive semiconducting device in the form of a point-contact diode!

To grow your own galena crystal, follow the step-by-step procedure that is given in the numbered photographs. Follow the instructions carefully keeping in mind that you must proceed carefully to avoid painful and injuring burns.

**Crystal Radio.** There are probably more variations of crystal set circuits than any single piece of electronic equipment. This is not surprising in view of the fact that a whole generation of experiments worked almost exclusively on the problem of increasing the sensitivity and the selectivity of the crystal set.

The circuit in the schematic diagram is a compromise. It is simple, uses readily obtainable components, and requires no more skill than the most elementary training in soldering.

Step 1. Reduce the lead to fine granules by rubbing it on a file or rasp. Sulphur melts at 250 F, lead at 600 F. By using powdered lead we can ensure that at least some of the sulphur will combine before it burns up.

Step 4. Place the filled tube on an insulated surface, a brick will do, and heat gently with the torch. Hold a protective pane of glass or plastic in front of your face while using the torch because the sulphur may spurt out. By the time the tube begins to glow, the lead will have melted. Now wait for it to cool.

The home-grown radio at the left can be put together as easy as A, B, and C for crystal. See schematic diagram.

Three specimens of mounted crystals. Cylindrical object at the far right is lead sulfide as it comes from the copper tube. As a rule, signals obtained from the crystal near solder line are the strongest.

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Step 2. Measure out six parts by weight of lead powder to one part of sulphur. Proportions aren't too critical. It's best to be liberal with the sulphur because, unfortunately, a great deal of it goes up in smoke. Be sure to mix the lead and sulphur together thoroughly.

Step 3. Pour the mixture into a piece of copper tubing about 1½ to 2 inches long and tamp it down. Fill the tube about half full. Fill the rest of the tube with sand to reduce the amount of oxygen available to the sulphur in order to decrease its rapid burning.

Step 5. Cut the tube open with a hack saw and remove the lump of metal. If nugget breaks readily and the broken surface presents a sparkling appearance, you have lead sulphide. If lump is not brittle but maleable, the sulphur burned up before crystallization took place. Start over applying heat more gently.

Step 6. Line a small ring of copper with paper to keep solder from sticking. Melt the ring full of solder and embed a fragment of crystal. When the slug cools, remove the ring and save for reuse. Clean the solder slug so it will make good contact with its holder. Now the mounted crystal is ready to be used.

December, 1964

able parts, and possesses considerable selectivity. The latter feature is important because today the great bulk of the population lives within range of several local stations. And, let's face it, the crystal set just wasn't made for DXing. So a little loss in sensitivity is sacrificed for simplicity and selectivity.

The detail drawing shows one method of making the “catwhisker,” the forerunner of today's point-contact devices. Its purpose is to make contact with one of the shear faces of the lead sulphide crystalline structure.

(Continued on page 108)
Four and five year-old Valerie and Jay are a good match at games the youngsters play. Little Jim is happy just watching those pretty color lights.

Switch & Shine

By James Robert Squires

Fill this cake pan with a circuit that requires very little dough and you've got a toy the kids will "eat up"

All children love the twist of a knob or the click of a switch. Very often they will vent their emotions on the TV, your revered hi-fi components, or the electric grill. Turning electrical equipment on and off can be dangerous and damaging. But you can still let the kids have their fun with this "Switch and Shine" toy. It can be built in one evening for only $3.75; and it will provide many evenings of entertainment for the young, and the old who are watching (or playing themselves).

"It's Too Easy!" is a whine you won't hear. One challenge of the toy is to turn on both eyes and the nose at the same time. This is not easily accomplished with a switch for each eye and nose but with the proper combination of switches. This takes the clown face out of the realm of a short-lived, easily mastered toy and into the category of a lasting and challenging game and amusement. For example, it took an average of seven tries to place all three lamps in series. This is less than the usual because I knew the special functions of S1 and S2 and therefore had an advantage.

"How Does It Work, Daddy?" The physical locations of the switches are pinpointed in the schematic diagram. For the eyes and nose to light together, five of the six switches must be in the right position. S1 can bypass S2 and provide either nose or eye voltage. To begin with, S1 must be in the left position and S2 in the closed position. The nose lamp completes its circuit through a combination of two switches, either S3-S4.
PARTS LIST

B1—3-volt battery (four 1.5-volt cells)
I1, I2, I3—Miniature lamps (GE #49)
S1—S.p.d.t. toggle switch
S2, S3, S4, S5, S6—S.p.s.t. rotary appliance switches (Burstein-Applebee Co. 12A172)
1—Heart-shaped baking pan
1—Battery holder for four C-cells
3—Lamp socket and jewel assemblies, 2 red and 1 green (Allied Radio 7E967 and 7E969, respectively)
Misc.: Wire, solder, solderless connectors, nuts, bolts, etc.

Estimated cost: $3.75
Estimated construction time: 1½ hours

or S5-S6. The right eye can complete its circuit through S3 or S4, S5 and S6. This also applies to the left eye; it can complete its circuit through S6 or S5, S4 and S3. For these reasons no one switch controls any eye or the nose by itself. These interconnections even serve to thwart the adult memory; you may even find yourself sitting on the floor holding a half-lighted clown's face while your youngest smugly holds his or her with its eyes and nose glowing!

The switches are not identified on the face but their physical positions are learned after awhile, of course. Switches S1 and S2 have distinct functions; their effect on the lighting can be memorized. However, switches S3 through S6 may have one effect on the lights at one time and another the next.

Electrical Checkers. Two can play the game with the goal being that the first person to place all the lamps in series is the winner—both players work independently against time. Or two can play "clown's faces" with the goal of all lamps lighted by alternating moves as in checkers. Skill comes when you learn to predict the next move or switch that should be operated. It is possible to plan moves to confuse your opponent but, be careful, that next move may set him up to win.

(Continued on page 110)
Lovely Ina Balin finds the Lodestar just perfect for rehearsing her lines in the latest Jerry Lewis film "The Patsy." Below, tape cartridge and battery cover are removed revealing sturdy internal construction.

Lab checked for utility, Channel Master Lodestar miniature tape recorder rates a top buy as a practical portable voice recorder

If you’re a club secretary having trouble keeping minutes during hot debates, then Channel Master’s Lodestar cartridge-loading, miniature, tape recorder should be at your side. This precision quality, battery operated instrument can be carried (it weighs two pounds fully loaded) and played anywhere. Designed to record only in the human voice frequency range, it is ideal for business meetings, parties, social events, etc., then play back, loud and clear, at your convenience.

**Tape Cartridge.** The single, most significant feature of the Lodestar is its tape cartridge and how easy you can load it into the recorder’s cartridge slot with the same finesse George Raft would use to slap a full clip into his 45 automatic. Record for 16 uninterrupted minutes on one-half track, remove the cartridge, flip it and start on a second 16 minute interval—32 minutes in all. Rewind takes four short minutes.

The recorder and cartridge were handed to three individuals with the verbal instructions to record, “Mary had a little lamb,” and to play it back. Having never seen the unit before and without the aid of Channel Master’s illustrated operating instructions, all three were able to do so in under five minutes—the record time was 96 seconds. With the instruction manual, only non-readers could fail to operate the unit without helpful hints.

**Use Test.** The best test for a consumer product is to use it as the owner would under (Continued on page 110)
NEW! LAFAYETTE DELUXE ALL-TRANSISTOR 5-WATT DUAL CONVERSION C.B. TRANSCEIVER with TRUE MECHANICAL FILTER Model HB-500

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PROPAGATION FORECAST
for December, 1964—January 1965

By C. M. Stanbury II

The next two months can either be the best or very worst for SWL's. It all depends upon the listener himself. Those higher bands, 31 meters and up, while still useful during daylight hours will be at their lowest ebb in 10 years. Nighttime crowding on 49 meters will reach an almost intolerable level especially between 1800 and 0100 EST. On the other hand, reception on 60, 75 (SWBC) and 90 meters will set all kinds of records. Small, hidden away countries and stations can be expected to appear on numerous occasions with remote African stations coming in like locals.

We remind readers that these predictions are primarily valid for short-wave broadcast stations. Our figuring takes into account not only propagation factors (time of year, sunspots, and the like) but operating habits of the SWBC stations themselves plus QRM patterns. The latter two factors are every bit as important as any “natural” condition.

Utility stations (aeronautical, marine, etc.) of course follow different operating patterns and the above does not necessarily hold for them. Their communications are generally over shorter distances and they will normally use the lowest frequency open. Read Marine Broadcast DX on page 95. Thus DXer's should pick the lowest band shown above for the appropriate area at any given time and work near these frequencies.

To use the table, put your finger on the region you want to hear and log, move your finger to the right until it is under the time you will be listening and lift your finger. Underneath your pointing digit will be the short-wave band or bands that will give the best DX results.

The time in the above propagation prediction 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. However, Asia and the South Pacific stations will generally be received stronger in the West while Europe and Africa will be easy to tune on the east coast. The short-wave bands in brackets are given as second choices.
That old musty-colored peacock will get a big kick in late 1965 when TV's newest development brings improved color to TV viewers.

**CHROMATRON COMES TO COLOR TV**

That living-color picture—a peacock fanning a color-splashed tail—is in for a big change. After a decade of home color reception built around the "shadow mask" picture tube, a new breed of color tube is bowing in. It is the Lawrence tube, conceived by a university professor 14 years ago, cheered as an engineering marvel—and once rejected as impractical. Today it is a reality. Far from a laboratory curiosity (like most other stabs at a new-type color tube) the Lawrence version has followed a tortuous path of development until refined to the point of practicality. The first commercial TV sets containing Dr. Lawrence's radically different technique will soon be here. You'll
be seeing the tube under a new name, too; it's now the "Chromatron."

According to its present developers, Paramount Pictures Corp., the Chromatron promises several advantages. First is increased color brightness. More vivid color gives the illusion of depth in the picture and permits viewing under more room light. It's simpler, too. The number of tubes required over a black and white set is reduced by four or five. Circuits, are fewer; adjustments, less. The Chromatron could also open up the big, untapped field of small-screen color TV. The tube lends itself exceptionally well to under 21-inch screen sizes.

**Seeing Is Believing.** By what technical wizardry does the Chromatron hope to capture a sizeable segment of the growing color TV market? To find the answer, I traveled to New York's big Paramount theater—to an office situated a few floors above the huge movie screen. The attraction in that office proved far more exciting than the current movie attraction floors below. There were three side-by-side TV receivers, each displaying the identical program in black and white. The time: 10:27 a.m. I was instructed to watch and carefully compare the screens. In three minutes the local TV station would start transmitting in color. As 10:30 came up, the peacock obligingly fanned its polychromatic tail. The eye could not resist being drawn to the center screen; the bird appeared in brilliant and vivid color, nearly eclipsing the images on the two sets alongside it. (One was black and white, the other a conventional color receiver.) After some minutes, an engineer flicked on two white fluorescent lamps, aiming their beams directly at the two color screens. Again the results were startling. The center screen continued to display strong, clear color, suffering little "wash out" from the bright lamplight. I moved in close to the center screen, placing my eye about two inches from it. Instead of the usual fine dots I'd been accustomed to seeing on the usual color screen, there were numerous thin lines similar to what you see on a black-and-white screen when viewed up close. On this TV picture tube, however, those lines ran up and down, and glowed in different colors.

That center screen was the business end of a Chromatron. Paul Raibourn, vice-president of Paramount, then conducted an interesting demonstration to illustrate how increasing color brightness sharpens and suggests a 3-dimensional quality in the image; a bowl of fruit appeared to pop out from its background. An identical picture, of less illumination, appeared flattened. This, of course, dramatized the big advantages in Chromatron's ability to deliver high-intensity color. But to probe the inner workings, operation and theory of the tube, I toured the lab where actual developments had occurred; Paramount Picture's Chromatic Division.

**Inside the Chromatron.** Easily the most significant feature of the Chromatron is a

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Fig. 1. Conventional color tubes use a dot-pattern shadow mask (left) that consists of many fine holes; Chromatron uses fine, evenly spaced grid wires (right). Note the difference in transparency of the masks.
unique grid structure of fine stainless steel wires positioned just behind the viewing screen. Here lies the secret of the tube’s “transparency”—the characteristic which determines how brightly the screen can light up. In a regular black-and-white tube, transparency presents little problem; an electron beam issuing from the neck of the tube strikes the viewing screen and causes it to glow with light. There is little to block its path.

But in color tubes, some additional element must be introduced between the tube neck and screen. Although its function varies, as shown later, this element generally serves to keep colors on their correct screen position. But in performing its job, this element also cuts down the number of electrons which may reach the screen. Brightness suffers. We can compare this effect in Fig. 1. In the conventional color tube, electrons must enter small holes in a “shadow mask”—only a certain number can get through to the screen. The grid wires of the Chromatron, however, present rather wide spaces to the beam so electrons in greater numbers may continue on to the screen. As explained by Emil Sanford, engineering manager of the division, the grid is 90 percent transparent vs. 16 percent for the conventional color tube. It results in approximately seven times more brightness.

The second key feature of the new tube is in its electron gun: the structure contained in the tube neck which supplies electrons, and aims them toward the screen where they generate visible light. The conventional tube utilizes a 3-gun arrangement. The Chromatron, however, achieves color with a single gun.

To draw further comparisons, and venture more deeply into Chromatron operation, it's necessary to consider certain features of the transmitted color signal. They can be considered more simply at the studio end, where the televised scene is broken down into basic colors, then into corresponding electrical signals by the camera. As we will see, any color tube at the receiving end principally acts to reverse the order of what occurred in the camera.

The Color TV Camera. The drawing in Fig. 2 reveals a color-separating action of the studio camera. Based on a system of primary colors, the camera is seen in three distinct sections. Each responds to a different color; red, green or blue. There are, of course, many more than three hues in a scene. The human eye, in fact, can discern up to about 40,000 different ones. But just as the artist mixes primary colors to gain countless combinations so does color TV rely on a tri-color system to handle a huge number of hues. The color camera, however, achieves a neat trick that would befuddle the artist. It begins with a complete picture (the scene to be televised), then breaks it down into three primary colors. You demonstrate the principle everytime you look through a piece of colored glass or cellophane. If it's tinted red, for example, only the red content of the scene filters through. Thus, the camera in Fig. 2 has red, blue and green filters—equivalent to primary colors—for dividing many colors in the scene into their simplest form.

