

DIRECTORY of SHORT-WAVE NEWSCASTS

POPULAR **SEPTEMBER**
ELECTRONICS **1962**

35
CENTS

MAC 9

BUILD

Reactance Demonstrator

Tuning Fork Oscillator

Use Mobile CB for P.A.

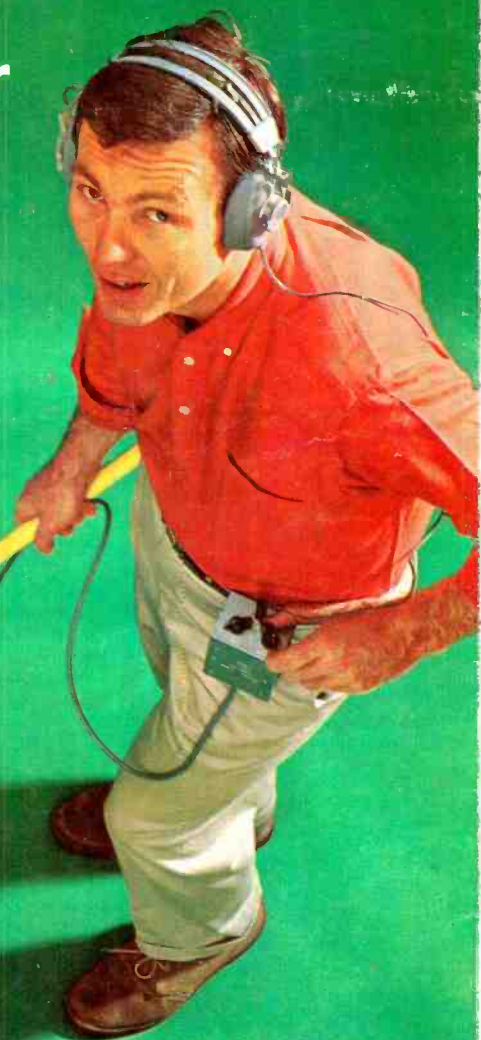
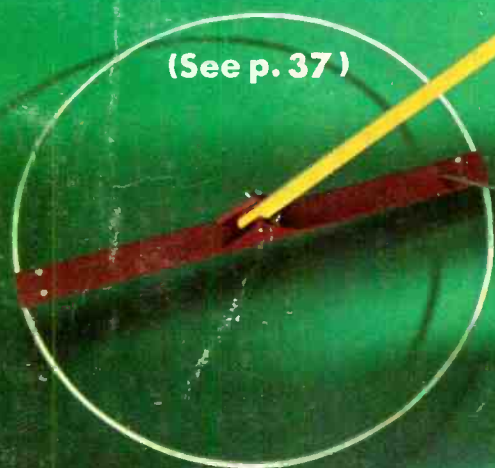
Super-Strong Magnet

METAL LOCATOR

Ultra-Sensitive Design

Build for \$25

(See p. 37)



NEW **Lab-Checked**
Hi-Fi Kit Reports

(See p. 43)



Prepare Now For The Higher Rewards The Electronics Age Offers You

There is an immediate and growing need for trained technicians in Industrial-Military Electronics, Radio-TV Servicing and Communications. Better than average jobs with high pay, interesting work, bright futures await you in the fast growing industry of the 1960's. Join thousands of NRI graduates now benefiting from career opportunities in this Electronic Age.

Training Equipment Included



NRI "learn by practice" training is the time-proved way to higher earnings and advancement. Except for FCC License course, all NRI courses include—at no extra cost—special training equipment to give shop and laboratory experience in your own home. Equipment is yours to keep. Makes NRI training come to life in an easy-to-grasp, interesting manner.

JOB COUNSELORS RECOMMEND

Today, a career in any branch of Electronics offers unlimited opportunity. Job Counselors advise, "For an interesting career, get into Electronics." The National Association of Manufacturers says: "There is no more interesting and challenging occupation in American industry."

NRI can provide the training—right in your own home and in your spare time. No need to go away to school. There are no special requirements of previous Electronic experience, or education in particular subjects. Mail postage-free card now. Read about Electronics opportunities, about NRI courses, about NRI trial plan.

Mail postage-free card.

National Radio Institute,
Washington 16, D. C.



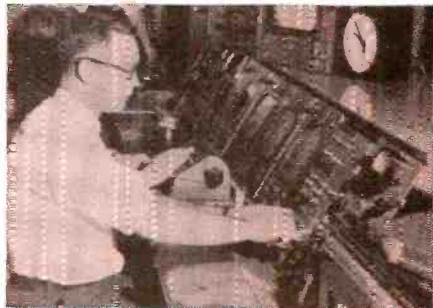
Industrial ELECTRONICS

The NRI course in Electronics—Principles, Practices, Maintenance prepares you for a career as an Electronic Technician in industry, business, government, the military. Computers, telemetry, automation, missiles, rockets all employ the same basic Electronic principles . . . and that is what this NRI course stresses with illustrated lessons, special training equipment.



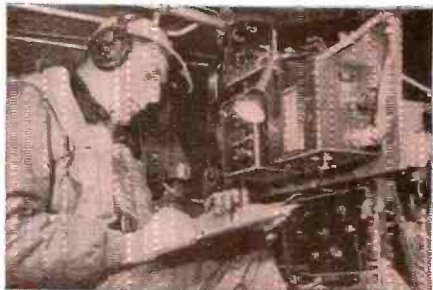
Commercial FCC LICENSE

You must have an FCC License if you want to operate or service transmitting equipment used in TV and Radio Broadcasting, aviation, marine, microwave, facsimile or mobile communications. Even a service Technician needs an FCC License today to work on C-Band Radio equipment. From Simple Circuits to Broadcast Operation, this new NRI course trains you quickly to take Government exams.



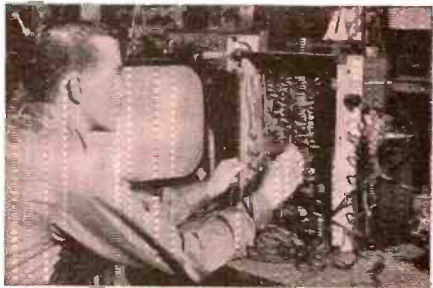
TV-Radio COMMUNICATIONS

In NRI's Communications course you get *actual experience* as NRI trains you for your choice of Communications fields. Commercial methods and techniques of Radio-TV Broadcasting; teletype; facsimile; microwave; radar; mobile and marine radio; navigation devices; multiplexing are some of the subjects covered. You work with special training equipment.



Radio and TV SERVICING

NRI's time-tested course in Servicing not only trains you to fix radios, TV sets, hi-fi, etc., but also shows you how to earn spare-time money starting soon after enrolling. Fast growth in number of sets means money-making opportunities for you in your own spare-time or full-time business, or working for someone else. Special training equipment at no extra cost. Mail postcard.



WHERE YOU TRAIN IS AS IMPORTANT AS YOUR DECISION TO TRAIN



NRI is America's oldest, largest home-study Electronics, Radio-Television school. NRI teaches *only* by home-study. The interests and efforts of our carefully-selected staff are devoted exclusively to this method of training. For nearly 50 years NRI has maintained the confidence and respect of students, graduates, and the Electronics Industry for constantly providing the best possible home-study training, at a cost most anyone can afford. For the complete NRI story, mail the postage-free card at the left. This could be the most profitable move you ever made.

For Nearly 50 Years NRI Has Been The Leader In Training At Home For Electronics, TV-Radio



J. E. Smith,
Founder—1914.

It takes a growing industry to give qualified men the best opportunity to advance and prosper. That's why so many men are deciding on a career in Electronics. But, even more important is *where* you get your training, and *how* the school of your choice teaches Electronics . . . how it trains and encourages men to reach their goals and realize their ambitions. It takes a growing

school—with years of specialized experience behind it—to do that for you.

This is a fast changing world, and a school offering Electronics courses must keep pace. The NRI staff of more than 150 is on the job every minute to see that course material is up-to-date . . . to see that you get all the help and advice you need . . . to assist you in job placement when you're ready, even to help you earn your way while you train. In short, whatever branch of Electronics you select, NRI is well qualified to help you grow in your new career . . . in usefulness, in prestige, in monetary gain.

NRI's Outstanding Staff Is Directed By These Men

DIRECTOR OF EDUCATION, William F. Durn, supervises lesson preparation, training equipment development, consultation services, lesson grading. He heads a full staff of instructors and advisors.



SUPERVISOR OF TRAINING, J. B. Straughn, is particularly concerned with NRI home-training equipment and its integration into course subject matter.

CHIEF TECHNICAL EDITOR, James P. Tate, Jr., heads a staff whose concern is the careful writing, editing and illustrating of lesson texts, keeping lessons up-to-date.



DIRECTOR OF PUBLICATIONS, Oliver Read, was formerly editor and publisher of Electronics World magazine; publisher Popular Electronics and Hi-Fi Stereo Review magazines.