We've shown a yellow banana in front of the camera to illustrate the point. Yellow, it's been discovered, is actually a mixture of two primaries—red and green. This might sound disturbing to an artist who, upon mixing red and green, would get some muddy-looking combination. Color TV however, mixes light, not paint pigments. Light mixtures follow a different set of principles. Another example is that the artist cannot mix red, blue and green to get white. But in working with these colors as light, the following percentages will form white: 30 percent red, 59 percent green and 11 percent blue. So our yellow banana shows up in the color camera as red and green, after its light is split by filters. The pickup tubes, operating like photocells, convert the colored shafts of light into corresponding electrical signals. In this fashion, thousands of colors are decoded into three separate signals ready for transmission over the air.

There remains another important step—modulation. Since the color TV system must satisfy the needs of both monochrome and
color receivers to be compatible, color signals must not interfere with black and white. This is done by side-pocketing color information on its own carrier. This is the 3.58 mc in Fig. 2. In the modulation process, color signals are encoded on 3.58 mc, which is subsequently rejected by black and white sets. The Chromatron, however, utilizes it in a unique image-producing system.

The Color Picture. Let's see how signals are converted back into light of the correct color at the receiving end. In Fig. 3 is an overall view of a Chromatron tube. Housed in the narrow neck of the tube is an electron gun. Its hot cathode boils off electrons which travel as a beam in the direction of the yoke. Purpose of the yoke is to deflect the beam over the entire surface of the screen. Based on magnetic push-pull action, the yoke moves the beam over a familiar path: the same one your eyes now traces over the printed page; from left to right and top to bottom. The screen, therefore, is completely scanned. Occurring 60 times per second, the eye sees the screen uniformly filled with light. (Identical scanning action is also occurring at the studio camera. Camera and receiver beams are locked together by synchronizing signals transmitted by the station.) As the beam travels away from the yoke, it passes through the grid of fine wires mentioned earlier, then strikes the screen. Chemical phosphors deposited over the screen surface glow with light under the impact of the electron beam. The Chromatron, up to this point, has provided two important effects: a scanning electron beam in step with that of the camera, and a screen illuminated with light. There remains now the task of applying color and positioning it in the correct place on the phosphor screen.

Grid Wires. Let's examine a small section of the screen and the grid which lies just behind it, as illustrated in Fig. 4. The screen consists of thin stripes of phosphor material which emit red, green or blue light when struck by electrons. (Only three are shown for clarity, but they are repeated over the whole screen width. Note the position of the two grid wires shown. Since the electron beam is passing between them, striking only the middle phosphor stripe, the color green would be produced at this instant.

To understand the action of the grid, try this simple demonstration. Hold your arm up and point your index finger toward the wall. Now start to wiggle your index finger from side to side while, at the same time, sweeping your whole arm across the wall. This is a good illustration of the grid's function: it "wiggles" the tip of the electron beam so it moves over red, green and blue phosphor stripes. (Your sweeping arm movement represented the overall scan of the beam caused by the yoke in the tube's neck.) Now to look more closely at how the grid achieves this effect—and the role it plays in selecting correct colors.

In Fig. 5 is a portion of the screen viewed from the top. Shown are three possible beam
positions for producing primary colors. Consider, first, Fig. 5 (A). Green is being produced, as just described; the beam passes through the grid wires and strikes the green phosphor. Now let’s apply an electrical charge to the pair of grid wires. If the upper wire, shown in Fig. 5 (B) is impressed with a positive charge, it will attract the electron beam (which is negative) in the direction shown. A negative charge placed on the lower wire aids this direction by repelling electrons. Thus, the overall effect is to deflect the beam toward the red phosphor. The final example, Fig. 5 (C), simply reverses the charge on the grid wires and the beam now strikes the blue phosphor stripe. It should be apparent that by placing the proper electrical charges on the grid, the beam can be angled to select any of the three primary colors.

This system can not only produce white, but all the mixtures needed for rendering a color program. To generate white light, it is necessary to wiggle the beam among the three stripes—red, blue and green. It’s done by placing an alternating voltage on the grid wires, as illustrated in Fig. 6. Although movement is extremely rapid, the beam remains just the right amount of time on each primary color for producing the white mixture. The viewer’s eye blends the primary colors, since the glowing stripes are narrow and close together, and the complete screen appears white. And a complete scale from black to gray to white can be produced by varying the strength of the electron beam. This function—beam strength—will be provided by control voltages applied to the electron gun.

3.58-me Carrier. Now to create a full-color image on the screen. Recall, for a moment, what happened back at the TV studio. Electrical signals corresponding to primary colors were modulated onto a 3.58-me carrier. When these signals arrive at the receiver, a detector circuit reverses the modulation process to recover the original information.

Signals are now restored to the same form as when they emerged from the camera. The 3.58-me carrier, however, is not discarded; it serves to synchronize the Chromatron, as shown in the block diagram of Fig. 7. Note that 3.58 mc is applied directly to the switching grid of the tube. Here it fulfills the same function ascribed earlier to the “alternating voltage;” that is, to wobble the beam among the three phosphor stripes. But note the same 3.58-me energy is also being fed to red, blue and green “gates” which feed the electron gun. As the name implies, the gate opens or closes to permit the color signal to reach the Chromatron’s electron gun. Let’s assume that we want the color red only to appear on the screen. As the 3.58-me grid switching voltage focuses the beam on a red stripe, it also unlocks the “red gate.” This permits the red color signal to pass through the gate. It turns on the electron gun and red appears. At the same time, green and blue color signals are unable to turn on the beam; their gates are locked. As 3.58-me energy switches the beam to green, it simultaneously opens the green gate—and shuts red and blue gates. Thus the Chromatron’s circuits continuously sort out the incoming color signals and place them on their correct stripes. This would be equivalent to the filtering, or color separating, action in the studio camera.

A Yellow Banana. Now that we can position colors properly, there remains the

**Fig. 5.** Applying voltages to pairs of grid wires focuses the electron beam on one of the three phosphor screen stripes.

**Fig. 6.** An alternating voltage on grid wires shifts the beam among screen stripes.
problem of their mixtures. Creating the pure yellow banana televised earlier is not too difficult to visualize; as the beam swings over the screen area of the banana, red and green stripes illuminate (the blue gate shuts). The viewer sees a yellow mixture. A whole range of other colors is possible by varying the strength of the electron beam for each primary hue. Incoming color signals provide this information. As the strength of a given color increases, the signal raises the strength of the electron beam. Countless juggling of proportions presents all necessary screen hues for reproducing the color signal.

This, in simplified form, is the Chromatron's operation. Bringing it to its present state of development was no mean feat. That color switching grid, for example, presented engineering problems in early models. The fast switching voltages applied to the thin stainless steel wires set up a type of oscillation, or ringing, not unlike a microphonic tube in an audio amplifier. As the wires vibrated mechanically, they affected color reproduction. Today the problem is cured by stringing a very fine glass fiber thread through the wires to damp out movement. Perfect alignment of the grid wire with phosphor stripes on the screen was also difficult. Now, an electron printing system is used; during manufacture, electron beams are swept across the raw screen to "print" the positions where the phosphor stripes are to be deposited. The resulting match is perfect.

Unmasked. Other features of the Chromatron are apparent when the tube is compared to the conventional "shadow" mask color tube, shown in Fig. 8. The standard tube utilizes three electron guns aimed at a screen covered with tiny phosphor dots. Each gun is driven by color signals from the

Mockup of basic Chromatron structure (upper left) shows glass phosphor screen, left, wire grid, center, then bellshape section leading to neck of tube. Layout of small Chromatron (above) that will be seen late next year. Note dark frame held by hand. It permits one-piece assembly of fine grid-wire suspension; an important breakthrough for mass-producing the Chromatron. At lower left, Engineer John Petro looks at 8" and 23" Chromatron.

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station—red, blue and green—and the corresponding dots glow in color. The purpose of the shadow mask, is to prevent the triple beam from sweeping over the wrong dots. This is how color separation is achieved. The elimination of the shadow mask in the Chromatron is the basis that tube’s claim to much higher color brightness. But another major factor occurs; convergence. The three beams of the conventional tube must focus precisely as they pass through holes in the shadow mask. Only in this fashion will they strike correct color dots. To provide the focusing action, there are special adjustable coils and magnets on the neck of the tube which compress or converge, the beams together. Since the Chromatron has only one electron gun, the convergence problem is eliminated; the switching grid focuses the beam onto the proper stripe. The effects of the earth’s magnetic field, too, are less in the Chromatron. This would ease the problem of moving a color portable from one room to another, or from a picnic area to seashore, for example. Variations in the earth’s field are less disturbing to color purity.

**Want to Buy One.** When will you see Chromatron-equipped sets on dealer’s shelves? It is expected that production models will make their initial entry into this country via Japan. Under license from Paramount, Japan’s big Sony Corporation is concentrating on an 18-inch color portable. Among American companies, Raytheon appears to be closest to producing the tube for U. S. manufacturers. Size might be anywhere from 8 to 16 inches. The only problem now confronting U. S. producers is setting up the tube on a production line, have it spew out in large quantities, and retain close tolerances. When this kind of momentum is achieved, the uncomplicated, low-cost color receiver should come on strong. In any case, Sony considers the Chromatron just about ready for production and possibly could bring sets into the U. S. in the very near future. Price at this time has not been announced, but Peter Ramella, Chromatic’s general manager, believes that ultimately the Chromatron approach could lop a sizeable chunk off the price of small-screen color. His estimate is an approximate $250 price tag.

Research has not ceased on the Chromatron. Even now there is an effort to further simplify the circuits outside the tube. Also under development are techniques which would enable the picture tube to accomplish functions now handled by small chassis tubes. New techniques, which promise even greater brightness, are in the offing.

With engineering now in a highly refined state, there remains only the mass-production details to work out. There is no question about the high interest being demonstrated by Sony and other Japanese firms. Combine this with interest already expressed by American producers and you can say that the Chromatron has come to color TV.

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**Fig. 7.** Action necessary for producing blue image on phosphor screen—the 3.58-mc signal simultaneously positions beam on blue screen stripe and opens blue gate. Blue signal (originally from TV camera) may now control gun’s beam strength at this short instant.

**Fig. 8.** Conventional color tube uses three guns, shadow mask, and phosphor-dot screen.
Short-wave listening hits the road

Two-transistor
Converter offers
9 SWBC-band operation

Short-wave listeners who take to the highways for family outings on Sundays need not leave their hobby behind while motoring. Now, SWL’s can install an all-transistorized, Autovox short-wave converter, Model OC-401, under the dashboard and convert the existing auto radio into a full-fledged short-wave receiver. World-wide reception on the nine popular short-wave bands (13, 16, 19, 25, 31, 41, 49, 60 and 90 meters) is just a flick of a pushbutton away. Since the off button restores normal broadcast band reception, the Mrs. wouldn’t mind the attractively designed 13½” high, 7-1/16” wide and 5-1/3” chromed unit under the dash.

The circuit of the converter is quite simple, however, parts mounted on an uncrowded printed circuit board secured to sturdy steel give the unit an appearance that it was designed for the military. Each push-button picks out a tuned LC circuit for the input to the RF transistor amplifier. The amplified signal is then supplied to a oscillator/mixer transistor stage which “beats” the signal down to the high end of the broadcast band. The oscillator circuit uses slug-tuned, high-Q coils for each band. The power supply has two important features. One is that either a 6-volt, negative ground or 12-volt, positive or negative ground car battery system may be used to power the converter. The other feature is a regulated supply powering the oscillator/mixer stage. Voltage regulation insures against frequency drift no matter what the battery/generator system is delivering to the converter.

The converter comes complete with brackets and hardware needed to install the unit under the dash of any car. Once mounted, unplug the antenna from your car radio and plug it into the converter—then plug the antenna lead from the converter into the AM radio. Two trimmers must be adjusted—these can be done with or without test instruments. Now connect the power lead to any DC line that is de-energized when the ignition switch is locked at off and you’re all set to DX.

If you like the idea of DX’ing while on the road, then the Autovox converter, Model OC-401 is a hot buy at $36.25 postpaid. Just write to Autovox Corporation of America, Dept. RT-14, 250 West 57th Street, New York, New York 10019 to place your order or obtain a list of local dealers.

Rugged, but neat, the Autovox converter is designed to take the hard knocks an auto can give.
Flying CB relays became a big time hobby when integrity died

C. M. Stanbury II

I sat quiet, and calmly listened to Waldron Arthur's flying CB relay, KBZ12000 as it hovered two miles up. The final competition started in an hour, his CBR1C relay had consistently flown higher than mine, his airborne receiver was blessed with a lower noise level and his directional beam would certainly produce more gain. But I was still going to beat him, like just once.

Harvey listened too, fiddled with my car keys. "Hadn't you better leave soon?"

"Yeah, I guess." I stood up. "You got it down pat?"

He droned off the grand design. "During the competition I monitor your signals. When you give your call as KBZ-thirteen-245, I push this button." Harvey pointed to my spore transmitter. "Out goes a false signal to Waldron's relay and down she comes."

"The relay is turned 45 degrees and then it can't pick up his ground signal." I took my car keys from brother rat.

"But eventually Waldron's pride and joy will crash?"

Half way out the door. "Yeah, probably." Outside, I got into my car, started the motor, headed for Davis Park and the CB-DX showdown. No matter which side Harvey was on, he got on your nerves after a while. Harvey is, frankly, a louse. He's not in the competition because he'd lost his license. A perpetual CQ right through a marine distress did the trick. Waldron turned out to be that distress and big man Waldron sicked the FCC on Harvey.

It was a hot day with threat of lightning and thunder. But the noise level at 27 mc. was not yet high enough to foul up anyone's control system. The real fireworks was still to come.

Waldron is the first and only CB'er to work all 51 states. I have 50. Waldron was first to work a Mexican CB'er, beat me by 5 minutes. In fact, Waldron invented the flying CB relays themselves. That's why I just had to do him in this time.

Davis Park is on a hill, highest point in the area which pretty well eliminated natural
terrain as a contest factor. When I got there, judges and official monitoring stations had already begun their final communications checks. A fixed station every 10 miles with mobile rigs to determine that winning distance exactly.

I slid from behind the wheel, Waldron waited with great big put-on friendly smile. "You already for the big day, boy?"

I nodded. "Think so." Removed my gear from the trunk. As I lifted out the miniature launch pad, Waldron took one end and helped me set it up.

"Think we got it level?" he asked.

"Good enough." If this had been Harvey, he would have busted a support or something dirty like that. In fact I kept my own R/C channel and system secret from him in case another competitor offered a better price. But Waldron is such a good sport, it's disgusting. "You got your gear already setup, man?"

"Oh, yes." He pointed to his own spot halfway across the park. "Waiting to go for the last half hour."

"Aren't you afraid somebody'll monkey with it?" I said as I brought out my helicopter-like relay.

"Well, nobody except Harvey takes DX that seriously. It's really just a game," he said softly. "That's all."

Harvey gets on the nerves; Waldron nauseates.

I injected the fuel and started the motor. Let it warm up then sent her up about 100 feet.

Waldron watched, confident as the devil. "Your motor sounds nice and smooth."

Checked out the other controls—down, up again, forward, back and turn—everything functioned well.

A blast from the PA. "Places, fellows, let's get this show on the road." Even the judges had delusions of grandeur.

He slapped me on the back. "Good luck, old man," and trotted off toward his own rig.

"Same to you, Waldron!" I sent the relay straight up. I wanted to catch as much tail wind as possible. Around 11,000 feet she would go no higher but now the wind and motor drove the relay east at 10 m.p.h. With a speed like that there'd be no trouble reaching the 130 plus maximum miles between base and relay. And the winning signal hop would be somewhere over 260.

From monitor's checks you could tell Waldron was using the same strategy. We both worked Monitor 10 within the first half hour. To count, the monitor only had to hear us at these speeds both relays would keep clear of those thunder storms moving in from the West. I figured on waiting for that storm to put Waldron out.

Everything broke loose around Midnight, rain, lightning, thunder, the works. Waldron and I had all base gear mounted in our cars but the other challengers were outside and in a few minutes really drenched. It unnerved one guy so badly he muffed a signal and lost control of his relay. Decided it was time for Waldron to do likewise. "Monitor 20, this is KBZ-thirteen-245. How do you read me?"

"KBZ13245, Monitor 20. Loud and clear," came through the QRN.

I switched over and monitored Waldron.

"Monitor 20, this KBZ12000. How do you read me?"

No answer, nothing but atmospherics. Harvey had done it well. Waldron tried again. Same result.

"Monitor 1, this is KBZ12000. My relay seems to have gone up. I am switching to 4, my alternate channel."

"Roger, KBZ12000."

I moved my receiver over to 4, knew it wouldn't help.

"Monitor 20, KBZ12000. How am I on?"

"S/9, KBZ12000."

"KBZ12000, this is Monitor 26. I'm now reading you also." I yelled shocked! Not only was Waldron back on the air but his range had suddenly jumped by 60 miles.

I sat there for a while knowing that KBZ12000 would win again. I ignored my own relay, tuned my receiver aimlessly over the channels. I listened to his RC frequency. Nothing, no control signals at all!

Now I systematically checked all 27. Waldron was not controlling his relay.

It took a couple more minutes before I got the whole picture. KBZ12000 had a second relay, already strategically located before the competition began and controlled down course by some stooge.

Not only is Waldron a better CB DX'er than yours truly, he's also a better cheat, too!

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You can stop watching and waiting for the mailman and go about your chores—he has arrived when your receiver's light pops on

Here is a small R/C mailbox alarm that will tip you off when the postman leaves your valuable mail. And, of course, it will also flash when someone who shouldn't be is tampering with your mailbox.

The alarm is constructed in two units—a small R/C transmitter that is installed in the mailbox and a small portable R/C receiver that can be taken to any room in the house. When the mailman opens the mailbox lid, a red light comes on in the small receiver alerting you that your mail has arrived.

The Transmitter. The mailbox alarm is operated on the R/C and CB Channel 23 frequency of 27.255 mc. A small transistor oscillator in the transmitter provides the power to turn the receiver relay on. The transmitting unit circuit is very simple and only a few hours are needed to construct it. The effective range is a good three blocks. Circuit operation, initiated by a mercury switch, is illustrated in the schematic diagram.

Construction. Cut a small piece of perforated board 1¾ x 2¾ inches. Drill two ½-inch holes in opposite corners for mounting the board to the metal chassis. Place coil L1 upon the board and drill holes for the coil connections. Lay the crystal down and drill two small holes for the crystal's prongs to stick through the perforated board. The layout of the small transmitter is not critical but the photos showing the placement of parts should be followed as closely as possible.

In wiring the unit, start at the antenna connection. Wind ten turns of number 22 hookup wire over a pencil to make L2 and then push the coil off the pencil form. Leave twelve inches of wire on one end to go to the small dipole antenna. Solder the other end of the coil to terminal 1 of L1. Run a wire
R/C MAILBOX ALARM

from terminal 2 to one side of the crystal. Place a 15 mmf. condenser across terminals 1 and 2 on coil L1 and solder these connections.

After all major connections are made, mount the small transistor by pushing all transistor leads through the small holes in the perforated board. Tie collector to coil L1, terminal 1. Solder the emitter to the upper end of R3 and C2. The base connection goes to the other side of the crystal and junction R1 and R2. Resistor R1 is soldered to the junction and to ground. Refer to photograph and schematic diagram for details.

Take the battery connections and solder the black lead to junction C3 and terminal 3. The red battery lead will go to one side of S1. Place a s.p.s.t. toggle switch, S2, in series with S1 and ground. S2 is an emergency switch—when you go on vacation, you can switch off the transmitter. S1, the mercury tilting type switch, will be installed in the mailbox. Leave about 25 inches of flexible wire to connect the transmitting unit to S1. Use flexible earphone or phono two wire cable.

Mailbox Minibox. The transmitter will fit in a 3¼ x 2¼ x 1½-inch minibox. Just drill two holes in the chassis to match those in the corners of the perforated board. In the side of the metal box, drill two ½ inch holes to place rubber grommets—one hole for the antenna wire and the other for the wire to S1. Drill a ¼-inch hole in the front cover opposite coil L1. This is made for easy tune-up adjustment. A small ⅛ inch hole is drilled in the back of the minibox for a metal screw to mount the transmitter to the mailbox.

Use ½-inch spacer washers when bolting the perforated board to the bottom of the minibox so the bare wiring doesn’t touch the metal box. Pull the twelve inches of antenna wire and the flexible switch wire out through the rubber grommet. Do not mount the minibox transmitter in the back of the mailbox until you have checked out the system.

The Receiver. The receiver is a commercially available (Lafayette 99 G 3008, $8.95) radio control receiver used in boats and airplanes. The receiver, which uses a 3S4 tube is completely enclosed in a plastic container. Only a plug for power and actuator connections is external to the enclosure.

This receiver, the necessary batteries, and components peculiar to the alarm are mounted inside a bakelite meter case to comprise the receiver unit. With this arrangement the receiver is compact and portable for taking it to any room in the house. You may be in the recreation room in the basement, but when the indicator light goes on you know the mail has arrived, or someone is tampering with your mailbox.

Receiver Packaging. Referring to the receiver photographs, drill a ½-inch hole in the top of the bakelite case for the tuning rod on the R/C receiver to project. Also, drill a ⅛-inch hole in the top of the case for the pull-out dipole antenna.

The small perforated board holds all the transmitter components including the 9-volt battery. Component placement should be as shown.

The mounting board is secured in a minibox using ½-inch spacer washers to prevent the wiring on underside from shorting to the box.
Inside the bottom of the case drill two small ¼-inch holes for the battery bracket. Another ¼-inch hole is drilled quite close to the middle of the plastic box. Place the receiver, with condenser shaft through the top hole, and mark this bracket hole. In the case front panel, drill two 15/32-inch holes for S1 and the pilot light assembly.

Drill a ¼-inch hole in one end of the battery holder terminal and mount the 7-prong wafer socket that comes with the R/C receiver. Now mount the battery bracket in the case. Bracket the R/C receiver unit to the bottom of the box and mount S1 and pilot light assembly II.

You will notice when you run the yellow antenna wire to the dipole antenna that female and male button type clips are furnished with the R/C receiver for this hookup. Use a lock washer under the dipole antenna connection so it will not loosen. Run the positive lead of the 67½ volt battery (B1) to terminal 1 of the wafer socket. Solder the negative lead of B1 to one side of S1; solder the negative terminal of the 1½-volt battery (B2) to the same side of S1. The other lead of B2 goes to terminal 2 of the wafer socket.

Be sure to complete and check all connections on the wafer tube socket. Make sure the 67½-volt and 1½-volt batteries, B1 and B2, are connected properly. If the battery wires are reversed, the filament of the 3S4 tube will burn out.

**Tuning the Units.** Set the receiver tuning knob in the full clockwise position. Turn on S1 and the red light should go on. Now raise the antenna to about two feet and turn the condenser knob counter clockwise. The light at this point will start to flicker and then go off. If the relay chatters, back off another ½ turn. The higher the antenna is raised, the more the condenser will have to be adjusted so the light will go out. To operate at the longest distance, the antenna should be at full length. After the antenna is set, no further adjustments are necessary.

Now set the small transmitter close to the receiver and temporarily connect the antenna. Tip the mercury switch, so the transmitter is on. Adjust the slug of coil L1 so it is about half way out of the coil. The red indicator light should go on. Now separate the two units by about ten feet and adjust coil L1 again for the most sensitive spot. Leave the adjustment set at this point. All adjustments should be made slowly and rather carefully. When the transmitting unit is placed in the mailbox, coil L1 and the yellow knob on the black box, may have to be adjusted for sensitivity again, due to the

Transmitter and receiver should be tuned before the transmitter is installed in mailbox. Temporarily connect antenna and mailbox lid mercury switch.
The transmitter radiates on R/C and CB channel 23—27.255 MC. The crystal controlled oscillator utilizes PNP transistor Q1. Switch S2, in series with mercury switch S1, is necessary to cut off transmitter at will without disarming S1.

The receiver heart is the R/C receiver unit that is tuned through a small hole in its plastic case. Wafer plug and socket connect receiver to batteries. The socket also serves as a terminal point for connecting switch S1 and lamp.

**PARTS LIST**

<table>
<thead>
<tr>
<th>Parts</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>9-volt Eveready 216 battery</td>
</tr>
<tr>
<td>C1</td>
<td>15-mmf. fixed mica capacitor</td>
</tr>
<tr>
<td>C2</td>
<td>0.1-mmf. fixed mica capacitor</td>
</tr>
<tr>
<td>C3</td>
<td>0.01-mmf. fixed mica capacitor</td>
</tr>
<tr>
<td>L1</td>
<td>6 turns No. 22 enameled magnet wire over 1/4-coil with slug</td>
</tr>
<tr>
<td>L2</td>
<td>10 turns hookup wire (See text)</td>
</tr>
<tr>
<td>Q1</td>
<td>30 mc PNP RF transistor (Lafayette Radio 19 G 4211)</td>
</tr>
<tr>
<td>R1</td>
<td>27,000-ohm, 1/2-watt resistor</td>
</tr>
<tr>
<td>R2</td>
<td>220,000-ohm, 1/2-watt resistor</td>
</tr>
<tr>
<td>R3</td>
<td>47,000-ohm, 1/2-watt resistor</td>
</tr>
<tr>
<td>S1</td>
<td>S.p.s.t. mercury switch (Burstein-Applebee Co. #17A994)</td>
</tr>
<tr>
<td>S2</td>
<td>S.p.s.t. toggle switch</td>
</tr>
<tr>
<td>XTAL</td>
<td>27.255 mc crystal for radio-control citizens band service</td>
</tr>
<tr>
<td>1</td>
<td>Aluminum chassis box 3 1/4&quot; x 2 1/2&quot; x 1 1/2&quot; (Premier AMC-1001)</td>
</tr>
<tr>
<td>2</td>
<td>27 mc telescoping antenna (Lafayette Radio 99 G 3008)</td>
</tr>
<tr>
<td>B1</td>
<td>67.5-volt battery</td>
</tr>
<tr>
<td>B2</td>
<td>1.5-volt dry cell</td>
</tr>
<tr>
<td>I1</td>
<td>Indicator lamp assembly with red jewel and 1.5-volt lamp</td>
</tr>
<tr>
<td>S1</td>
<td>S.p.s.t. toggle switch</td>
</tr>
<tr>
<td>1</td>
<td>Radio-control receiver (Lafayette Radio 99 G 9028)</td>
</tr>
<tr>
<td>1</td>
<td>27 mc telescoping antenna (Lafayette Radio 99 G 3008)</td>
</tr>
<tr>
<td>1</td>
<td>Bakelite case 6 1/4&quot; x 3 3/4&quot; x 2&quot; and front panel (Lafayette Radio 19 G 2001 and 19 G 3701, respectively)</td>
</tr>
<tr>
<td>1</td>
<td>7-prong wafer socket</td>
</tr>
<tr>
<td>Misc.</td>
<td>Rubber grommets, wire, plastic, masonite, tape, nuts, bolts, washers, etc.</td>
</tr>
</tbody>
</table>

Estimated cost: $23.00
Estimated construction time: 4 hours

greater distance to the receiver. Each time the transmitter mercury switch is tipped the red light on the portable receiver will go on. The front panel can be marked with decals, or with a labeling gun.

**Mercury Switch Installation.** The mercury switch that activates the transmitter is installed on a masonite arm in the mailbox. Cut a piece of hard masonite 5 1/2 inches long by one inch wide and drill two 3/4 holes in it as shown in the drawing. Bolt the mercury switch bracket to the masonite strip and insert the switch in its bracket. See photo. Tape the switch leads to the masonite strip and use star washers on the switch strip and on all the bolts that could loosen with use. Now drill a 5/4-inch hole above the mercury switch. Tie a foot long piece of fish cord, or
The mercury switch is shown being held in the horizontal off position as when lid is closed.

The angle bracket on the mailbox lid holds the mercury switch off until the lid is pulled open.

Telescoping antenna is installed on the back of the mailbox where it is out of harm's way.

dial light string, to this small hole.

Place the switch assembly close to the front lid of the metal mailbox. Drill a \( \frac{3}{8} \)-inch hole in one side of the metal box. Be sure the masonite switch piece can fall freely to the bottom of the box. Push a small bolt through the spacer and washers as shown in the diagram. Snug up the bolt, so the mercury switch will fall freely downward. Cut off the end of the bolt and solder the outside nut in place. The solder will keep the bolt from coming loose.

Drill a \( \frac{3}{8} \)-inch hole in the lid of the mailbox for a small angle bracket. See photo. This bracket should be about level with the pivot point of the mercury switch assembly. Use star washers on both sides of the lid and small "L" bracket. Above the string on the switch assembly, drill a \( \frac{3}{8} \)-inch hole in the top of the mailbox for the small string; feed the string up through the hole. The string should only be long enough to let the mercury switch fall clear downward. Now, knot the cord or tie a small nut or washer to it so it will not slip through the hole. Lift the string and close the mailbox lid. The switch will rest horizontally on the angle bracket in the off position. Now pull open the mailbox . . . down swings the mercury switch, and the transmitter is fired.