POPULAR ELECTRONICS



POPULAR ELECTRONICS is indexed
in the Readers' Guide
to Periodical Literature

This month's cover photo by Bruce Pendleton

VOLUME 17

SEPTEMBER 1962

NUMBER 3

Special Construction Feature

- The Lodestar..... Charles Caringella, W6NJV 37
Here's a metal locator that's as modern as its all-transistor circuit;
a cinch to build, it works on the time-tested "beat frequency" principle

Electronic Construction Projects

- "Seeing" Inductive Reactance..... Roy E. Pafenberg 46
The Master Magnet..... Walter B. Ford 48
The 440 Fork Fred Ippolito & Pat Brocato 63
Simple TVI Filters..... Herb S. Brier, W9EGQ 77

Audio and High Fidelity

- Hi-Fi Lab Check 43
Fisher KM-60 FM Tuner StrataKit; Paco ST-26 FM Tuner/Amplifier Kit
CB Rig Doubles as PA System Robert B. Kuehn, 16Q0744 59
Back-Seat Music Makers..... B. van Sulphin 73

Amateur and Citizens Band

- FCC Report..... Robert E. Tall 8
First Rig for the "Plan Ahead" Novice..... 58
Equipment Report: Courier 1 Has Many Extras..... 66
Across the Ham Bands: "Six and Two" for the Newcomer..... Herb S. Brier, W9EGQ 75
On the Citizens Band..... Dick Strippel, 2W1452 81

Short-Wave Listening

- Directory of World-Wide Newscasts..... Stewart West, WPE2LH 53
Satellites on the Air..... 60
Short-Wave Report: Up-To-Date Schedule for VOA Program.... Hank Bennett, W2PNA 61
Short-Wave Monitor Certificate Application..... 62

Electronic Features and New Developments

- News Scope..... 6
Computers Can Think..... Harold Arnold 67
Solderless Banana Plug..... Hans F. Kutschbach 74
Transistor Topics..... Lou Garner 78
Potentiometer Quiz..... Robert P. Balin 86
The Clinging Vine (a Carl and Jerry Adventure)..... John T. Frye, W9EGV 88

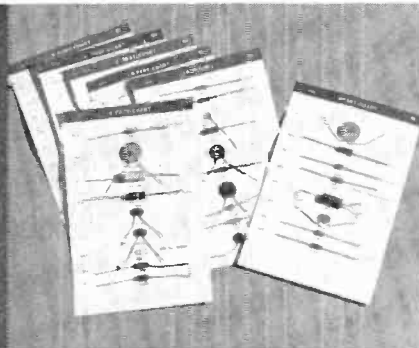
Departments

- Coming Next Month..... 12
Letter Tray..... 14
Tips and Techniques..... 24
POP'tronics Bookshelf..... 28
New Products..... 96
Hi-Fi Showcase..... 98
Electronics Datebook..... 107

Copyright © 1962 by ZIFF-DAVIS PUBLISHING COMPANY. All rights reserved.

POPULAR ELECTRONICS is published monthly by Ziff-Davis Publishing Company at 434 South Wabash Avenue, Chicago 5, Illinois. Subscription Rates: One year United States and possessions, \$4.00; Canada and Pan American Union Countries, \$4.50; all other foreign countries, \$5.00. Second Class postage paid at Chicago, Illinois, and at additional mailing offices. Authorized as second class mail by the Post Office Department, Ottawa, Canada, and for payment of postage in cash. September, 1962. Volume 17, Number 3.

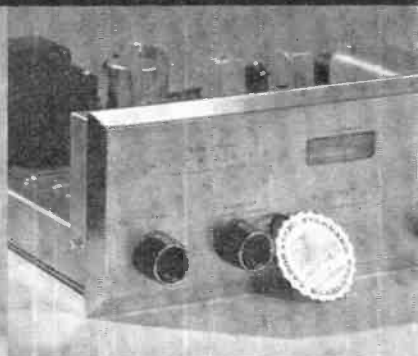
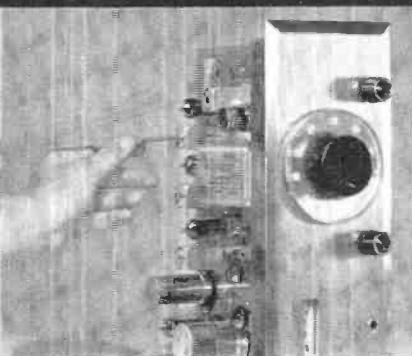
Here's why Audio Magazine says Scott® Kits are "Simplest to build..." and have "Engineering of the highest calibre"*



The exclusive Scott full color instruction book shows every part and every wire in natural color and in proper position. To make the instruction book even clearer each of the full color illustrations shows on a few assembly steps. There are no oversized sheets to confuse you.

Each full color illustration is accompanied by its own Part Chart... another Scott exclusive. The actual parts described in the illustration are placed in the exact sequence in which they are used. You can't possibly make a mistake.

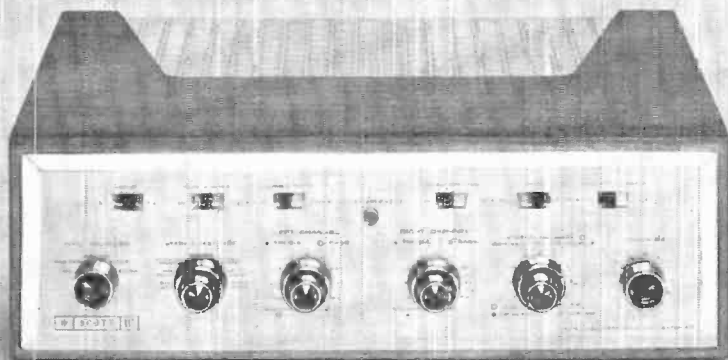
Much of the uninteresting mechanical assembly is completed when you open your Scott Kit-Pak. All the terminal strips and tube sockets are already permanently riveted to the chassis. To insure accuracy all wires are pre-cut and pre-stripped to proper length.



There are certain areas in every professional high fidelity component where wiring is critical and difficult. FM front ends and multiplex sections are an example. In Scott Kits these sections are wired at the factory, are thoroughly tested by Scott experts, assuring you a completed kit meeting stringent factory standards.

Tuners are aligned with the unique Scott Ez-A-Line method using the meter on the tuner itself. This assures perfect alignment without expensive signal generators. Amplifier kits require no laboratory instruments for perfect balancing.

The new Scott Warranty Performance Plan guarantees that your kit will work perfectly when completed. If you have followed all recommended procedures and your kit fails to work Scott guarantees to put you kit in working order at the factory at minimum cost.



When you finish your kit you'll be delighted by its handsome good looks. And when you turn your Scott Kit system on you'll know for yourself why the expert editors of leading high fidelity magazines like Audio say... "Only the most sophisticated engineering thinking could design a kit as simple and foolproof as this..."*

*Audio - February 1961, Pages 54-56



H. H. Scott Inc., Dept. 520-09
 111 Powdermill Rd., Waynard, Mass.

Please rush me without charge your full color brochure on the complete line of Scott FM stereo tuner, stereo amplifier and speaker kits. A sample 36 page full-color Scott Kit Instruction book will be included if you enclose 50¢ in coin or stamps.

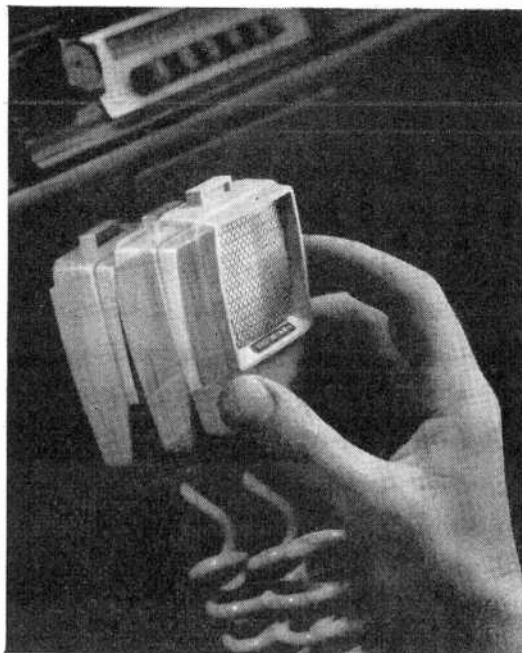
Name.....

Address.....

City..... State.....

If any of your friends would like a copy of the new Scott Kit brochure send us their names and addresses.

Export: Morhan Exporting Corp., 458 Broadway, N.Y.C.
 Canada: Atlas Radio Corp., 50 WIngold Ave., Toronto



Kerchunk! new sound of safety

Kerchunk is the sound made by the heavy duty magnet on the back of a Sonotone CB Ceramike as it mounts firmly, securely to your car's dashboard.

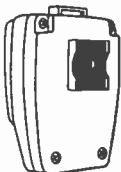
Kerchunk says: "Message to base completed easily, safely." *Kerchunk* means no more groping when you return your mike to its dashboard mounting bracket—no need to take your eyes off the road.