A Final Dipole Detail. Let's not forget we have to radiate back to the house.

The small dipole antenna must be installed and insulated from the metal mailbox. Cut two pieces of plastic or another insulator material 3 inches long and one inch wide. Drill all holes in them as shown in the diagram and then drill two small \( \frac{3}{8} \)-inch holes in the dipole antenna. Bolt the antenna to the outside piece of plastic. Grind down or countersink the bolt heads and push them into the plastic. Now cover these two heads with the inside piece of plastic and bolt both pieces to the metal mailbox. The most logical place for the antenna is the rear of the mailbox away from possible damage.

Drill a hole in the bottom of the mailbox for the antenna lead from the transmitter. Bolt the wire to the bottom insulated nut on the antenna keeping the wire as short as possible.

On the Air. After remounting your mailbox it's ready to go on the air. Pull the switch up with the small cord, close the mailbox lid, and switch on the receiver. When the mailman arrives you'll know it—whether you're in the house, or out in the backyard, for that matter.

December, 1964
Due to the availability of inexpensive tape recorders and pickup devices, recording telephone calls has become very common in the last few years. Many people record long-distance phone calls for playback to the family, for example. Technical discussions recorded from the phone, and later played back, invariably disclose some facts that just didn’t “register” during the brainstorming session. Telephone recordings can speed the transfer of information (dates, times, places, schedules, inventory, etc.), thus shortening the toll on long-distance calls, since it is not necessary to take the time to write out everything during the call.

The Law. However, the Federal Communications Commission (FCC) realized a few years ago that recordings from the phone could also present the problem of invasion of privacy if the person called was not aware that the conversation was being recorded. Therefore, it is now Federal law that a characteristic tone be transmitted approximately every 15 seconds during any telephone call between two States if the conversation is being recorded. Many States have similar legal requirements on all recorded calls within the State that would include all local calls.

The Boing. We have all become familiar with the standard “beep” tone; people recognize this regular background interruption as an indication that the conversation is being recorded. Although the Boinger does not duplicate this sound precisely, its musical “boing” seems to fulfill the intention of the law, and with a great deal less cost and complexity than other means. Local and federal requirements for a recording identifier are difficult to define, and subject to interpretation. Therefore, anyone who does much telephone recording and would like to keep it legal, the Boinger proves satisfactory and certainly shows intent to comply with the law.

The Boinger. This gadget costs less than $3.50 to build from all new parts, is an ex-
extremely simple device that injects a musical "boing" into the telephone conversation every 15 seconds. The coupling to the telephone is acoustic, directly into the mouthpiece. The person at the other end of the line hears a sharp clear tone and the same tone is documented on the tape at the recording end. There is no tendency for recorder blocking during the tone which is an unfortunate characteristic of some telephone recording "beepers."

**Description.** The self-powered Boinger will run for hours on its built-in 15-cent battery. Connection to the telephone headset is quick and easy using the simple wire retainer that snaps into the mouthpiece groove. A small piece of foam rubber acts both as a spring and a cradle for the telephone. The regular telephone recording pickup attaches to the earpiece or under the telephone base in the usual manner.

The heart of the Boinger is any inexpensive and small music box movement such as those available from Lafayette Radio for $1.98. When the movement is slightly modified, as described later, all that remains is to add a battery and a switch to make the Boinger. The music box, as purchased, is completely assembled, and contains the 1.5-volt motor, gears, drum, and a harp with about 20 tines. With switch S1 closed the battery powers the motor. Through a reduction gear arrangement, the drum turns at 4 revolutions per minute, which, by a happy coincidence, is one revolution and boing every 15 seconds. On the drum are small

Combined schematic-pictorial diagram shows the switch and battery connected to the motor of the music box movement. Note the position of the tine with respect to the drum. The drum must turn in the direction shown (by using correct battery polarity) or may jam and burn out the motor, or the tine will shortly fatigue and snap.

The Boinger attaches directly to the mouthpiece of your telephone, and puts out an audible "boing" every 15 seconds. It is used when recording a telephone conversation to remind both parties that the conversation is being recorded. This is a Federal law on interstate calls and is also a law on local telephone calls in a large number of our 50 states.
projecting pins, so placed that they trigger various tines of the steel harp as they rotate past. The vibration of the tines makes the characteristic music box sounds. By removing all the tines but one, a single tone can be produced every 15 seconds!

Construction. The unit shown was built in a plastic box but a metal box is preferable. The reason is that noise has been noted in testing, caused by electromagnetic radiations from the motor being coupled inductively to the recording pickup at the other end of the headset. By using a metal box to house the Boinger, you can shield these radiations and eliminate this background static on the recording. The internal wiring is not at all critical, but the components should be arranged so that the most direct path is available from the tine to the mouthpiece. The switch should be located in a convenient spot, and several holes should be drilled in the box near the mouthpiece so the tone is directly coupled. (In the plastic box version, a small piece of metal, with holes, was mounted under the music box frame to act as a sounding board.) A piece of foam rubber, cut to shape with a sharp knife, is cemented to the box to form a cradle for the phone mouthpiece. A piece of music wire or coat hanger wire is formed around the mouthpiece groove and the ends bent to fit into two small holes in the side of the Boinger box. This wire swivels down for storage, swings up for attachment to the phone. A snug fit to the phone is provided by the springy foam rubber cradle.

Don't forget to modify the music box steel harp. This is easily done. Remove the two screws holding the harp to the frame, and snip or bend off all the tines except one near the center. Temporarily reinstall the harp and note which projections on the drum trigger the lone remaining tine, and then remove all these projecting pins but one with pliers or a file. Now, the one tine will be triggered only once each time the drum makes one revolution—which is once every 15 seconds—just what we want!

Backward Boinging. Although at first thought it would seem that the polarity of the battery would not be important, it turns out to be quite important. The DC motor will operate with either polarity, but the direction of rotation is determined by the polarity. The tine must be triggered from below, or it will break off in a short time. If the drum is turning in the wrong direction, that is, triggering the tine from above, then turn the battery over in its holder. When the proper direction has been found, put a dab of red nail polish on the positive battery holder terminal so that you will know which end of the battery goes where when you replace the battery at some future date.

Install the tine firmly and check the positioning to insure that the remaining drum pin makes firm contact with the tine. There is enough slop in the harp screws to allow adjustment for a nice strong "boing." Now you are ready to put the Boinger to use.

Boinging. When you intend to record a phone call, attach your regular recording pickup (either a suction-cup type, or a flat under-base type) and then clip the Boinger to the mouthpiece. Turn on the Boinger switch, place your call, and record. After you have completed your call, the Boinger will remind you to turn it off—it will boing every 15 seconds until you do!
A seventy-watt all-transistor stereo amplifier that runs as cool as a cucumber, that can be held in one hand, and is small enough to fit into a briefcase—all for $99.95. Ridiculous? No! That's the description of the Knight-Kit KG-870, a full-feature integrated stereo amplifier kit that definitely has transistor sound.

When first unpacked, components and hardware seem to overflow the table—this is not a stripped down kit. And unless you want to spend your time searching for individual components it is best to follow instructions by pouring each bag of components into an individual container, such as a muffin tin. Typical of Knight's efforts to make the kit trouble-free, resistors are supplied mounted on an easel card (it stands up); since each resistor position is marked with an identifying number you just reach out and pluck the right resistor the first time. Not only is color coded wire provided, each lead is precut and stripped to the correct size. And while some leads may appear to be oversize don't trim them; the amplifier works best when made Knight's way.

Paper Work. Two manuals are provided: an Operator's Manual with a notably excellent troubleshooting section, and an Assembly manual. The assembly manual is uniformly good. There are no pages of corrections and pictorials, and illustrations are always on the page facing the wiring instructions. For those who like oversize wall-mounted, wiring guides a set of individual wall-size pictorials is provided.

Frequency response curve (right) for the KG-870 is shown for the right channel only since both channels were almost identical. Frequency response was within Knight-Kit's claims.
The pictorials are particularly good, with individual cuts showing just a few wires and components—no "unit pictures" showing a tangle of coded wires and components. Since newcomers often have trouble identifying hardware (What's a filister head screw?), life size illustrations of all hardware are provided.

**Putting It Together.** The kit uses a combination of printed circuit and point-to-point wiring in about equal proportions. Actually, the point-to-point wiring is primarily connecting leads between the front panel controls and the PC boards; most components go on the boards. To avoid the jungle of parts usually associated with the tone controls (two bass and two treble), two couples of seven leads are provided; no rat's nest wiring and no shorts.

Since the wiring is built up in layers it's very easy to melt a few leads if you try to bulw your way in with a soldering gun or a large iron. Invest a buck and do the soldering with a low wattage pencil tipped iron; it's sort of insurance the kit will work the first time.

**What You Get.** It takes about 25 hours to wire the KG-870, but when you're finished you have a full-feature amplifier having just about every convenience. There are five inputs: an RIAA magnetic phono, an NARTB tape head, a high and low level auxiliary and a tuner input—all controlled by a single selector switch. A sixth input for tape monitor permits the amplifier to be used for monitoring while recording on a three head tape recorder using the same amplifier for the program source (the professional way to make tape recordings). The tape recorder feed—a jack on the rear apron—is connected ahead of the tone and volume controls so changes made to the amplifier sound do not affect the recording.

Both a level (volume) and variable loudness controls are provided. The ganged tone controls are locked by a friction clutch; after each channel is set for optimum tone balance they track together. The balance control, which adjusts the volume of both channels to correct for speaker placement, can also be used to completely shut down either channel, such as might be desired when playing "background" music.

Front panel slide switches adjust speaker phasing and reversal. Another slide switch ties both amplifier inputs together when all mono is desired. A panel mounted headset jack is also provided—when phones are plugged in the speaker volume is automatically reduced to a negligible level. A single selector switch permits either flat operation, rumble or scratch filter, or both.

**What's It Like.** The KG-870 definitely has "transistor sound"; a quality which can't be shown on a curve, it can only be heard. The sound seems to come from nowhere—there is no hum or noise that rides under the sound in vacuum tube amplifiers. Only when all controls are run wide open is there a trace of a "hiss" (no hum). Even with inexpensive speakers the sound seems notably clean (that "transistor sound" again).

Typical of transistor amplifiers, rated power output depends upon the speaker impedance, either 16- or 8-ohms. We haven't omitted 4 ohm speakers, they're just not recommended with this amplifier.

The input sensitivities shown are measured. Though the magnetic phono is listed a 3 millivolts, high level mono pickups can be used (if your budget won't allow a new pickup now) since the pre-amp will take more than 12 millivolts without overload. The curves and charts tell the rest of the story; the Knight specs are well within Knight's claims.

Both a wood and a leatherette finish metal cabinets are optional. The metal cabinet, being a snug fit, results in a very compact amplifier which fits unobtrusively on a bookshelf. There is practically no heat dissipation, the amplifier doesn't require "wide open spaces" you lose practically no shelf space.

Summing up; the KG-870 at $99.95 is an attractive buy when purchasing your first hi-fi amplifier or picking up a replacement for that vacuum-tube heat wave.
There are certain trade names—such as Rolls-Royce—which are synonymous with quality. In fact, these names by themselves are often used to mean quality. One such name in the hi-fi field is H. H. Scott. Anyone hearing the name Scott assumes that the equipment is of the highest quality; that it is not stripped down with as few components as possible and pushed to the absolute limit. So when Scott offers an FM stereo tuner in kit form (Model LT-110B) it would not be incorrect to assume a "something extra" in performance and assembly ease.

Color Comes to Hi-Fi. The extras start off with an assembly manual using a new approach to kit construction. The first thing noticed is color—a profusion of color. Every wire and component is shown in the pictorials exactly as it appears on the chassis. If you're connecting a red lead, the pictorial shows a red lead. If you're connecting a 150K resistor, the pictorial shows a resistor with brown-black-yellow bands plus the tolerance band of gold or silver. Unless you're color blind you have to try mighty hard to make a mistake. And if you are color blind, don't fret. The instructions are complete even if the color aids were left out.

The pictorials for each group of wiring steps is on the same page as the steps—in some instances the pictorial is spread all over the page to retain the same proportions as the actual components.

Best of all, the soldering steps are indicated in a red solder code. If you're working on a step with a red "S" and haven't used a soldering iron, you've made a mistake. Similarly, if you've picked up the iron on a step without a red "S," you're about to make an error.

What You Do. While the LT-110B is not a stripped down kit you aren't buried under boxes and boxes of components. The critical circuits—the front end and the MPX adapter—are not only supplied pre-wired, they are pre-mounted to the chassis. The pre-mount-
ing insures that the factory alignment of these circuits will in no way be changed by wiring or mishandling.

So what's left for the user to wire? Plenty! The connecting leads, IF amplifiers, power supply and audio amplifiers—all non-critical circuits. The user still has to put in about 6 hours of construction time. However, don't try to wire the kit over the weekend. Take your time, and take lots of coffee breaks. Kit manufacturers have found that kit builders make more mistakes when they are tired than for any other reason.

As good as the layout is in terms of ease of assembly there are a few tight corners, particularly on the terminal strips. In a few instances up to five wires are connected to a single terminal lug; take care that every connection is neat and clean. On terminals with over three wires make certain the solder flows over all wires; often just the top wires get soldered if the iron is removed too quickly.

You will find a thin copper foil bonded to a section of the aluminum chassis. At the RF frequencies encountered in FM proper grounding is important, and copper—a superior conductor to aluminum—insures good grounds.

Alignment. Though the completed tuner is complex by any standards, there is no alignment problem; actually, it couldn't be easier. The really critical circuits—the front end and MPX adapter—are pre-aligned at the factory and under no circumstances should the user attempt to improve on the factory alignment. Only the IF amplifiers and detector is user aligned, and it is done without instruments.

First, a station is tuned in so it peaks on the built-in tuning meter. Then, using the supplied alignment tool the IF transformers are adjusted for maximum meter reading—that's all there is to the IF alignment. To align the detector, a supplied capacitor (with clips) is connected across one tube, causing a loud hum to be heard when the tuner is connected to an amplifier. The detector transformer slug is then adjusted for minimum hum and alignment is complete.

Of course, for those who insist that nothing can equal an instrument alignment, Scott supplies instrument alignment instructions. However, the instruments required are unlikely to be found in the local serviceman's shop let alone on the home workbench. We suggest that if you insist on an instrument alignment you bring the tuner to an authorized Scott service agency.

All the tough wiring, about 90% of that shown in the top half of the photo, is done at the factory, tested and pre-aligned.

Electronic Features. Now to the electronics (you've waited long enough). A single function switch selects the mono, stereo and stereo with subchannel filter modes. In addition, a separate stereo noise filter is provided which attenuates the high frequency response when a stereo program has severe noise conditions. The AGC (automatic gain control) is also adjustable. In the mono mode it reduces interference which might be caused by strong local FM stations. In the stereo (MPX) position it provides a better signal-to-noise ratio on the subchannel.

To insure proper identification of stereo programs and to insure optimum stereo tuning a sonic monitor is provided (on the front panel). In the monitor position the audio output is muted. As the stations are tuned in no sound is heard until a stereo program is received. Then the monitor produces a steady tone in the speakers. When the tuner is adjusted for cleanest tone coincident with highest tuning-meter reading, the station is tuned on-the-button. Shuting off the stereo monitor restores the audio output.

A separate gain control is provided on each audio output (left and right). These controls allow the tuner's output to be equalized with the other amplifier inputs—such as the phono—so the listener isn't subject to "blasting" when switching from tuner to any other sound source.

In addition to the normal tuner outputs, two sets of tape recorder jacks are provided. On the rear panel standard phono jacks are paralleled with the tuner outputs to provide a tape recorder feed for recorder's built into the equipment cabinet. For portable type

(Continued on page 106)
Five-Way Power Tap

Eliminating temporary setups saves time, fumbling, and shocks

The 5-way power tap inserted between an electrical appliance and an ac outlet enables you to make five checks on small electrical appliances, electric lamps, electric motors, and other electrical devices. This low cost test gadget may be dispensible in the radio repair shop, but it has proven itself invaluable in the repair of home appliances and motors. The five most common applications of the tester are:

1. Measuring current drawn by electrical devices
2. Detecting shorts, grounds, or continuity in appliances
3. Testing appliances suspected to be faulty
4. Testing line voltage or voltage drop across an appliance
5. Tapping off line voltage safely.

**Current Measurement.** To measure the amount of current drawn by an appliance an ammeter can be plugged into the two red binding posts placing it in series with the appliance. The appliance is then plugged into the receptacle.

**Continuity Test Lamp.** To use this device as a test lamp for checking shorts, continuity, and grounds, plug the lamp and adapter into the receptacle and plug a set of test leads into the two red binding posts. To check for low resistance leakage use a 100 watt bulb, to check for medium leakage use a 7.5 watt bulb, and to check high resistance circuits use a neon bulb. The usual procedure when checking for shorts or grounds is to touch one test prod to the case or frame of the appliance or motor and the other test prod to one pin at a time of the line cord (not plugged in of course). To check for continuity touch each test prod to one pin of the line cord.

**Fused Outlet.** To use the device as a fuse box, a fuse block is constructed that will plug into the two red binding posts. Fuses of various amperages can then be used. The rating of fuse will depend on the current being drawn by the appliance being tested. Checking every repaired appliance this way will relieve the embarrassment of blowing out the line fuses and plunging your household into darkness.

**Appliance Voltage Drop.** Often it is desirable to be able to measure the line voltage drop of an electrical appliance. An
appliance is plugged into the receptacle and a voltage reading is taken at the red binding post on the line side and at the black post. A fuse of the proper rating is inserted into the two red posts and another reading is taken. The difference between the two readings is the voltage drop.

**Line Voltage Tap.** When making experimental hookups it is often necessary to tap into the line voltage. By connecting clip leads to the black post and the red post on the line side, you can tap off the line. By using a fuse in the two red posts, and moving one clip lead to place the fuse in the circuit, you have a fused voltage available. The neon pilot light reminds you when the EI tap is plugged in—so be careful with those hot test probes!

**Construction Tips.** The tester is built into a very compact aluminum box. As shown in the photograph, the d.p.s.t. toggle switch, neon pilot light, and three binding posts are mounted on top of the box. On one end is a single female receptacle and on the other a short power cord. These components can be laid out in any arrangement that is convenient. If you intend to use the tester in a garage or basement, it would be wise to use a three wire line cord and a grounding receptacle.

In construction, be sure to use at least number 16 wire line cord and a d.p.s.t. toggle switch. Number 16 wire is necessary for working on the higher current appliances; and the d.p.s.t. switch breaks both sides of the line which will save you the trouble of removing the line cord from the wall. The pilot serves to remind you to throw the switch off before changing accessories. Of course, use number 16 wire to wire the receptacle, switch, and binding posts.

Most of the parts used in the tester can be obtained from any well-stocked radio parts supply house. The lamp adapter used for the test lamp can be purchased at the housewares rack of your local supermarket.

**A Capital Investment.** The little time and energy invested in building the 5-way tester is returned in time and aggravation-saving dividends every time you would otherwise try to accomplish its function by fumbling with wires and temporary setups.

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**PARTS LIST**

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1</td>
<td>Female receptacle, Amphenol 61-F (Allied Radio 40H677)</td>
</tr>
<tr>
<td>J2</td>
<td>Binding posts; 2 red and 1 black (Allied Radio 41H368 and 41H367, respectively)</td>
</tr>
<tr>
<td>J3</td>
<td>D.p.s.t. toggle switch</td>
</tr>
<tr>
<td>J4</td>
<td>Aluminum chassis box 4&quot;x2½&quot;x1⅜&quot; (Bud CU-2102A)</td>
</tr>
<tr>
<td>R1</td>
<td>25,000-ohm, ½-watt resistor</td>
</tr>
<tr>
<td>S1</td>
<td>Line cord, screws, nuts, decals, etc.</td>
</tr>
</tbody>
</table>

**Estimated cost:** $5.00  
**Estimated construction time:** 1 ½ hours
SAY "broadcast" and most DX'ers automatically think of programs intended for the general public on the AM, FM and SWBC bands. But those stations transmitting solely for the benefit of mariners can also provide both interesting and rated DX. These marine broadcast stations operate on frequencies ranging from just above the AM broadcast band (and below!) to the upper limits of short-wave. These are the only broadcasters using both CW as well as voice for their programs (weather forecasts, warnings to navigation) and can be DX'ed on either a domestic or international basis.

2690 Ke. Most of the voice stations operate below 3 mc. While this low frequency cuts down the range somewhat, truly interesting targets are waiting to be logged. The low sunspot count means better DX reception is at its peak. A striking example occurred

By C. M. Stanbury II
during the Alaskan earthquake emergency. With every DX'er hunting for the stricken area, only station reaching coast-to-coast was NMJ on 2670 kc. operated by the U. S. Coast Guard at Ketchikan. During their regularly scheduled broadcast at 0100 EST, along with numerous special transmissions, a complete account of those coastal locations hit was provided. If a navigation aid (light, beacon etc.) had gone out, you knew the quake or tidal wave had been there. NMJ's info was every bit as up to date as that from any orthodox broadcast station.

An equally inviting catch is NUZY, the Campeche Patrol Vessel serving American shrimp boats in the lower Gulf of Mexico. Broadcasts from international waters have been very much in the DX news, but only on the BCB. NUZY is the only short-wave to make regularly scheduled broadcasts from the high seas. That NUZY transmission you are most likely to hear is at 0120 again on 2670. Come to think of it, there is yet a third important broadcast on that channel—from NMR, San Juan, Puerto Rico at 2200 EST. Puerto Rico, of course, has no orthodox short-wave broadcast outlets.

NMJ, NUZY and NMR are all operated by the CG and reports should be addressed to Radioman in Charge, (call letters), U. S. Coast Guard, at the appropriate location. NUZY's appropriate location is Brownsville, Texas. It is usually necessary to enclose a prepared QSL post card which the R.I.C. merely has to sign and mail.

**Nit Picking.** Next with that low sun-spot count, you will be able to bag some rare targets in Europe. There is GNE on 2740

(Continued on page 106)

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**CW Marine Broadcast DX Guide**

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Build a 5-kc OSCILLATOR ADAPTER
for your in-circuit transistor tester

Put an end to those messy, time consuming temporary setups

As more transistor radios need servicing, more radio technicians are purchasing inexpensive in-circuit transistor testers. These testers measure the ability of the transistor, while still wired in the circuit, to oscillate at a frequency in the range of 5 kc. This type of transistor tester will also function as a signal generator by connecting a pnp transistor to the test leads. The Oscillator Adapter is a simple “add-on” unit for your in-circuit transistor tester. It supplies the pnp transistor plus means for varying the unit’s output level. The circuit design permits the generation of many harmonics so signals throughout the entire audio, 1F, and RF spectrum are available for troubleshooting and signal tracing transistor and vacuum-tube receivers and audio devices.

**Signal Generator Setup.** To use a transistor tester or analyzer as a signal generator requires connecting together a pnp transistor, a coupling capacitor, and a pair of test leads. As well as making an untidy mess on your workbench, this temporary connection provides no means to attenuate the signal as it is applied to various points in the set. As you work your way from the speaker to the antenna, the signal will get louder as more stages of amplification are added. But adding a 10,000-ohm variable resistor, as shown in the schematic diagram, makes it possible to attenuate the signal as it is applied to the various test points in the set.

**Compact Package.** Putting all these components into a small plastic box reduces the tangle of leads and makes for more efficient trouble-shooting procedure. Since a front panel is not available with the plastic case, it will be necessary to make one, preferably from sheet aluminum. If wood or plastic is used, cement aluminum foil to the underside of the panel to provide shielding. Also use spaghetti on the output leads as shown in the photograph of the rear of the panel.

The base, collector, and emitter posts on the front panel are simply appropriate length

By James A. Fred

DECEMBER, 1964
PARTS LIST
C1—0.02 mf., 200-vdc tubular paper capacitor
Q1—2N107 Transistor, pnp (GE)
R1—10,000-ohm linear potentiometer (Mallory
Midgetrol U20 or equiv.)
1—Dial plate (Mallory 390)
1—Fluted knob
1—Plastic instrument case 4" x 2½/₄" x 1½/₄"
(Burstein-Applebee Co. No. 29B8)
2—Binding posts, one black and one red
Misc.—Screws, bolts, nuts, wire, solder lugs,
front panel material, insulating washers, spa-
ghetti, etc.
Estimated cost: $4.50
Estimated construction time: 1½ hours

Feature of oscillator adapter is 10K poten-
tiometer, R1, to attenuate the signal when working on a receiver front end. Transistor base diagram identifies leads.

No tangle of leads involved when using oscillator adapter to troubleshoot and signal trace receivers and audio devices.

Rear view of front panel turned around in case shows transistor connected directly to bolts, and spaghetti on output leads.

Panel layout locates holes at left for transistor connections, center hole for R1, and output binding post holes.

bolts pushed through the panel from the inside and nutted on the front. Use insulating washers on both sides. The clip leads from the transistor analyzer clip onto the exposed bolt. Binding posts are used for the oscillator output for attaching test probes.

Unqualified Use. The oscillator adapter is shown used with the Lafayette Model KT-223 transistor analyzer but it is equally useful with the EMC Model 212, the Paralon In-circuit Tester, the Seco Model 100, and numerous other transistor checkers.
Workbench Battery Holder

A simple but practical workbench dry cell holder can be made by the experimenter from a scrap of wood, some stiff cardboard, thumb or carpet tacks, two small wood screws, and two pieces of spring brass or steel from an old clock. The holder can be made for one to five or more dry cells in series provided the tension of the two springs insures sufficient contact pressure between all the dry cells and the springs. Connect a red and black insulated wire, if desired, under each flat washer—black to minus, red to positive—and connect alligator clips to the ends to provide quick connect or disconnect.

Slave Photoflash

A useful project for the amateur photographer, the Slave Photoflash shown schematically at right, can be used to provide side or back lighting of flash shots. In operation, C1 is charged by B1 through current limiting resistor R1. When light from the main flash strikes the light-activated switch, LS1, this device switches "on," permitting C1 to discharge through the flashbulb and fire it. Switch S1 is a s.p.d.t. momentary switch to discharge C1 through R2 while a new flashbulb is being installed.

Referring to the schematic diagram of the photoflash, LS1 is a GE type GE-X2 light-activated switch. Battery B1 is a 22½-volt battery such as Burgess type U15. Resistor R1 is a 10K, ½-watt resistor and R2 a 10-ohm, 1 watt unit. Capacitor C1 is a 250 mf., 25-volt electrolytic capacitor. S1 is a s.p.d.t. momentary contact push-button, switch (it should normally be in position "I"). SO1 is a standard flashbulb socket.

The instrument may be assembled in a small Minibox or similar case. A tripod adaptor should be used to simplify mounting. A standard flashreflector assembly is used, but it should be attached to the case using a flexible (or swivel) connector.

In use, the LS1 is "aimed" towards the main flash while the slave flash reflector is pointed in the direction needed to achieve the desired lighting effect. Camera’s shutter speed should be set to 1/10 second. Switch S1 should be held in position “II” whenever a flash bulb is installed.
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If you're a newcomer to amateur radio—whether a new novice or a general class—most likely your new shack is buried in a mountain of antenna literature all of which claims the most sophisticated design yet. And your mind is cluttered with all the variables involved in making the best selection for your particular circumstances. There are dipoles, trap antennas, beams, and Yagis, and colinears, and verticals, and so on, and so on. In fact, any radio catalog worthy of the name has at least several pages of "superb," "magnificent," or "extraordinary" sky hooks, and, of course, they all have extraordinary prices.

Getting the right antenna is more than just a question of plunking down your money and picking the antenna with the most esoteric specs or the most cleverly merchandised name—some of which are doozies. You have to know what you want the antenna to do, and a fledgling rarely knows what's needed until he has kicked around the band and gotten the hang of things.

Most often, the best antenna requires only a few dollars worth of wire and an hour or so of time, following, of course, all the adequate forethought. You want something simple that works right off the bat; and an antenna that doesn't require a hundred bucks worth of test gear and five years of experience to get going. Don't laugh! There are

Antennas

for the new amateur

By Herbert Friedman, W2ZLF

DECEMBER, 1964

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www.americanradiohistory.com
Antennas for the new amateur

many fine antennas that give outstanding performance when tuned to a gnat’s eyelash, but when they’re not tuned you’d be better off coupling the transmitter to the bedspring. Many antenna types fall into the “simple” or the “quick and dirty” category, and most of them do a fine job, not only for the novice but for the Ol’ Timer as well.