Responsible for this boon to those who rely on CB or mobile communication, from car or truck, is an important Sonotone development called "Magnet Mount." A heavy duty magnet on the back of Sonotone Ceramike mobile communications Models "CM-30M" and "CM-31M" lets you place the mike almost anywhere on or around the dashboard. Further, Magnet Mount eliminates the need to drill holes for dashboard mounting brackets.

Sonotone Ceramikes have far more to recommend them than just this amazing mounting device. The quality-engineered mobile communications models, "CM-30M" and "CM-31M" provide loud and clear reception. Inherently immune to extremes of temperature and humidity, they will operate even if immersed in water. Neoprene encased transducers render them shock and impact-proof.

CERAMIKE "CM-30M" — Intelligibility unsurpassed. High sensitivity from -49 db from 60 to 7000 cps. Lightweight, shatterproof plastic case. Convenient "Push-to-Talk" button. Spring-spiraled, 4-conductor shielded cable—list \$16.50 With dashboard mounting bracket instead of Magnet Mount. Model "CM-30"—list \$14.00

CERAMIKE "CM-31M" — Budget-priced communications model in shatterproof plastic case features excellent intelligibility in 60 to 7000 cps at -49 db sensitivity. 2-conductor coil cable, no switch, list \$16.00. With dashboard mounting bracket instead of "Magnet Mount." "CM-31"—list \$13.50



SEE SONOTONE CB CERAMIKES FEATURING MAGNET MOUNT

Sonotone® Corp. • Electronic Applications Div. • Elmsford, N. Y.
Cartridges • Speakers • Tape Heads • Mikes • Electron Tubes • Batteries • Hearing Aids

POPULAR ELECTRONICS

World's Largest-Selling Electronics Magazine

Publisher **PHILLIP T. HEFFERNAN**

Editor **OLIVER P. FERRELL**

Managing Editor **JULIAN M. SIENKIEWICZ, WA2CQL**

Art Editor **JAMES A. ROTH**

Associate Editors **MARC E. FINKEL**

RICHARD A. FLANAGAN

MARGARET MAGNA

Draftsman **ANDRE DUZANT**

Amateur Radio Editor **H. S. BRIER, W9EGQ**

CB Editor **D. STRIPPEL, 2W1452**

Semiconductor Editor **L. E. GARNER, JR.**

Short-Wave Editor **H. BENNETT, W2PNA**

Contributing Editor **J. T. FRYE, W9EGV**

Editorial Consultant **OLIVER READ, W4TWV**

Advertising Manager **WILLIAM G. McROY, 2W4144**

Advertising Service Manager **ARDYS C. MORAN**

ZIFF-DAVIS PUBLISHING COMPANY

Editorial and Executive Offices (ORegion 9-7200)

One Park Avenue, New York 16, New York

William B. Ziff, Chairman of the Board (1946-1953)

William Ziff, President

W. Bradford Briggs, Executive Vice President

Hershel B. Sarbin, Vice President and General Manager

M. T. Birmingham, Jr., Vice President and Treasurer

Robert P. Breeding, Circulation Director

Charles Housman, Financial Vice President

Stanley R. Greenfield, Vice President

Midwestern and Circulation Office (WAbash 2-4911)

434 South Wabash Avenue, Chicago 5, Illinois

Midwestern Advertising Manager JAMES WEAKLEY

Western Office (CRestview 4-0265)

9025 Wilshire Boulevard, Beverly Hills, California

Western Advertising Manager, WILLIAM J. RYAN, 11Q3002

Foreign Advertising Representative

D. A. Goodall Ltd., London, England



Member
Audit Bureau of
Circulations

SUBSCRIPTION SERVICE: All subscription correspondence should be addressed to POPULAR ELECTRONICS, Circulation Department, 434 South Wabash Avenue, Chicago 5, Illinois. Please allow at least six weeks for change of address. Include your old address as well as new—enclosing if possible an address label from a recent issue.

EDITORIAL CONTRIBUTIONS must be accompanied by return postage and will be handled with reasonable care; however, publisher assumes no responsibility for return or safety of art work, photographs or manuscripts.

Always say you saw it in—POPULAR ELECTRONICS



COLUMBIA
STEREO TAPE CLUB
 NOW OFFERS NEW MEMBERS
 An outstanding selection of
Stereo Tapes—at Club Plan Savings!

- | | | | | | | | |
|--|--|--|---|---|--|--|---|
| WEST SIDE STORY
Original Soundtrack Recording
9. Complete academy Award winning score | Wolffgang's Victory
BEETHOVEN
ANTAL DORATI
London Symphony Chch plus Camsons & Muzels
LIVING PRESENT SOUND SERIES | The New
ANDRE KOSTELANETZ
"Wunderland of Sound"
COLUMBIA | TIME OUT
THE DOVE BRUBECK QUARTET
COLUMBIA | SONGS OF THE NORTH & SOUTH
1861-1955
Mormon Tabernacle Choir
COLUMBIA | HARMONICAFS
Peg O' My Heart
Deep Purple
Tenderly
- 9 More
COLUMBIA | BOB MARTIN w/ RODGERS & HAMMERSTEIN'S THE SOUND OF MUSIC
with Original Broadway Cast
COLUMBIA |  |
| 15. "No better need be sought!"—Atlantic | 24. "Ideal for stereo."—High Fidelity | 21. "He is champion of recordings!"—Newswk. | 22. "It soars and it swings."—Playboy | 40. Battle Hymn of the Republic, Dixie, etc. | 29. Also: Sabre Dance, Mam'selle, etc. | 7. Do-Re-Mi, Laendler, Maala, 17 in all | 23. 13 top stars in 14 classical and pop hits |

- | | |
|---|---|
| BEETHOVEN
SYMPHONIES No. 4 and 5
COLUMBIA | FRANKIE LAINE
HILL BENT FOR LEATHER
High Noon
Wild Gossip
Mule Train
9 more
COLUMBIA |
| 15. "Complete score." | 10. Also: The Hanging Tree, Rawhide, etc. |
| BRUNO WALTER
Columbia Symphony Orchestra | RACHMANINOFF
Piano Concerto No. 2
BERNSTEIN-ENTREMOUNT
N.Y. PHILHARMONIC
COLUMBIA |
| 15. "No better need be sought!"—Atlantic | 10. "Gorgeous colors."—Hi Fi Review |
| LENER & LOEW
Camelot
RICHARD BURTON
JULIE ANDREWS
and Original Broadway Cast
COLUMBIA | RAY CONNIF
his orchestra and chorus
CONCERT IN RHYTHM
COLUMBIA |
| 15. "Complete score." | 18. "A super soprano." |
| 15. "Complete score." | 18. "A super soprano." |

AS A NEW MEMBER YOU MAY HAVE

ANY 3

of these \$6.95 to \$9.95 stereo 4-track tapes

\$5.98

FOR ONLY RETAIL VALUE up to \$29.85

If you join the Club now and agree to purchase as few as 5 selections from the more than 150 to be offered in the coming 12 months

- | | |
|--|--|
| JAZZ POLL WINNERS
Hampson Davis
Kingston
Bruback
15 other stars
COLUMBIA | DRFF CARMINA BURANA
THE PHILADELPHIA ORCHESTRA
LEWIS AND CLAYTON ORMANDY conducting
COLUMBIA |
| 21. Also: Don Elliott, Gerry Mulligan, etc. | 16. "Superb... best recording."—Wash. Post |
| banjos back in town
The Banjo Banquet
play 38 all-time favorites
COLUMBIA | REX HARRISON JULIE ANDREWS MY FAIR LADY
ORIGINAL CAST RECORDING
COLUMBIA |
| 28. "Packed with rosy gusto."—High Fidelity | 5. The Rain in Spain, Show Me, 16 in all |

- | | |
|--|---|
| RAY CONNIF
his orchestra and chorus
CONCERT IN RHYTHM
COLUMBIA | BOBBY HACKETT
Dream Awake
MISY + STARDUST
That Old Feeling
4 more
COLUMBIA |
| 2. I'm Always Chasing Rainbows, 12 in all | 34. Also: The Boy Next Door, Bewitched, etc. |
| MILES DAVIS
Sketches of Spain
COLUMBIA | EILEEN FARRELL PUCCHINI ARIAS
MADAME BUTTERFLY
LA BOHEME
TOSCA
184 other stars
COLUMBIA |
| 27. "Exquisite, glitters throughout."—Playboy | 18. "A super soprano." |

- | | |
|--|--|
| Request of Love
THE PERCY FAITH STRINGS
Invitation
Blue Moon
Easy to Love
4 more
COLUMBIA | VIVA Cugat!
XAVIER CUGAT
and his Orch.
PERCY FAITH'S GEMS SERIES
COLUMBIA |
| 3. Also: How High the Moon, etc. | 47. Isle of Capri, Si-boney, Say Si Si, etc. |
| PERCUSSION ORIENTALE
DAVID CARROLL
and his Orchestra
COLUMBIA | SPENBACH: Gaites Parisienne BIZET CARMEN HIGHLIGHTS
Andrs Kostelanetz
COLUMBIA |
| 46. Caravan, in a Persian Market, 9 more | 8. "A glittering performance..."—Billboard |

- | | |
|---|--|
| SHOW TIME
DORIS DAY
COLUMBIA | TV SING ALONG WITH MITC-I
4. Moonlight Bay, Avon-16 hits in all |
| 31. A Wonderful Gay, I Love Paris, 12 in all | 4. Moonlight Bay, Avon-16 hits in all |
| Bach Organ Favorites
E. Power Biggs
COLUMBIA | TOCHAIKOVSKY
The SLEEPING BEAUTY
Balliet-Sulpa
PHILADELPHIA ORCH
EUGENE ORMANDY
COLUMBIA |
| 20. "...perfect in stereo."—High Fidelity | 13. "Fabulous sound."—Washington Post |

- | | |
|--|--|
| LES BROWN BAND
Begin the Beguine
Blues
Caravan
So Rare
Undecided
String of Pearls
COLUMBIA | OPERA OVERTURES
L'Elisir de Semele
THOMAS SCHIFFRIS conducts
The Columbia Symphony
COLUMBIA |
| 30. Also includes: April in Paris, etc. | 35. "Rich, billowing sound."—Hi Fi Review |

HERE AT LAST is a convenient method of acquiring, systematically and with expert guidance, a stereo tape library of the music you enjoy most—at truly remarkable savings! The selections shown here are typical of the wide range of entertainment you'll be offered each month — every one reproduced with all the flawless clarity and brilliance of modern pre-recorded stereo tape!

By joining now, you may have your choice of ANY THREE of the outstanding 4-track stereo tapes shown here — up to a \$29.85 retail value — ALL THREE for only \$5.98.

TO RECEIVE YOUR 3 PRE-RECORDED STEREO TAPES FOR ONLY \$5.98 — simply fill in and mail the coupon today. Be sure to indicate which Club Division best suits your musical taste: Classical or Popular.

HOW THE CLUB OPERATES: Each month the Club's staff of music experts selects outstanding selections for both Divisions. These selections are described in the Club Magazine, which you receive free each month.

You may accept the monthly selection for your Division . . . or take any of the wide variety of other tapes offered to members of both Divisions in the Magazine . . . or take NO tape in any particular month.

Your only membership obligation is to pur-

chase 5 tapes from the more than 150 to be offered in the coming 12 months. Thereafter, you have no further obligation to buy any additional tapes . . . and you may discontinue your membership at any time.

FREE BONUS TAPES GIVEN REGULARLY. If you wish to continue as a member after purchasing five tapes, you will receive — FREE — a pre-recorded bonus tape of your choice for every three additional selections you buy!

The tapes you want are mailed and billed to you at the list price of \$6.95 (Classical \$7.95; occasional Original Cast tapes somewhat higher), plus a small mailing and handling charge.

SEND NO MONEY — just mail the coupon today to receive 3 tapes for only \$5.98.

IMPORTANT NOTE: All tapes offered by the Club must be played on 4-track stereo play-back equipment. If your tape recorder does not play 4-track stereo tapes, you may be able to convert it simply and economically. See your local service dealer for complete details.

COLUMBIA STEREO TAPE CLUB
Terre Haute, Indiana

SEND NO MONEY—mail coupon to receive 3 tapes for \$5.98

COLUMBIA STEREO TAPE CLUB, Dept. 403-5
Terre Haute, Indiana

CIRCLE 3 NUMBERS:

2	15	29
3	16	30
4	18	31
5	19	34
6	20	35
7	21	40
8	22	45
9	24	46
10	25	47
11	27	48
13	28	

CLASSICAL POPULAR

I understand that I may select tapes from either Division. I agree to purchase five selections from the more than 150 to be offered in the coming 12 months, at the list price plus small mailing and handling charge. Thereafter, if I decide to continue my membership, I am to receive a 4-track pre-recorded bonus tape of my choice FREE for every three additional selections I accept.

Name.....
(Please Print)

Address.....

City.....Zone.....State.....

A.P.O. P.O. addresses: write for special offer 305

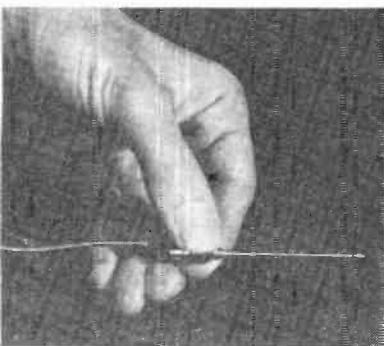
35 WC



▶ **ELECTRONIC PIANOS**, completely portable and operated on batteries, may soon become the rage of picnickers, beachgoers, and just about any type of sun lover. Made by the Wurlitzer Company, DeKalb, Ill., the new 64-note transistorized version of the piano weighs only 81 pounds and is built into its own suitcase—about the size of a two-suit. The instrument's musical scale has a bass made richer by amplification and a slight bell-like overtone in the upper register. A vibrato control permits other musical tonalities that range from the Hawaiian guitar to vibraphone effects. Apartment pianists can keep their neighbors happy by using earphones while practicing for surfside jam sessions.



▶ **PEEKING INSIDE** of transistors, diodes, micro-modules or just about any miniature encapsulated assembly is an important quality control step in the construction of complex electronic equipment. Previously, when delicate parts were X-rayed to detect faults, the processing of the film was a costly process that ate up hours as well as dollars. Now, a new "Gammacon" X-ray TV system introduced by American Microwave & Television Corp., San Carlos, Calif., displays the X-ray image instantaneously, magnified up to 30 times, and thus eliminates the need for film processing. The TV camera system uses 945-line scan, permitting easy and accurate inspection of $\frac{3}{8}$ " by $\frac{1}{2}$ " rectangular areas.



▶ **MICROMINIATURE GEIGER COUNTERS**, ranging in size from 0.040" (in diameter) x .250" to .125" x 1.000", are being used to monitor tumor cell growth during treatment in experimental studies at the Columbia-Presbyterian Medical Center in New York City. Probably the smallest beta or gamma radiation detectors in existence, the counters are made by the EON Corporation of Brooklyn and are the newest of the many electronic weapons being used in the attack on cancer. Since they are small enough to be passed through the bore of a hypodermic needle, they can be implanted directly in blood vessels, body cavities, or solid tissues without appreciable tissue damage. Hence, researchers can study the effects of new radioisotope-labeled compounds on tumor cells in animals.



▶ **CHECKING ON CHOW** by totaling the costs of meals and keeping track of food sold are functions of a new inventory control system designed for cafeterias. The system, developed by American Machine and Foundry Company, is a combination cash register and inventory machine which greatly simplifies accounting procedures for the billion-dollar cafeteria industry. There are 16 variations of the "Amficon-Inventrol" (the system's given name), which can be tailored to compute a city or state sales tax, indicate cash received, make change, and even make it possible for the cashier to total a second tray while the first customer is getting his money ready. The cashier need not remember prices at all, but simply punch buttons corresponding to the foods seen on the tray.

men
17-55

**JOB OPPORTUNITIES!
EXCITEMENT!
MONEY!**

All this
can be
Yours as a trained

Electronics TECHNICIAN

OVER 6,000 FIRMS HAVE EMPLOYED
DeVRY TECH GRADUATES!

Thousands of companies in the United States and Canada who have employed DeVry Tech men prove two most important facts: (1) Electronics is one of the biggest, fastest growing opportunity fields of our time; and (2) DeVry Tech graduates are "WANTED" MEN.

Whether DeVry Tech prepares you in spare time at home or in its modern Chicago or Toronto Laboratories, your training is designed to get you ready to meet the exacting standards of industry. You get practical training that not only helps to fit you for a job or a service shop of your own—but also gives you a foundation for a career that can be profitable the rest of your life.

You work over 300 learn-by-doing experiments at home, using DeVry Tech's exclusive Electro-Lab method. You build and KEEP valuable equipment. With another DeVry Tech exclusive, you have the benefit of training movies that you can show over and over until basic points are crystal clear. Special texts guide you every step of the way as well.

HOW DeVRY TECH CAN "BLUEPRINT" YOUR CAREER!

DeVry's faculty not only know how to teach Electronics, but they also understand men. They most likely know the type of problems you face. From this staff you get help, advice and understanding. It is this "human" side of DeVry's program that has caused many of our graduates to say: "DeVry Tech not only trains you for a job, they actually help you blueprint a profitable future!"

NO ADVANCED EDUCATION NEEDED!

Why don't you write for FREE FACTS today? Learn how you TOO can be a member of the great fraternity of DeVry Tech graduates across the continent . . . men who were properly trained, encouraged, appreciated and understood! SEND IN COUPON NOW!

EFFECTIVE EMPLOYMENT SERVICE

DeVry Tech's effective Employment Service is available to all graduates without additional cost.

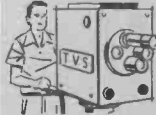
2 FREE BOOKLETS
Send Coupon TODAY!