The Dipole. The dipole is the basic antenna to which all other antennas are compared. It has an overall electrical length of half-a-wavelength from end to end. We say electrical half-wavelength since the antenna is physically shorter than a calculated half-wavelength. Something known as “end effect” electrically shortens the antenna, so it must be shortened physically to be electrically correct. For this reason, a dipole’s length is calculated from the modified formula.

\[
L(\text{feet}) = 468/f(mc)
\]

The freespace formula is

\[
L(\text{feet}) = 492/f(mc)
\]

Keep in mind that the end effect only applies to antennas supported on the ends by insulators. If you erect a dipole that is supported by a mast in the center, there are no end effects and the standard formula

\[
L(\text{feet}) = 492/f(mc)
\]

is used. The feedpoint impedance (radiation resistance) of the antenna at its resonant frequency is 72 ohms, a value easily matched by either 72-ohm coaxial or twinlead transmission line. Fifty-two ohm coax will also work well.

Note that the energy of a dipole is radiated at right angles to the wire axis. If the wire axis is running from east to west, the energy is radiated north and south. A perfect dipole would have no east-west radiation. This fact must be considered when erecting your antenna. If you live on the east coast and want to work Europe, the dipole must be positioned so it radiates essentially east and west. South America would require an east-west alignment of the antenna, naturally. It’s almost impossible to cover several directions with a single dipole, and for reasonably full coverage it may be necessary to string two dipoles at right angles to each other.

The Folded Dipole. While similar in characteristics to the straight dipole, the folded dipole is often attractive to new amateurs because it’s the cheapest and the easiest antenna to erect. The folded dipole is an electrical half-wavelength loop, open at the center. If the loop is made from ordinary 300-ohm TV twinlead, the feedpoint impedance is 300 ohms; another section of 300-ohm twinlead can be used for the transmission line. With the price of twinlead at one to two cents a foot, an entire folded dipole installation for 80 meters can be bought for less than four dollars. The energy distribution pattern (radiation pattern) of the folded dipole is the same as for the straight dipole.

Loaded Dipoles. One of the problems the modern urban amateur has to face is that his Old Homestead rarely includes a rear 20 acres. If he’s got a plot 40 or 80 x 100 he’s lucky. A few simple calculations shows that it’s going to be difficult to stretch a 135-foot, 80-meter dipole on a modern lot; and not many neighbors appreciate antennas or “those wires” crossing their property. And 80 meters isn’t the only headache; if you’ve got to string your antenna in the tight dimensions of 60 x 100 even a shoehorn won’t squeeze in a 65-foot, 40-meter antenna. What to do?

Antennas can be physically shortened with a device known as a loading coil. You remove a substantial section of that long length of wire, stick in the coil, and voilà!, a short resonant dipole. You could build your own loading antenna but you’re better off buying one. Several manufacturers offer loaded antennas, and if you’re interested in working

Radio-TV Experimente
the low bands but haven't the space, look into a loaded "short antenna."

**Trap Antennas.** One of the variables to consider in setting up your rig is the number of bands you'll be working. Assuming you'll want the provision for working 10, 15, 20, 40, and 80 meters as most amateurs do, you'll be fed with 72- or 52-ohm cable, and, as with the trap antenna, the transmitter "sees" only the correct antenna for the band in use.

**Harmonic Hazards—and Tricks.** Whenever you use a multi-band antenna—whether trap or fan—keep in mind that it will radiate harmonic energy just as efficiently as the fundamental. This is unlike a single band antenna, such as a straight dipole which radiates efficiently only at its resonant frequency. If, for example, you're working 80 meters with a strong 40-meter harmonic, a multi-band antenna will put you on both bands! Similarly, if you're working 80 meters and the transmitter has a 10-meter parasitic, a multi-band antenna with a 10-meter section will do a great job of radiating the parasitic. Therefore, when using any multi-band antenna, make certain your transmitter is as clean as you can make it. If you suspect a high harmonic output, utilize an antenna tuner between the transmitter and the antenna system; the tuner will stop harmonic energy before it is radiated.

You may have noted that in the fan antenna drawing there is no provision for 15 meters. But you can still work this band! A dipole will operate with reasonable efficiency on the third harmonic, so the 40-meter antenna is used for 15 meters.

**Get on the Air Fast.** While there are many other antenna types, the basic configurations we've covered are recommended because they give the least trouble, work efficiently, and allow you to get on the air fast. Many of you will become "antenna men" coming up with a new design every week, but while you're digging into those antenna books you'll be on the air with these pure and simple work horses. There are still many Ol' Timers and DX Hounds using them year after year accumulating an enviable collection of QSL's.
**Marine Broadcast DX**

*(Continued from page 96)*

kc. at Oban, Scotland with a broadcast at 0303 EST (although you will need crystal selectivity for this one). After that, you should switch back to old standby 2670 kc. at 0333 EST for the transmitter at Ilfracombe, Eire—one of the very few communications stations which do not have call letters. Your chances for this pair will improve as the winter deepens.

On upper short-wave frequencies there is only one important marine voice broadcast. This one is produced by the Malaysian Telecommunications Dept. and aired at 2045 EST via VPW4, 8762.2 kc. Singapore. The new federation is not too easily located in eastern North America due to interference, however VPW4 will sometimes provide a QRM-free alternate.

**Breaking the Code.** Now all other upper frequency DX marine broadcasts use cw (Morse code) but this is not nearly as big a road block as it appears. Many have long ID (identification) periods before their transmissions. Any DX'er may tune in approximately 15 minutes ahead of schedule and decode the call one letter at a time. The call will be interspersed with some sort of “marker” such as the letter V, E or CQ. After this marker come the word “de” (-.-) then those all important call letters. Once the DX'er has, with a little practice, mastered this initial stage of cw DX, he will be able to tackle those cw marine stations which are too busy to send markers, for even they transmit call letters three time in succession very near the beginning of each short-wave broadcast.

All right, exactly what DX can be heard via cw broadcasts? Well, there is ZHF88 Port Stanley, Falkland Islands—certainly a rare country. But even better is ZBH at Grytviken, South Georgia. This island is classed by the British (who own it) as part of Antarctica, so here's one way to log the 7th continent. Switching poles and returning to Alaska, those who find NMJ and low frequencies too rough should try NHB at Kodiak, Alaska. Between these polar extremes are goodies like Malta, Aden, French Somaliland, Guam ( Marianas), Malaysia again via transmitters at Hong Kong plus the often politically embroiled U.S. military base at Asmara, Ethiopia (NKA) on the Red Sea. Complete details on all these targets are contained in our CW Marine Broadcast DX Guide given in this article on page 96.

When you master that second stage of cw-DX skill, you can apply it to the low frequencies as well. For example, that surprisingly rough task of working coast to coast on long wave is actually quite easy. Westerners should go for WSL, 418 kc. Amgansett, N. Y., at 0300 PST while east coast DX'ers will find KSE, 482 kc., Torrance, California, inviting at 2318 EST. Station WSL is operated by Mackay Radio & Telegraph Co. and station KSE by Radio-marine Corp. of America.

**Lab Check/Scott LT-110B**

*(Continued from page 92)*

recorders which are used only occasionally for FM tapings a three circuit phone jack is provided on the tuner's front panel—you don't have to pull the tuner out of a cabinet or jockey it around for recordings on portable recorders.

For performance of course, you get the noted Scott quality. Very good stereo separation and excellent sound. And just in case you feel separation isn't up to snuff—occasionally poor station separation is blamed on the tuner—Scott provides a control which allows the user to adjust the tuner for the optimum separation. However, the best performance test you can give an FM tuner is the consumer listening test. In this test the LT-110B was connected to an indoor 300-ohm, TV-lead antenna (supplied with the kit) and turned on. All the FM stations within the reception range of the test site were received loud and clear without noise even on normally weak stations. Also, fringe stereo stations were heard for the first time in true stereo without the hiss and static we have become accustomed to hearing.

The tuning control is Scott's “instrument type”—a planetary vernier drive with good calibration. Though the tuner is not provided with AFC (automatic frequency control) the oscillator stability is exceptionally good and can be considered drift free—even after a short warm-up.
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TREASURE FINDERS

grow your own crystal radio

(Continued from page 63)
— a sensitive spot. It must be easily maneuverable and yet remain in place once it is adjusted.

When you have the crystal set built you can simplify matters considerably, if you have a germanium diode, by wiring it temporarily in place of the crystal until you have the coil adjusted and the condenser tuned to a strong local signal. An outdoor antenna and a good ground are essential. The ground can be either a water pipe or the electrical conduit shielding the house wiring.

With a little ingenuity the dyed-in-the-wool experimenter can wind the coils, make a fixed condenser from foil and waxed paper or Saran wrap, and a variable condenser from two sets of sliding metal plates separated by paper or thin plastic. He can then point with pride to the crystal set as his own product, right down to the last component—including the crystal he grew.

It will take a steady hand to bring the "cat-whisker" in contact with shear face of crystal.

Using this schematic diagram, you can begin construction of a crystal receiver with a detecting diode you've homemade. If you wind your own coil to boot, you'll ignore coil detail.

This being one method of engineering the catwhisker to make a contact with the crystal.
Tape Loop Pack

(Continued from page 60)

Perfectly uniform and smooth wood dowels will serve as rollers if you can insert brad pins in the ends; the pins must be centered accurately and be in true alignment with the roller axis. Rollers may also be made from \( \frac{3}{4} \)" diameter steel rods whose ends are turned or filed down into pins. The rollers shown in the illustrations were made by pushing brass tubes into acrylic plastic tubes, after brad pins had been sweat soldered to the ends of the brass tubes.

Assemble the rollers in the rack and check for freedom from binding or wobble.

Lay the assembled rack on the base panel, and tape into position temporarily. The end with the roller nearest the frame end butts against the rear block of the base panel; the other end of the frame overlaps the ends of the shorter front (notched) block.

Turn the assembly over and drill about four \( \frac{3}{4} \)" holes through the back of the base panel and part way into the frame strips. This ensures accurate alignment of the tape rack lock pins with the holes in the frame. The \( \frac{3}{4} \)" diameter dowel pins should project about \( \frac{3}{4} \)" above the base panel surface.

**Tape Guide Pins.** The pin holes in the cover panel only should be enlarged to \( \frac{3}{4} \)" or \( \frac{3}{16} \)" diameter (one or two drill sizes larger than original).

Place the cover in place, slipping the rear of the panel under the rear lock plate lip. Check to see that holes in the two panels align accurately.

Place a drop of glue into each of the rear pin holes. Then thrust \( \frac{3}{4} \)"-diameter dowels (rough cut to about 1 1/2" lengths) through the cover holes until they emerge from the base panel holes. When all pins are in place, cut them flush with the outer surface of each panel. Fasten pins at the other end of the pack in the same way.

If you have trouble finding \( \frac{3}{16} \)" diameter doweling, check your drug store for the small sticks used to make cotton Q-tips. Do not use dowels larger than this size.

It may seem unnecessary to make the tape guide pins project into holes in the top cover. However, if this is not done, the thin magnetic tape may slip between the pin tops and underside of the cover and cause binding.

**Front Lock Plate.** Aluminum counter-top edging was used to make the front lock plate. Cut to dimensions shown in the drawings. Tape into position so that the lock lip holds down the front end of the cover and drill a hole through the wood block, using the lock hole as a guide. Make this hole slightly smaller than the one in the lock strip; you should have to screw the 6-32 bolt through the hole after inserting it from the rear of the block. Use a hex- or wing-nut to hold the lock plate in place.

**Test Procedure.** Prepare a tape loop by splicing together the ends of 19 feet of magnetic tape. Hold the rack vertically in the right hand and wind the tape over the rollers from right to left. Place the loaded rack into the base section, moving the tape loops into position between the guide pins.

Now mark the tape positions on the spacer panel surface, remove the tape, and ink or paint bold stripes to indicate the tape positions. These will serve as guides to greatly facilitate proper winding of the tape for easy insertion of the rack into the base section without entangling the tape with the pins.

You can make the first test recording with the cover off to observe tape movement.

**Recording Procedure.** To use the pack, just lay it on top of the recorder, dropping the exposed portion of the tape into the recording head section of the machine. The size of the external loop should be just long enough to drop into position easily; a little slack does no harm.

The 19 feet of tape in the pack will provide one minute of recording time at 3 3/4 ips tape speed or 30 seconds at 7 1/2 ips. You can, of course, load the pack with shorter loops if you wish. Longer loops would require wider tape packs; but the bigger the pack, the more carefully it must be constructed to reduce to a minimum any internal friction that would put a drag on the tape.

Using a monaural tape recorder, you can record two separate channels by turning the pack over after one channel has been recorded. You can make stereo recordings in the same way, or put four monaural channels on the same tape by using one stereo channel at a time.
Tape Recording
"from the hip"

(Continued from page 66)

extreme conditions—if it works, then, it is sure to work under less demanding conditions.

With the Lodestar carried on a shoulder strap and mike attached to the carrier's lapel, recording tests were made at a party, press conference, and classroom lecture. Results—the unit performed admirably, faithfully recording and playing back the human voices it heard. Although the unit is not recommended by the manufacturer for recording music, you can pick up pop tunes off the air so that you can learn the lyrics and sing-along later. Under the test conditions, the four penlight cells provided six hours of service. The meter indicator, used to set tape speed, also doubles as an audio recording indicator to prevent overload distortion.

The unit's cast aluminum case, rigid semiconductor circuitry, and leather carrying case offer good shock resistance against accidental drops. The test unit was dropped three times on each of its axes from a 30-inch table top onto a linoleum surface. It continued to play without a trace of damage.

Price. The Lodestar (Model 6546) lists for $59.95 and is obtainable nationwide at Channel Master dealers. Write to Channel Master Corp., Sales Department, Ellenville, New York for the name and address of your local dealer. The recorder comes complete with crystal microphone, magnetic earphone, tape cartridge with protective plastic cover, leather case and strap, and a small leather case to hold mike and earpiece when not in use. Additional tape cartridges with mailing cases for tape pals cost only $2.95 each. Considering the craftsmanship that went into the construction of the Channel Master miniature recorder, simplicity, and low-cost battery power supply, the Lodestar will make a swinging gift during the coming Christmas gift-giving season.