"One of North America's Foremost Electronics Training Centers"

Accredited Member of
National Home Study Council



**DeVRY TECHNICAL
INSTITUTE**
CHICAGO • TORONTO



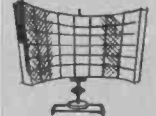
TELEVISION



COMPUTERS



MICRO-WAVES



RADAR



BROADCASTING

LET DeVRY HELP
YOU PREPARE
AND BLUEPRINT
A SOLID
CAREER IN
THIS
FAST-GROWING
FIELD!



MAIL TODAY FOR FREE FACTS!

DeVRY TECHNICAL INSTITUTE

4141 Belmont Ave., Chicago 41, Ill., Dept. PE-9-5

Please give me your 2 FREE BOOKLETS, "Pocket Guide to Real Earnings" and "Electronics in Space Travel," also include details on how to prepare for a career in one or more branches of Electronics.

Name _____ Age _____

Street _____ Apt. _____

City _____ Zone _____ State _____

Check here if you face military service.

Canadian residents address: DeVry Tech of Canada, Ltd.
2075 970 Lawrence Avenue West, Toronto 19, Ontario

BUILD YOUR AMATEUR TRANSMITTER from these easy-to-build kits!



ADVENTURER — 50 watts CW input rugged 807 transmitting tube, instant bandswitching 80 thru 10 meters. Crystal or VFO control, wide range pi-network output.

VALIANT — 275 watts input CW and SSB (P.E.P.) with auxiliary SSB exciter, 200 watts phone; instant bandswitching 160 thru 10 meters. Crystal or VFO control, wide range pi-network output, timed sequence keying.

RANGER II — 75 watts CW. 65 AM. Also serves as RF audio exciter. Self-contained bandswitching 160 thru 6! VFO or crystal control. Timed sequence keying, wide range pi-network output.



Adventurer



Valiant



Ranger II

Write today — FREE 30-page amateur catalog!



E. F. JOHNSON COMPANY

2403 Tenth Ave. S.W. • Waseca, Minn.

Name _____

Address _____

City _____ State _____

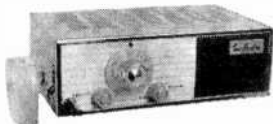
1ST FOR THOSE WHO KNOW QUALITY



UTICA T & C II



Dual conversion 6 channel crystal controlled transceiver with tunable receiver, 5-meter and signal strength output indicator; external crystal socket and auxiliary speaker terminal. Chrome cabinet. \$199.95



UTICA MC-27 TOWN & COUNTRY

Dual conversion 6 channel crystal controlled transceiver in mirror-finish cabinet \$179.50

UTICA COMMUNICATIONS CORP.

5055 N. Kedzie Avenue • Chicago 25, Ill.



FCC Report

☆☆☆☆☆ ☆☆☆☆☆☆☆ ☆☆☆☆☆☆☆

By **ROBERT E. TALL**

Washington Correspondent

FACED with a rash of applications and correspondence from Citizens Band radio licensees and applicants contemplating the use of CB equipment with 30-watt power input, the FCC is carefully explaining to these people that Class D Citizens stations still are, as they always have been, limited to 5-watt power input. And the correspondence is being returned to the senders.

The sudden influx of correspondence regarding 30-watt CB operations, FCC officials point out, has apparently resulted from mention in a national publication that the Commission is considering permitting the assignment of two additional channels—27.235 and 27.275 megacycles—to the Class D service on a shared basis with other services. These other services can now use 30-watt equipment, but the FCC "split-channel" plan does *not* include allowing CB units to use more than the present 5-watt maximum.

In the "form" letter accompanying the correspondence being returned, the FCC emphasizes the present 5-watt restriction for Class D units, and comments that "A person desiring to obtain greater communication range than can be obtained by Class D stations should investigate the possibility of using Class A Citizens stations (which are permitted up to 60 watts power, but operate on frequencies in the 460-470 mc. band) or stations in one of the other services in which he may be eligible . . ."

The FCC letter further points out that: "In connection with your apparent desire to operate a station in the 'Citizens Band' with up to 30 watts input power, it should be noted that only those frequencies listed in section 19.31(d) of the rules are available for assignment for use by Class D stations. The frequencies 27.235, 27.245, 27.265 and 27.275 mc. are *not* available for use by any Class D station, but are available for assignment to licensed stations in many other services, such as the local government radio service, the business radio service, etc. In those services, stations are limited to 30 watts input power on the above frequencies

The Same School That Originated The RTS BUSINESS PLAN

...NOW
Proudly
Presents...

A SPECIAL COMPACT COURSE COVERING ALL THREE PHASES OF **ELECTRONICS**

The Entire Course Is Made
Up Of The Following:

- 35 LESSONS COVERING BASIC AND INTERMEDIATE ELECTRONICS
- 9 EQUIPMENT KITS COMPLETE WITH TUBES AND BATTERIES
- SOLDERING IRON
- 25 LESSONS COVERING THESE ADVANCED ELECTRONIC SUBJECTS:

Thyratron Tubes • Semiconductors • Electronic Symbols and Drawings • Voltage-Regulators • Electronic-Timers • Control Systems • X-Rays • Photoelectric Devices • Dielectric Heating • Geiger Counters • Pulse Circuitry • Clippers and Limiters • Multivibrators • Electronic Counters • Radar • Magnetic Amplifiers • Analog-Computers • DC Amplifiers • Digital Computers • Storage Systems • Input and Output Devices • Servomechanisms • Telemetering

- 60 EXAMINATIONS
- UNLIMITED CONSULTATION SERVICE
- KIT MANUALS
- DIPLOMA UPON GRADUATION

**BASIC • INTERMEDIATE • ADVANCED
DESIGNED FOR THE BUSY MAN OF TODAY**

This is MODERN training for the MODERN man. You'll find no "horse and buggy" methods here. Every page of this streamlined course is devoted to important Electronics principles and practical projects. You'll be amazed how fast you grasp Basic Electronics the RTS way. RTS has combined modern THEORY and PRACTICE to make this the finest training program of its kind available!

SATISFIES NOVICE, TECHNICIAN OR HOBBYIST

Whether you're new to Electronics or an old "pro," chances are you'll find this to be the ideal course for you. The novice will appreciate the completeness of the training. It starts with the most basic considerations, covering each important point thoroughly, yet concisely. The technician will enjoy the practical review of fundamentals and profit from the 25 advanced subjects covered.

RTS GIVES YOU "TOP MILEAGE" FOR YOUR TRAINING DOLLAR

The price quoted below buys EVERYTHING — there are no extras to pay for. RTS has gone "all out" to give you the best training value in America. Why pay hundreds of dollars for training such as we offer when it's available for this LOW PRICE? If you can find a better training bargain... BUY IT!

CAN BE COMPLETED IN MONTHS INSTEAD OF YEARS

Some students will complete this course with "Jet-Like" speed but we allow up to two years if your circumstances require it. You study at your own rate. You are ENCOURAGED but not pushed. You'll find the lessons professionally written. LET US SEND YOU ONE OF THESE LESSONS ALONG WITH YOUR CAREER BOOKLET SO YOU CAN SEE FOR YOURSELF. NO OBLIGATION!

AND MUCH MORE...

RTS' Membership in
The Association of
Home Study Schools
is your assurance of
Reliability, Integrity and
Quality of Training.



RTS ELECTRONICS DIVISION
815 E. ROSECRANS AVENUE
LOS ANGELES 59, CALIFORNIA

Ext. 1922



COMPLETE
COST...
INCLUDES ALL KITS,
TUBES, BATTERIES, ETC.
\$125.00*

**Rush
Coupon**

**NO
SALESMAN
WILL
CALL!**

* TERMS ALSO AVAILABLE
AS LITTLE AS

\$5.00 DOWN \$5.00 PER MONTH

**SAVE TIME — SEND
\$5.00 WITH COUPON**
YOUR FIRST LESSONS AND
KIT WILL BE RUSHED TO YOU
THE SAME DAY THEY ARE RECEIVED!

DON'T LOSE OUT — FIND OUT!

RTS ELECTRONICS DIVISION, Dept. PE-92

815 E. ROSECRANS AVENUE LOS ANGELES 59, CALIFORNIA

Rush me full information by return mail. (Please Print)

Name _____ Age _____

Address _____

City _____ Zone _____ State _____

ENROLL ME NOW **SEND MORE FACTS**

MARK Static Sheath*

Eliminates Precipitation Static
Improves Signal-to-Noise Ratio
Affords up to 20 db Operating Gain
Increases Receiver Sensitivity
Extends Intelligible Coverage
Easiest to Install*

**INCREASE
COVERAGE**
on Citizens Band

**MARK II SUPER BEACON
FIXED STATION ANTENNA**
*with exclusive Static Sheath**

Design advantages of the new MARK II now make it possible to step up the efficiency of your CB operation, and maintain clearer communication over greater distances. 19 feet overall, the omnidirectional MARK II makes fullest use of the 20-foot legal length limit. Requires no radials or skirts. Provides 1 db gain over ground plane antennas.

Employs a full half-wave radiator voltage fed through a special launcher-matcher cable section for excellent impedance match over the entire 11-meter citizens band. Low angle radiation insures utmost efficiency and maximum contact with mobile units. Improved mechanical features and extrarugged base support pipe add to its reliability. Simplified clamp mounting makes installation easy.

Precipitation Static is caused by charged particles in the air impinging in a continuous stream on metal antenna radiator surfaces. The patented Mark Static Sheath is a tough, durable, dielectric plastic covering that eliminates this static interference.

Write for Catalog HW19-PE

MARK HELIWHIP®

Another Fine Product Line by

B & K MANUFACTURING CO.



Division of DYNASCAN CORPORATION
Dept. PE-9, 1801 W. Belle Plaine, Chicago 13, Illinois

FCC Report

(Continued from page 8)

and may be authorized to utilize antennas having greater antenna height than is permitted Class D stations."

New CB Petition. Relative to the same subject, one of the latest petitions filed with the FCC (by an Ohio radio equipment manufacturer) asks the Commission for Class D rule changes to specify that no Class D units manufactured after a certain date "shall have a final stage capable of delivering more than 25% above the 5 watts maximum authorized power regardless of what changes are made in circuit components preceding the final stage."

The company urged that CB equipment manufacturers be required to certify that their units meet the proposed rule, and, further, "that manufacturers not supplying such certification, or not complying with the '25% above 5 watts' limitation, or engaging in misleading advertising relative to the capabilities of the equipment, shall be subject to fine."

More on "Forfeitures." As expected, President Kennedy signed the Communications Act changes permitting the FCC to levy fines of from \$100 to \$500 on radio licensees, including CB'ers, for violations of 12 specific provisions of the agency's rules. The Commission has begun putting the new enforcement tool into effect.

Also signed by the President was legislation permitting the agency to stop requiring that applications be notarized. It may take a while for all FCC application forms to catch up with the new procedure, but CB'ers can now feel free to ignore the notarization requirement. (An article entitled "New Form for CB," intended to serve as a guide in filling out the revised FCC Form 505, appeared on p. 55 of our August issue.)

CB Club Asks Help. The Five-Eleven Radio Club, of Pittsburgh, Pa., is one of a number of CB clubs which have formally asked the FCC's "help" in clearing up the "misuse" of the Class D radio service in their areas.

The club listed the "primary" offenses in the area as "(1) lengthy transmissions; (2) unmodulated carriers; (3) extreme profanity; and (4) general horseplay on the air." The letter to the Commission pointed out that "different offenders have publicly stated that they defy the FCC or any other organization to notify them of violations," while "others have stated that they received citations and bragged that they use them for wallpaper."

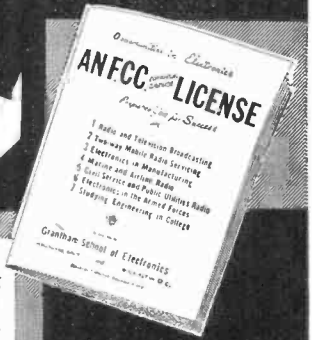
Campaign for More Frequencies. Advance planning for an informational program to give the American public and Congress a

Always say you saw it in—POPULAR ELECTRONICS

F.C.C. COMMERCIAL OPERATOR LICENSE

Training..

This booklet
FREE!



This free booklet gives details of our training and explains what an F.C.C. license can do for your future.

F. C. C. LICENSE — KEY TO BETTER JOBS

An F. C. C. *commercial* (not amateur) license is your ticket to higher pay and more interesting employment. This license is Federal Government evidence of your qualifications in electronics. Employers are eager to hire *licensed* technicians.

WHICH LICENSE FOR WHICH JOB?

The **THIRD CLASS** radiotelephone license is of value primarily in that it qualifies you to take the second class examination. The scope of authority covered by this license is extremely limited.

The **SECOND CLASS** radiotelephone license qualifies you to install, maintain and operate certain radiotelephone equipment but not commercial broadcast station equipment.

The **FIRST CLASS** radiotelephone license qualifies you to install, maintain and operate every type of commercial radiotelephone equipment including all radio and television stations in the United States, its territories and possessions. This is the highest class of radiotelephone license available. Many companies which employ industrial electronics technicians require this license.

GRANTHAM TRAINING PREPARES YOU

The Grantham Communications Electronics Course prepares you for a **FIRST CLASS F.C.C.** license, and it does this by **TEACHING** you electronics. Each point is covered simply and in detail, with emphasis on making the subject easy to understand. The organization of the subject matter is such that you progress, step-by-step, to your specific objective—a first class F. C. C. license.

CORRESPONDENCE OR RESIDENCE CLASSES

Grantham training is available by correspondence or in resident classes. Either way, you are trained quickly and well. Write, or mail the coupon below, to any division of Grantham School of Electronics. Our free booklet will be sent to you immediately.

FOUR SCHOOLS TO SERVE YOU

To better serve our many students throughout the entire country, Grantham School of Electronics maintains four Divisions—located in Hollywood, California; Kansas City, Mo.; Seattle, Wash.; and Washington, D.C.

Upgrade Your Income with a First Class F. C. C. LICENSE

HERE'S PROOF... that Grantham students prepare for F. C. C. examinations in a minimum of time. Here is a list of a *few* of our recent graduates, the class of license they got, and how long it took them:

	License	Weeks
James C. Bailey, 217 Behrends Ave., Juneau, Alaska	1st	12
Edward R. Barber, 907 S. Winnifred, Tacoma, Wash.	1st	20
M. A. Dill, Jr., 20 Cherry St., Gardiner, Maine	1st	12
Bernhard G. Fokken, Route 2, Carby, Minn.	1st	12
Kenneth F. Fultz, Broad St., Middletown, Md.	1st	12
James C. Greer, Mound City, Kansas	1st	12
Thomas J. Hoof, 216 S. Franklin St., Allentown, Pa.	1st	22
Clyde C. Morse, 7505 Sharronlee Dr., Mentor, Ohio	1st	12
Louis W. Pavek, 838 Page St., Berkeley 10, Calif.	1st	16
Wayne Winsauer, 2009 B St., Bellingham, Wash.	1st	12

Accredited by the National Home Study Council

GRANTHAM SCHOOL OF ELECTRONICS

HOLLYWOOD CALIF.

1505 N. Western Ave. (HO 7-772*)
Hollywood, Calif.

SEATTLE WASH.

408 Marion Street (MA 2-722*)
Seattle, Wash.

KANSAS CITY MO.

3123 Gillham Road (KE 1-632C)
Kansas City, Mo.

WASHINGTON D. C.

821 - 19th Street, N. W. (ST 3-3614)
Washington, D. C.

MAIL COUPON TO SCHOOL NEAREST YOU

[Mail in envelope or paste on postal card]

To: GRANTHAM SCHOOL OF ELECTRONICS

1505 N. Western Hollywood • 408 Marion Seattle • 313 Gillham R.I. Kansas City • 821-19th, NW Washington



Gentlemen:

Please send me your free booklet telling how I can get my commercial F. C. C. license quickly. I understand there is no obligation and no salesman will call.

Name _____ Age _____

Address _____

City _____ State _____

I am interested in: Home Study, Resident Classes

23P

CB ANTENNA SALE!!!

- COMMAND SUPER III-3-ELEMENT BEAM** (vertical or horizontal) heavy duty SALE **\$11.99**
- COMMAND SUPER V-5-ELEMENT BEAM** (super-gain, vertical or horizontal) SALE **\$18.99**
- COMMAND CONTACT II**—stainless spring + 102" whip + chrome body mount (reg. \$12) SALE **\$ 6.89**
- COMMAND CORSAIR MOBILE ANTENNA**—bumper mt. + spring + 102" whip (reg. \$15) SALE **\$ 8.99**
- COMMAND CORSAIR II ANTENNA**—double bumper mt. + spring + whip (reg. \$17) SALE **\$ 9.99**
- COMMAND CRYSTAL SELECTOR 12-POSITION** (mounts either side of set—with cable) (reg. \$10.00) SALE **\$ 5.95**
- COMMAND COMET ANTENNA** (top-loaded whip + trunk lid mount) (reg. \$10) SALE **\$ 6.99**
- JAMES KNIGHTS CB CRYSTALS** (specify make, model, channel nos.) SALE **\$ 1.99**
- BASE LOADED INDOOR CB ANTENNAS** (reg. \$8) SALE **\$ 2.49**
- COMMAND CB SILENCER KIT 15-pc.** mobile noise suppression kit: contains tun. gen. supp. + feed thru + spk. plug and dist. supp., etc. (reg. \$10) SALE **\$ 3.99**
- TOKYO ROSE CRYSTAL STUDIO MIKES FOR CB** SALE **\$ 4.89**
- 100 ft.—RG58u COAX CABLE** SALE **\$2.99**
- 100 ft.—RG 8u COAX CABLE** SALE **\$7.99**

Check items wanted. Return ad or order with check or money order. Include postage, excess refunded. 50c service charge on orders under \$5.00. Beams and 102" whips shipped Railway Express. 50% deposit on C.O.D.'s

CB DEALERS: Write for Quantity Prices!