Switch & Shine
(Continued from page 65)

Moms Cake Pan and Dad's Know-how.
A heart-shaped cake pan is used as the chassis for the funny face. The metal is thin and easily worked. Using the dimensions on the chassis diagram, locate and drill the eye and nose holes, and switch holes around the chin of the pan. The rotary switches used around the chin are perfect in this application since they don't indicate their electrical position. This is important when used for a game. The "Switch and Shine" toy as illustrated here uses a multiple battery holder to hold four batteries instead of two to give extended life to the toy. Two sets of two batteries are connected in series and then the sets are paralleled to give 3 volts at a current rating sufficient to light all the lights for considerable time.

The chassis face can be painted as a clown or as any one of a dozen funny faces to delight the children. You can even let them do the painting! If you mount the lamp holders first, the jewels will protect the painted face from getting scratched during construction. Solderless connections were used in this construction because they were around; but they do prevent shorts and tapping connections. Although the cake pan was left open in the illustrations, it would be advantageous to make a panel to cover it to protect the circuits from curious little fingers.

"Daddy Made It." The creative use of things at hand and the part of you that goes into a child's toy proves rewarding to both you and your children. It not only fosters a closer parent-child relationship but you endow your child with a finer sense of values than those children who grow up crying "buy me that!"
Electronics
Steals the Thunder

(Continued from page 46)

Pretty Heavy Weather. Weather Bureau scientists estimate the "weather" above us weighs five billion million tons, is a vast dynamo of air masses reacting to the storms of the sun, the movement and topography of the earth, that it is never still and never repeats its actions exactly.

The Great Outdoors Indoors. Trouble with the weather it's always stayed outdoors. To learn more about this powerful dynamo above us, so we can study modification faster and with safety, man is now creating his "weather" indoors. Frustrated by the fact he could never quite bring the weather into a nice cool laboratory, and take it apart, modern engineers try next-best, they simulate "weather" by electronic computer.

In a small, modern building in the heart of Washington, D. C., scientists of the Weather Bureau's General Circulation Research Laboratory first seek to build a framework of physical laws already known. They translate these into mathematical formulas to analyze and program into IBM's largest computer, STRETCH.

It Picks Up the Pieces. Wind speed and direction, temperature, humidity at 10,000 points of the earth's surface and on each of nine levels of the atmosphere are fed into the computer. To describe the state of the atmosphere for one single instant in time takes 400,000 pieces of information.

Fed its instructions, the computer dutifully predicts changes in wind speed and direction, temperature and humidity at 100,000 points for each succeeding five-minute period. To simulate a single day's weather takes 10,000,000,000 operations. More than one trillion operations are needed to compute weather changes over a period of one hundred days. But Bureau scientists are so enthusiastic about their simulated weather they predict we may one day forecast one full year in advance, even study changing the weather.

Already H. Wexler, director of research of the U. S. Weather Bureau, contemplates melting icecaps by dropping carbon dust on their tops to attract the intense heat from the sun. Other weather scientist enthusiasts predict one day we will make the deserts bloom, the Arctic poles flourish with vegetation.

From Capitol Hill. When we called on Karl E. Mundt, U. S. Senator from farm-state South Dakota, to seek out his views, we found this subject one of his favorites. "I believe weather modification is now coming of age," he said thoughtfully. "Funding has been too meager if one considers the importance of the subject. For years, I have been interested in doing something about weather control and modification, increase of rainfall, the elimination of devastating tornadoes."

The farm-state Senator told Radio-TV EXPERIMENTER, "This year it looks as if the Congress might provide more funds so that we can continue vital research programs and begin to modify the weather" for the benefit of "farmers and citizens generally."

He summed up his thoughts: "The goal is producing water from the clouds at the time we want it and where we want it." And he quoted a farmer friend of his who had told him, "'When we don't need rain, we get too much. When we need it, there ain't none at all.'"

It's this sort of whimsy on the part of the weather that long ago prompted Mark Twain to comment nobody ever does anything about it. But Mark Twain complained before silver iodide and satellites, radar, balloons and computers stole the thunder from the dancing Hopi's.
11 ELECTRONIC PARTS

1. This 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 latest Allied Radio catalog? The surprising thing is that it's free!

2. The new 440-page 1965 edition of Lafayette Radio's multi-colored catalog is a perfect buyer's guide for hi-fiers, experimenters, kit builders, CB'ers and hams. Get your free copy, today!

3. Progressive "Edu-Kits" Inc. now has available their new 1964 catalog featuring hi-fi CB. Amateur, test equipment in kit and wired form. Also lists books, parts, tools, etc.

4. We'll exert our influence to get you on the Olson mailing list. This catalog comes out regularly with lots of new and surplus equipment as well as many other hard-to-get items are included in this new 148-page catalog.

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

6. Whether you buy surplus or new, you will be interested in Fair Radio Sales Co.'s latest catalog—chuck full of buys for every experimenter.

7. Want a colorful catalog of surplus goodies? John Mestina Jr. has one that covers everything from assemblies to Zener diodes. You can buy complex units that set the government back thousands, at a fraction of the cost!

8. Are you still paying drugstore prices for tubes? Nationwide Tube Co. will send you their special bargain list of tubes. This will make you light up!

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

10. 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.

112 Tone-arms, cartridges, hi-fi, and stereo preamps and replacement tape heads and conversions are listed in a complete Shure Bros. catalog.

13. Here's a beautifully presented brochure from Allied Lansing Corp. Studio-type mikes, two-way speaker components and other hi-fi products.

14. For the love of mikes! Astatic Corp. has lots. Studio types, ham types, recording types, etc. See its catalog sheets for the details.

15. A name well-known in audio circles is Accoutrums Research. Here's its booklet on the famous AR speakers and the new AR turntable.

16. Garrard has prepared a four-color booklet on its full line of automatic turntables. Accessories are detailed too.

17. Two brand new full-color booklets are being offered by Electro-Voice, Inc. that every audiophile should read. They are: "Guide to Outdoor High Fidelity" and "Guide to Compact Loudspeaker Systems."

18. Speakers and enclosures from Argos Products Co. feature a new and novel well-mounting system. To find out more, Argus will be happy to send literature.

19. A valuable 8-page brochure from Empire Scientific Corp. describes technical features of their record playback equipment. Also included are sections on basic facts and stereo record library.

20. Tape recorder heads wear out. After all, the head of a tape deck is like the stylos of a phonograph, and Robins Industries has a booklet showing exact replacements. Lots of good info on how the things are built, too.

21. Whorfedale, a leading name in loudspeakers and speaker systems, has a colorful booklet to send to you on its product line. Complete with prices, it is a top-notch buyers guide.

22. A wide variety of loudspeakers and enclosures from Utah Electronics lists sizes shapes and prices. All types are covered in this 16-page heavily illustrated brochure.

23. Here's a complete catalog of Robby-styled speaker enclosures and loudspeaker components. University is one of the pioneers in the field that keeps things up to date.

24. When a manufacturer of high-quality high fidelity equipment produces a line of kits, you can just bet that they're going to be of the same high quality! H. H. Scott, Inc., has a catalog showing you the full-color, behind-the-panel story.

27. An assortment of high fidelity components and cabinets are described in the Sherwood brochure. The cabinets can almost be designed to your requirements, as they use modules.

28. Very pretty, very efficient, that's the word for the new Betacom intercom. It's ideal for stores, offices, or just for use in the home, where it doubles as a baby-sitter.

30. "All the Facts" about Concord Electronics Corporation tape recorders are yours for the taking in a free booklet. Portable battery operated to four-track, fully transistorized stereo cover every recording need.

31. "The Care and Feeding of Tape Recorders" is the title of a booklet that Sarks-Tarzian will send you. It's 16-pages jam-packed with info for the home recording enthusiast. Includes a valuable table of recording times for various tapes.

32. You can learn lots about tape recorders. Big tape recorders for studios, little tape recorders for business men, all kinds of tape recorders from American Concertone.

33. "40 and More Ways to Use Your Roberts Tape Recorder" shows how to get the most enjoyment from your tape recorder for "your family growing up," language lessons, speeches, even synchronized sound with slides and home movies. Yours for the asking from Roberts Electronics.

34. The 1964 line of Sony tape recorders, microphones and accessories is illustrated in a new 16-page full color booklet just released by SuperScope, Inc., exclusive U.S. distributor.

36. A 12-page catalog describing the audio accessories that make hi-fi living a bit easier is yours from Switchcraft, Inc. The cables, mike mixers, and junctions are essential!

38. An entirely new concept in customizing electron tubes has generated a new replacement line. Gold Lion tubes give higher output and lower distortion than ordinary production high-fidelity tubes.

39. Got "furniture-sag"? Hmmm? Adjustable Caster Co. thinks you'd better level the shelf your turntable sits on before you try to level the turntable itself! Lots of data here.
KITS
41. Here's a firm that makes everything from television kits to pocket knives. The Conair catalog is yours for the asking.
42. Here's a 100-page catalog of a wide assortment of kits. They're high-styled, highly-accurate, and Heath Co. will happily add your name to the mailing list.
43. Want to learn about computers the easy way? Brochure from Digicat Electronic describes its line of transistorized kits.

AMATEUR RADIO
45. Catering to hams for 29 years, World Radio Laboratories has a new FREE 1965 catalog which includes all products deserving space in any ham shack. Quarterly flyers, check-full of electronic bargains are also available.
46. A long-time builder of ham equipment, Hallicrafters, Inc. will happily send you lots of info on the ham, CB and commercial radio-equipment.
47. Here's a goodly assortment of literature covering the products of the Dow-Key Co. They make coaxial relays, switches, and preamps for hams and CB'ers.

CITIZENS BAND
48. Hy-Gain's new 16-page CB antenna catalog is packed full of useful information and product data that every CB'er should know about. Get a copy.
49. Want to see the latest in communication receivers? National Radio Co. puts out a line of mighty fine ones and their catalog will tell you all about them.
50. Are you getting all you can from your Citizens Band radio equipment? Cadre Industries has a booklet that answers lots of the questions you may have.
51. Antennas for CB and ham use as well as for commercial installations is the specialty of Antenna Specialists Co. They also have a generator for power in the field.
52. When private citizens group together for the mutual good, something big happens. Hallicrafters, Inc. is backing the CB React teams and if you're interested in CB, circle #53.
53. A catalog for CB'ers, hams and experimenters, with outstanding values. Terrific buys on antennas, mikes and accessories. Just circle #54 to get Grove Electronics free 1964 Catalog of Values. Also see items 46 and 47.
54. Interested in CB or business-band radio? Then you will be interested in the catalogs and literature Mosley Electronics has to offer.

SCHOOLS AND EDUCATIONAL
55. Three new courses in marine communication, aircraft communication, and guidance and mobile communications are available from National Radio Institute. The pamphlets are well-illustrated and educational.
56. Here are three pamphlets dealing with television trouble-shooting, radio trouble-shooting and high fidelity. These, from Progressive Edu-Kits are very complete and easy to understand.
57. Interested in ETV? Adler Electronics has a booklet describing educational television and this goes into a depth study of ETV in all its ramifications. There's a good science fair project here for someone!
58. For a complete rundown on curriculum, lesson outlines, and full details from a leading electronic school, ask for this brochure from the Indiana Home Study Institute.
59. Facts on accredited curriculum in E. E. Technology is available from Central Technical Institute plus a 64-page catalog on modern practical electronics.

ORGANS
60. A complete booklet and price list giving you the inside data on Schober Organ is yours for the asking.

AUTOMOTIVE
61. Got some questions regarding transistor ignition? Mr. Palmer Labs will send you a booklet which explains what transistor ignition is all about.
62. Driving your car is a do-it-yourself money saver if you decide, after reading, that this is for you, their kits will let you build your own!
63. Want power plus for your auto? New Transistorized Ignition adds 20% more MPG. 3 to 5 times more spark plug life. Lower maintenance cost. Free catalog and instruction booklet available from Anderson Engineering.

TEST EQUIPMENT
64. Want the most measurement value per dollar. That's what Electronic Measurements Corp. says. Looking through the catalogue they send out, they very well might be right!

TELEVISION
65. Interested in tackling a TV kit? Arkay International, Inc. will send you full literature (including a scheme) of this truly educational kit. It's used in many of the electronic schools.
66. The first entry into the color-TV market in kit form comes from the Heath Company. A do-it-yourself project for the radio and TV watchers should know about.
67. The smallest television set to date is featured in this beautiful prepared brochure from Sony Corp. You'll be amazed at the variety this firm offers.
68. Get your 1964 catalog of Cistie's TV, radio, and hi-fi service books. Bonus-TV tube substitution guide and trouble-shooter chart is yours for the asking.

SLIDE RULE
69. Want to find rapid solutions to complicated math problems? Solve interest and ratio, log and trig problems with 10-scale slide rule. Alumina will send complete information.

TOOLS
70. Xcelite's Allen hex-type screwdriver kits in plastic cases are must items for the home experimenter's tool box. Learn about what's available to keep your tool box filled with the right tool for the right job.
This is the third and last part of *White's Radio Log*, now published in three parts twice each year. This format change, the first in over two decades, enables the Editors of *Radio-TV Experimenter* to offer its readers two complete volumes of *White's Radio Log* each year, while increasing the scope of the *Log* and its accuracy.

In this issue of *White's Radio Log* we have included the following listings: U. S. AM Stations by Call Letters, U. S. FM Stations by Call Letters, Canadian AM Stations by Call Letters, Canadian FM Stations by Call Letters, Cuban and Mexican AM Stations by Call Letters, and the World-Wide Short-Wave Section.

In February, 1965 issue of *Radio-TV Experimenter*, Volume 43, No. 1, the *Log* will contain the following listings: U. S. AM Stations by Frequency, Canadian AM Stations by Frequency, U. S. Television Stations by States, Canadian Television Stations by Location and the World-Wide Short-Wave Section. In the event you missed any part of the *Log* published during 1964, you will have a complete volume of *White's Radio Log* by collecting any three consecutive issues of *Radio-TV Experimenter* during 1964 and 1965. The three consecutive issues are an entire volume of *White's Radio Log* that offers complete listings with last minute station change data that are not offered in any other magazine or book. If you are a broadcast band DX'er, FM station logger, like to photograph distant TV test patterns, or tune the short-wave bands, you will find the new *White's* format an unbeatable reference.