GROVE ELECTRONIC SUPPLY COMPANY
4103 W. Belmont Avenue, Chicago 41, Illinois

- Rush items checked
- Send FREE catalog of giant CB Values

Name
(please print)
Address
City Zone..... State.....

FCC Report

(Continued from page 10)

true picture of the importance of two-way radio communications to the country should be well on the road by the end of this year. This program could result in CB'ers being asked to stand up and be counted in what could be a pretty hectic political dispute before it is all over.

The thrust of the campaign is to get some more usable frequency space for the spectrum-starved two-way radio services. The mobile radio interests leading the program are more than a little disappointed at the manner in which Congress totally ignored the vital needs of the two-way field in legislation earlier this year calling for all-channel television receivers in the future, and they can be expected to enlist all possible allies in proving their case.

The mobile radio campaign appears to be headed principally toward Congress and the people, in a move to side-step the broadcaster-dominated FCC Commissioners. Just a few of the present 6-mc.-wide TV channels, of course, could make a lot of narrow-band mobile radio channels.

-30-

COMING NEXT MONTH



Taping off the air is a "natural" for any SWL or ham—it's one sure way to squash the skeptics and prove that your "finds" are no mere boasts. This information-packed story tells you exactly how to get in on all the fun.

ON SALE
SEPTEMBER 25

UHF-TV CONVERTER

One transistor and one diode team up in this home-brew device to allow you to tune in all of the 83 new TV channels. Battery-powered, it can be hooked up to any TV set.

2 TUBES FOR 2 METERS

Build this sensitive, line-operated superregen receiver, and get set to listen to the 144-148 mc. ham band.

NATURE'S ELECTRONICS

Bionics, the infant science of patterning electronic equipment after living creatures, has opened a new world to scientists and may soon offer exciting new contributions to the art of electronic technology.

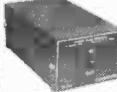
KUHN

"LEADERS IN SPECIALIZED RECEIVING EQUIPMENT"

MOBILE FIXED CONVERTERS

- POLICE
- FIRE
- COMMERCIAL
- CITIZEN'S BAND

345A Complete \$29.95



A new high gain Crystal Controlled Converter. Excellent sensitivity. Rugged construction. Easy to install. Designed for standard transistor car radios. Requires no high voltage supply. 2-54 MC or 150-162 MC.

KUHN CONVERTERS . . . the most advanced line . . . designed for optimum performance.



348A Complete \$34.95

Transistorized, directly tunable Converter. Powered with self-contained mercury cell. Excellent sensitivity and stability. Designed for car, home or portable receivers. Two types available: Aircraft VHF 115-130 MC or 150-162 MC.



344A Complete \$23.95

A new low cost Crystal Controlled Converter designed for use with standard transistor car radios. Operates directly from 12V DC. Rugged construction. Good sensitivity. Range 2-54 MC.

ORDER TODAY or SEND FOR FREE CATALOG . . . containing complete information on a full line of CONVERTERS AND RECEIVERS FOR EVERY APPLICATION

315A



Complete \$14.95

A low cost Tunable Converter for any 10 MC area of: 26-54 MC, Aircraft VHF, or 150-160 MC. Easily installed. For use with home or auto sets. 316A Directly Tunable Converter. Available in four ranges: 26-30 MC, 30-50 MC, 115-130 MC, or 150-160 MC. Complete \$21.95



20 GLENWOOD CINCINNATI 17, OHIO

want to boost your pay?

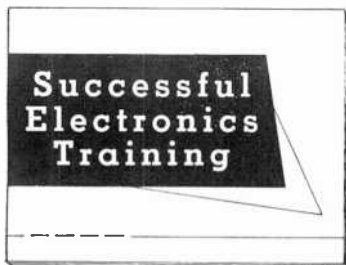
Move Ahead in ELECTRONICS

Get All 3 Free!



Get This Handy Pocket
Electronics Data Guide Folder
Free . . .

Puts all the commonly used conversion factors, formulas, tables, and color codes at your fingertips. Yours absolutely free if you mail the coupon today. No further obligation!



find out how . . .

1. You can get job security. Specialized education is the road to higher salary and important jobs in the growing field of electronics.
2. You can solve the problems that stump other technicians. Problems in electronics are becoming more complex. Your ability to solve problems will help you get ahead in your field.
3. You can handle new electronic devices. Every day, advances are being made in electronics. Only through education can you find out how to keep up with these developments and how to use the new devices.

Cleveland Institute of Electronics

1776 E. 17th St. Dept. PE-94 Cleveland 14, Ohio

Your FCC License Or Your Money Back!

Completion of the Master Course (both Sections) will prepare you for a First Class Commercial Radio Telephone License with a Radar Endorsement. Should you fail to pass the FCC examination for this license after successfully completing the Master Course, you will receive a full refund of all tuition payments. This guarantee is valid for the entire period of your enrollment agreement.

Investigate Our NEW Training Program
in Computers, Servo Mechanisms
Magnetic Amplifiers, and others

Accredited by the National Home Study Council

MAIL COUPON TODAY



Cleveland Institute of Electronics

1776 E. 17th St., Dept. PE-94, Cleveland 14, Ohio

Please send Free Career Information prepared to help me get ahead in Electronics. I have had training or experience in Electronics as indicated below:

- | | |
|---|---|
| <input type="checkbox"/> Military | <input type="checkbox"/> Broadcasting |
| <input type="checkbox"/> Radio TV Servicing | <input type="checkbox"/> Home Experimenting |
| <input type="checkbox"/> Manufacturing | <input type="checkbox"/> Telephone Company |
| <input type="checkbox"/> Amateur Radio | <input type="checkbox"/> Other |

In what kind of work are you now engaged?

In what branch of Electronics are you interested?

Name Age

Address

City Zone State

PE94

Superior's New Model 820

TUBE TESTER

TESTS ALL MODERN TUBES
INCLUDING THE NEW



- ✓ NOVARS
- ✓ NUVISTORS
- ✓ 10 PINS
- ✓ 12 PIN COMPACTRONS

SPECIFICATIONS:

- Employs new improved emission circuit.
- Tests over 850 tube types.
- Tests OZ4 and other gas filled tubes.
- Employs new 4" meter with sealed air-damping chamber resulting in accurate vibrationless readings.
- Use of 26 sockets permits testing all popular tube types.
- Dual Scale meter permits testing of low current tubes.
- 7 and 9 pin straighteners mounted on panel.
- All sections of multi-element tubes tested simultaneously.
- Ultra-sensitive leakage test circuit will indicate leakage up to 5 megohms.

Model 820 comes complete with tube charts and instructions; \$3850 housed in handsome, portable, Saddle-Stitched Texon case. Only

SHIPPED ON APPROVAL
NO MONEY WITH ORDER - NO C. O. D.

Try it for 15 days before you buy. If completely satisfied then send \$5.00 and pay balance at rate of \$5.00 per month until total price of \$38.50 (plus postage) is paid - No Interest or Finance Charges Added! If not completely satisfied, return to us, no explanation necessary.

MOSS ELECTRONIC, INC.
DEPT. D-340, 3849 Tenth Ave. New York 34, N.Y.
Please rush Model 820. If satisfactory, I will pay on terms specified. Otherwise I will return tester.

Name _____
Address _____
City _____ Zone _____ State _____
All prices net, P.O.B., N.Y.C.

NEVER FAIL—

ZONE YOUR MAIL

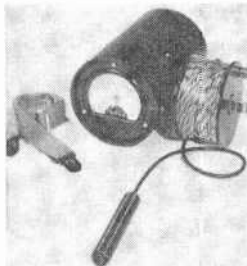
The Post Office has divided 106 cities into postal delivery zones to speed mail delivery. Be sure to include zone number when writing to these cities; be sure to include **your** zone number in **your** return address—after the city, before the state.

ults To identify my...
LETTER
on, we changed 12 to 7 or 8 turns of #22
e on a 1/4" diameter...
TRAY

Address correspondence for this department to:
Letters Editor, POPULAR ELECTRONICS
One Park Avenue, New York 16, N. Y.

Commercial Fish Finder

■ We read with interest the underwater thermometer article ("The Fish Finder") in your July 1962 issue. You'll probably be interested to know that our company manufactures a combination underwater thermometer and depth measuring instrument (photo enclosed). Called the "Thermo-Fishometer," it sells for \$29.95. It has been on the market for over a year, and has been enthusiastically received by fishermen in the United States and many other countries.



BURT PHILLEY

Bright Radio Laboratories, Inc.
222 East 2nd St., Minneola, N.Y.

"Drainpipe 8"

■ I noticed an error in "Clean Sound from the Drainpipe 8" (June 1962 issue). The 38" dimension on the drawing of the speaker system (p. 62) should actually be 44".

S. BERGLUND, W7TNG
Portland 1, Oregon

Right you are, sir; sorry for the misprint.