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<td>KAAA Kingman, Ariz.</td>
<td>KATE Albert Lea, Minn.</td>
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<td>KDBB Butte, Mont.</td>
<td>KDBO Butte, Mont.</td>
<td>KDCO Newton, Iowa</td>
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<td>KABB Hot Springs, Ark.</td>
<td>KATI Casper, Wyo.</td>
<td>KDCQ Centerville, Iowa</td>
<td>KDCG Centerville, Iowa</td>
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<td>KABC Los Angeles, Calif.</td>
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<td>KALC Riverside, Calif.</td>
<td>KAVI Eugene, Ore.</td>
<td>KBKU Brighton, Colo.</td>
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<td>KALC Santa Barbara, Calif.</td>
<td>KAVP Nampa, Idaho</td>
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<td>KAGU Yuba City, Calif.</td>
<td>KAVP Oklahoma City, Okla.</td>
<td>KCHT Jonesboro, Ark.</td>
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www.americanradiohistory.com
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<td>WWHP New Rochelle, N.Y.</td>
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<td>WWHN Baltimore, Md.</td>
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<td>WWTU Canton, N.C.</td>
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<td>WWTX Detroit, Mich.</td>
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<td>WVVW Winchester, Ky.</td>
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<td>WWBL Louisville, Ky.</td>
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<td>WWCD Naples, Fla.</td>
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<td>WWJO San Antonio, Tex.</td>
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<td>WWHA Seattle, Wash.</td>
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<td>WSHR Greensboro, N. C.</td>
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<td>WSGC Glens Falls, N. Y.</td>
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<td>WSWB St. Albans, Va.</td>
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<td>WSWT Washington, D. C.</td>
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<td>WSYK Ocean City, N. J.</td>
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**U. S. FM Stations by Call Letters**

Abbreviation: (s) = stereo

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<td>WWAL Big Delta, Alaska</td>
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<td>WWKX White Plains, N. Y.</td>
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<td>WWSN Syracuse, N. Y.</td>
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<td>WWRL Los Angeles, Calif.</td>
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<td>WWRI -FM Richmond, Va.</td>
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<td>WXYI Gainesville, Ga.</td>
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<td>WWYK Bergenfield, N. J.</td>
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<td>WWMC Milwaukee, Wis.</td>
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<td>WWJO Des Moines, Iowa(s)</td>
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<td>WWYS Albany, N. Y.</td>
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<td>WVOO Sacramento, Calif.</td>
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<td>WWCB Detroit, Mich.</td>
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<td>WWFC -FM Fort Wayne, Ind.</td>
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<td>WWYD New York, N. Y.</td>
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<td>WWAS Milwaukee, Wis.</td>
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<tr>
<td>WWSM Madison, Wis.</td>
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**Radio-TV EXPERIMENTER**

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[www.americanradiohistory.com](http://www.americanradiohistory.com)
<table>
<thead>
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<th>C.L.</th>
<th>Location</th>
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</table>
World-Wide Short-Wave Stations

The World-Wide Short Wave Stations section of White's Radio Log is, as its name implies, a log, that lists stations actually monitored by listeners in the United States, Canada and overseas. It is not intended to be a listing of all shortwave transmitters licensed as such listings contain numerous inactive transmitters, and low powered stations which are rarely heard by DX'ers. The stations listed here, therefore, are those most often reported and consistently heard during the past few months. Many have been monitored by DX Central the official Radio-TV EXPERIMENTER monitoring post in New York City.

Because of the fact that this log represents actual monitoring reports rather than data taken from published program schedules received from the stations, you may find that frequencies (and operating times) given here differ from official listings. This is because foreign short-wave stations frequently operate several kilocycles away from their assigned (and announced) frequencies. In addition, the schedules of these stations are often changed and the changes are not published in the schedules until many months later. We feel that the type of log which White's Radio Log is presenting represents a very realistic picture of the current status of short-wave broadcasting, and is something which cannot be obtained elsewhere.
For the DX'er. If you care to roam the bands for DX, we present here some information which will be of invaluable use to you in tracking down DX stations.

Although the current radio propagation conditions have made the high frequency bands (11 and 13 meter bands) relatively poor for DX'ers, the other bands are generally good during certain periods of the year. As a general rule, the following bands are "hot for DX" during the times indicated:

- 60-meter band = Winter nights.
- 49-meter band = Winter nights.
- 41-meter band = Winter nights.
- 31-meter band = Nights, all year.
- 25-meter band = Nights, all year.
- 19-meter band = Days all year, and Summer nights.
- 16-meter band = Days, all year, and Summer nights.
- 13-meter band = Days, all year.
- 11-meter band = Days, all year.

Something Different is being tried this time around in our listings. A number of monitors feel that they would get more use from our listings if we arranged the stations by frequency rather than by country, as we have done in previous issues. We would appreciate your comments on which way suits your DX chasing.

We are also listing, for the first time in this issue, a number of non-broadcast stations and frequencies reported by our monitoring stations. These are all indicated by an asterisk (*). In some cases, when a great number of stations of the same general category utilize a frequency, we have indicated the use of the frequency rather than attempt to list any of the specific stations monitored (2182, 2662 kc/s, etc.).

A new "clandestine" station has been monitored on 6700, 6705 and 7275 kc/s. The station is "Bayrak Radio," The Voice of the Turkish Cypriot Fighters. Although their schedules, by necessity, must be irregular, they seem to be most active at 0130 and 1230 in Turkish, 0200 and 1330 in Greek, and 0230 and 1400 in English on 6700 kc/s (times EST). Check their various frequencies at these times.

The past few months has shown an alarming outbreak of ship-based "pirate" broadcasters, mostly centered around England. A few land-based pirates have also popped into the scene. For the record, here's some data on the most talked about of these stations:

Radio Caroline, (see the article "New Pirate Broadcaster," by Tom Kneitel, R-TVE Aug-Sept, page 101) has now settled down on 1520 kc/s with a 0000 to 1500 and 1800 to 2100 (EST) schedule. The owners of Radio Caroline bought out the interests of a rival pirate, Radio Atlanta, and will now operate two pirate broadcasters on 1520 kc/s under the Radio Caroline identification. As a result of the merger, the original ship has now been moved from the east coast to broadcast from the west coast near the Isle of Man. This gives the station coverage into Manchester and Liverpool. The new ship will cover the old Radio Caroline spot on the east coast. The merger killed the opening of yet another pirate, Radio Vannin, which was set to open at Douglas Head, Isle of Man, with no less than four 20 kw medium wave transmitters. The only competition expected will be from Radio Mary Rose, which is expected to drop anchor off Liverpool and blanket northwest England.

Radio Leeds, another pirate, has been operated by students of Leeds University. The station is aboard a yacht off Harwich, Essex, England and uses 1520 kc/s (same frequency used by Radio Caroline).

Radio Sutch, on 1542 kc/s, will operate with 500 watts from 0600 to 0800 and 1100 to 1830.

Radio Invicta, broadcasting from an abandoned Army fort in the estuary of the Thames River, runs 10 hours of music daily. The station's claim to fame is that it broadcasts music "of a higher quality than the other pirate stations."

As an ironic twist, Radio Free Yorkshire was operated by two Liberal candidates "to demonstrate the dangers of pirate radio and to protest against the conditions which allow pirate radio to exist."

The above data on pirates came from Tom Kneitel, K3FLL/WB2AAI, who keeps track of such things.

R-TVE monitor John Westbrook, at the USN Sonar School in Key West, Fla., writes to tell us about the clandestine station Radio Free Dixie on 700 kc/s. John said that when heard at 2210 EST the signals were very strong. Programming was mostly jazz music and racist propaganda. We understand that this is a Cuban station.
Let Us Know. Listeners are invited to submit their loggings to us for publication in the Shortwave section of White’s Radio Log. Be sure to include the following information for each station you report: approximate frequency, callsign and/or station name, city and country, and time heard in Eastern Standard Time, 24 hour clock. Address your reports to: DX CENTRAL, White’s Radio Log, c/o RADIO-TV EXPERIMENTER, 505 Park Avenue, New York, N. Y. 10022, U.S.A.

Time To Listen. All times shown in White’s Radio Log are in the 24 hour EST clock system. For example, 0800 is 8:00 AM EST, 1200 is noon EST, 1800 is 6 PM EST, and so on. For conversion to other time zones, subtract 1 hour for CST (0800 EST is 7 AM CST), 2 hours for MST, 3 hours for PST.

The following abbreviations are used in our listings: BC—Broadcasting Company, Corporation, or System; E—Emissora; R—Radio or Radiodiffusion; V—Voice or Voz.

TNX. We are indebted to the following DX’ers who added their loggings to those of DX CENTRAL, the official RADIO-TV EXPERIMENTER monitoring station in New York City, to bring you this month’s listings:

Why not send us your loggings for our next listing? Share your DX with others!

Get those reports in now! Good DX!

Ernest P. Kionke, Gowanda, N. Y.
Russell Hawkins, Lafayette, Tenn.
Gordon Robinson, Victoria, B. C.
Robert Wallace, Dallas, Tex.
Pericles Cosseboom, San Francisco, Calif.
William Dickerman, Williamsport, Pa.
John Charlton, Windsor, Ont.
Timothy C. Brown, Williamsport, Md.

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<td>Boston Marine Op.* Boston, Mass.</td>
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<td>WFA</td>
<td>Miami Marine Op.* Miami, Fla.</td>
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<td>2490</td>
<td>WDR</td>
<td>U.S. Coast Guard* various ship &amp; land</td>
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<td>2462</td>
<td>WYQV</td>
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<td>VOA</td>
<td>Windward I, B. C.</td>
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<td>VQG</td>
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<td>RCDR</td>
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<th>Location</th>
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December, 1964
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49 Meter Band—5950 to 6200 Kc/s

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31 Meter Band—9500 to 7775 Kc/s

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41 Meter Band—7100 to 7300 Kc/s

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11675  — R. Australia Melbourne, Australia 0715
11690  — Govorn Yerevan Yerevan, U.S.S.R. 1515
25 Meter Band—17000 to 11795 Kcs
11710  — R. Australia Melbourne, Australia 1000
KGEI  V. of Friendship San Francisco, Calif. 2305
11720  — R. Athens Athens, Greece 0500
11725  — R. Brazzoville Brazzoville, Congo 0725
11730  — R. Niterland Lilhver, Nigeria 1930
11735  — R. Havana Havana, Cuba 0515
11738  — CEI174 V. of New Mundo Santiago, Chile 1715
11740  — Vaticn R. Vatican City 1615
11766  — Armed Forces R. London, England 2100
Z13  R. N.Z. Wellington, N.Z. 2230
11795  — WINB Red Lion, Pa. 0500
11800  — R. Ghana Accra, Ghana 0535
11805  — R. Globo Rio Janeiro, Brazil 1900
11810  — R. Sweden Stockholm, Sweden 2015
11815  — R. Melbourne, Australia Melbourne, Australia 0135
11825  — WURL R. N.Y. Worldwide New York, N.Y. 1125
BED69 V. of Free China Taipei, Formosa 2130
11835  — CVEH V. Evangelque Cart Hapiten, Haiti 1843
11845  — CXAI V. el Espectador Montevideo, Uruguay 1530
11840  — R. Australia Melbourne, Australia 1300
11850  — LLK R. Norway Oslo, Norway 2300
11855  — ORU4 Belgium R. Brussels, Belgium 0815
11860  — R. Havana Havana, Cuba 0000
11865  — BE63 V. of Free China Taipei, Formosa 0410
11865  — HER5 Swiss B.C. Berne, Switzerland 2315
11880  — XEHU R. Comerciales Mexico D.F., Mex. 1730
11900  — RA1 Rome, Italy 1920
11905  — WURL R. N.Y. Worldwide New York, N.Y. 1130
11910  — RA1 Rome, Italy 1930
11915  — HSZ9 Overseas B.C. Bangkok, Thailand 0000
11920  — BSC Russian Broadcast Center Budapest, Hungary 1500
11925  — HL6 Korean B.C. Seoul, Korea 0245
11970  — WURL R. N.Y. Worldwide New York, N.Y. 1100
11970  — HL6 Korean B.C. Seoul, Korea 0245
11975  — RA1 Rome, Italy 1930
11980  — R. Havana Havana, Cuba 2200
12095  — GRF B.B.C. London, England 1650
12265  — (N. Atl. Aero)* V. of Airline Denmark 1700

19 Meter Band—15100 to 15450 Kcs
15100  — R. Japan N.H.K. Tokyo, Japan 1700
15110  — R. Mosow Moscow, U.S.S.R. 1150
15115  — R. Peking Peking, China 2325
15120  — R. Havana Havana, Cuba 0950
15125  — R. Tehran Tehran, Iran 1530
15130  — R. Havana Havana, Cuba 1500
15140  — TAU R. Ankara Ankara, Turkey 1700
15165  — OZBF V. of Denmark Copenhagen, Denmark 1020
15185  — Finnish B.C. Helsinki Finland 1630
15200  — VLG15 R. Australia Melbourne, Australia 0830
15205  — XESC R. Tropical Mex. Mexico D.F., Mex. 1800
15210  — V. of Africa Cairo, Egypt 1600
15220  — R. Australia Melbourne, Australia 2329
15225  — R. Africa Paris, France 1425
15230  — Food B.C. New York, N.Y. 0930
15235  — R. Sweden Stockholm, Sweden 0915
15240  — R. Australia Melbourne, Australia 2315
15245  — R. Berlin B.C. Berlin, Germany 0700
15245  — VSF V. of Denmark Copenhagen, Denmark 1020
15250  — RA1 Rome, Italy 1930
15255  — DAS Damescu, Romania 1120
15265  — Finnish B.C. Helsinki Finland 1630
15280  — V. of America Greenville, S.C. 0915
15285  — V. of America Los Angeles, Calif. 1730
15295  — V. of America Greenville, S.C. 0915
15300  — VSF V. of Denmark Copenhagen, Denmark 1020

16 Meter Band—17700 to 17900 Kcs
15305  — HER6 Swiss B.C. Bern, Switzerland 0820
15310  — V. of America Miami, Fl. 1515
15320  — CKCS R. Canada 1530
15345  — V. of Athens Athens, Greece 1500
15345  — BED49 V. of Free China Tokyo, Japan 2150
15350  — HCBV V. of the Andes Lima, Peru 1730
15370  — V. of Europe Lisbon, Portugal 1315
15380  — R. Liberdad Manila, Philippines 1630
15385  — V. of the West Tel Aviv, Israel 1400
15395  — BED7I V. of Free China Los Angeles, Calif. 1950
15425  — WURL R. Italian Worldwide New York, N.Y. 1105
15440  — R. Sweden Stockholm, Sweden 1010
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15465  — R. Baghdad Baghdad, Iraq 1600
15475  — B.B.C. London, England 1100

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