American FM Rebuttal

■ We at Station KPFA would like to offer a few words of comment on Robert Angus' article "What's Wrong with American FM?" which appeared in your June 1962 issue. While we don't challenge the author's general premise that FM is a "classical juke box," we do suggest that he might have cited some important exceptions to the rule. Among them are the Pacifica Foundation stations in Berkeley, Calif. (KPFA), Los Angeles, Calif. (KPFK), and New York City (WBAI). These three non-commercial stations are sustained by listener subscriptions of \$12.00 (or more) per year. At present, there are some 30,000 subscribers (8,000 of them to KPFA) and independent surveys estimate our complete audience at 200,000.

The activities of KPFA are typical of those of the two other stations in this "network." Here at Berkeley, we strive to make up for the woeful deficiency in live FM programming—and recently undertook to offer 12 hours of it in one day. An-

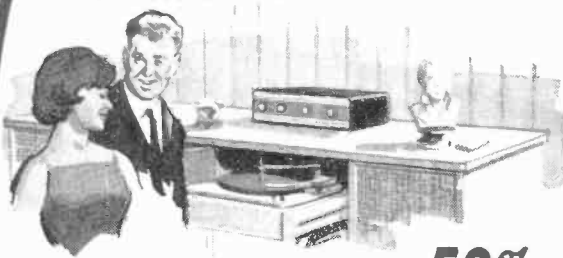
(Continued on page 20)

Always say you saw it in—POPULAR ELECTRONICS

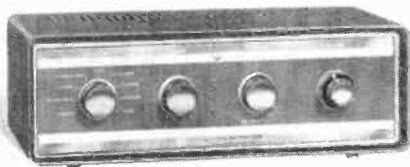
NOW! Enjoy Quality Stereo Hi-Fi at Lowest Cost!

WITH THIS DO-IT-YOURSELF **knight-kit**[®]
COMPLETE HOME MUSIC SYSTEM

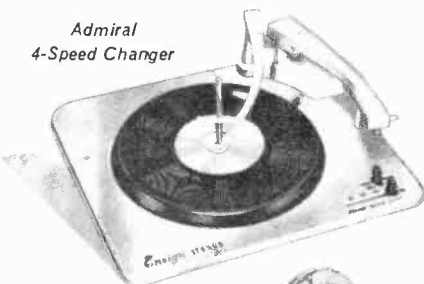
ONLY
\$69⁹⁵
 COMPLETE



*Knight-Kit
 Stereo Amplifier*



*Admiral
 4-Speed Changer*



*Knight Full-Range
 Speakers*

SAVE UP TO 50%

Get the most for your money
 this easy do-it-yourself way

unbelievably **\$69⁹⁵** SEND NO MONEY
 low cost, only

If you're looking for quality and value in Stereo hi-fi, here's the great music system buy for you! Simply assemble the amplifier yourself—it's easy, it's enjoyable—and you SAVE! System easily plugs together; complete with all cables, including 15' speaker cables; with record care booklet. Yours for a lifetime of pleasure!

HERE'S THE AMAZING VALUE YOU GET:

Genuine Knight-Kit KA-25 20-Watt Stereo Amplifier—Full array of controls for complete, simple adjustment of sound; dual-concentric, clutch-type level control regulates volume of either channel or both together; ganged bass and treble controls; unique selector switch provides choice of inputs as well as selection of stereo, stereo reverse, or monophonic; ± 1 db, 30-15,000 cps response at full rated output. Handsomely styled metal case. Easy to assemble with step-by-step instructions.

Famous Admiral 4-Speed Stereo Changer—Complete with ceramic turnover stereo cartridge and dual sapphire needles—plays both Stereo and monophonic LP's, 78's, 45's and 16²/₃ rpm records. Automatic shutoff; handles ten 12" records; intermixes 10" and 12" records.

2 Knight KN-809 Full-Range Hi-Fi 8" Speakers—Offer realistic full-range reproduction—really astonishing stereo fidelity. Easy to custom mount in wall or in your own enclosures. With 10-oz. ceramic magnet, rigid die-cast frame, soft-suspension hyperbolic woofer cone.

COMPLETE KNIGHT-KIT STEREO MUSIC SYSTEM

The savings can't be duplicated—the quality can't be matched for anywhere near the price. Order today—no money down (just check coupon). An unbeatable value at only **\$69⁹⁵**

**A ONCE-IN-A-LIFETIME
 QUALITY HI-FI BUY!**

**ORDER
 TODAY**

**NO
 MONEY
 DOWN**

*Now! More Buying Power with
 Your Allied Credit Fund Plan*

**SATISFACTION GUARANTEED
 OR YOUR MONEY BACK**
order from

ALLIED RADIO

ALLIED RADIO

100 N. Western Ave., Chicago 80, Ill.

Ship me Knight-Kit Music System No. 21 HF 038BH

- Ship on Allied's Credit Fund Plan—no money down
- \$.....enclosed (check) (money order)

Name _____
PLEASE PRINT

Address _____

City _____ Zone _____ State _____

RCA Training Can Be The Smartest Investment You Ever Made!



If you're considering a future in electronics, investigate the courses offered by RCA Institutes Home Study School. In the rapidly expanding world of electronics, good basic training in Electronic Theory and Practice is most important. And you can be sure of the very finest when you enroll at RCA Institutes.

Founded in 1909, RCA Institutes is one of the largest technical schools in the United States de-

voted exclusively to electronics. The very name "RCA" means dependability, integrity and scientific advance.

The courses offered by RCA Institutes are many and varied. A complete program of integrated courses for beginners and advanced students is available. They include: Electronic Fundamentals, Transistors, Television Servicing, Color Television, Electronics for Automation. Each one

is especially tailored to your needs, designed to prepare you for a profitable future in the ever-expanding world of electronics. And once you become an RCA Institutes graduate, you are assured of top recognition by leading companies everywhere.

Investigate the superb facilities for technical instruction at the RCA Institutes today. It can be the smartest move you ever made.

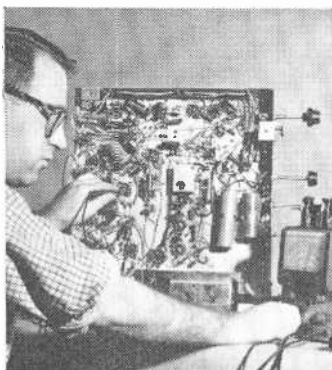
Always say you saw it in—POPULAR ELECTRONICS

HOME STUDY COURSES

*in Electronic Fundamentals · TV Servicing · Color TV
Communications Electronics · Automation Electronics
Computer Programming · Transistors · Electronic Drafting*

Voluntary Tuition Plan. All RCA Institutes Home Study courses are available under the Voluntary Tuition Plan. This plan affords you the most economical possible method of home study training. You pay for lessons only as you order them. If, for any reason, you should wish to interrupt your training, you can do so and you will not owe a cent until you resume the course. No other obligations! No installment payments required.

RCA Personal Instruction. With RCA Home Study training you set your own pace in keeping with your own ability, finances, and time. RCA Institutes allows you ample time to complete the course. Your lesson assignments are individually graded by technically trained personnel, and helpful comments are added where required. You get theory, experiment, and service practice beginning with the very first lesson. All lessons are profusely illustrated. You get a complete training package throughout the entire course.



You Get Prime Quality Equipment. All kits furnished with the course are complete in every respect, and the equipment is top grade. You keep all the equipment furnished to you for actual use on the job . . . and you never have to take apart one piece to build another.

RESIDENT SCHOOLS *in Los Angeles and New York City— You can study electronics in the city of your choice.*

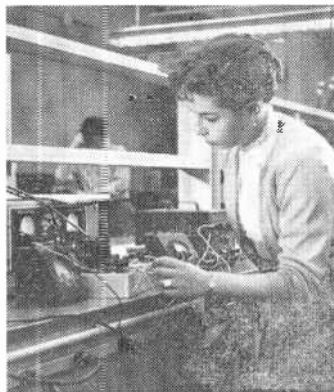
No Previous Technical Training Required For Admission. You Are Eligible Even If You Haven't Completed High School. RCA Institutes Resident Schools in Los Angeles and New York City offer training that will prepare you to work in rewarding positions on research and production projects in fields such as automation, transistors, communications, technical writing, television, computers, and other industrial and advanced electronics applications. If you did not complete high school, RCA will prepare you for such training with

**SEND POSTCARD FOR FREE
ILLUSTRATED BOOK TODAY!
SPECIFY HOME STUDY OR
NEW YORK OR LOS ANGELES
RESIDENT SCHOOL**

courses specially designed to provide the basic math and physics required for a career in electronics.

Free Placement Service. RCA Institutes graduates are now employed in important jobs at military installations with important companies such as IBM, Bell Telephone Labs, General Electric, RCA, and in radio and TV stations all over the country. Many other graduates have opened their own businesses. A recent New York Resident School class had 93% of the graduates who used the FREE Placement Service accepted by important electronics companies . . . and had their jobs waiting for them on the day they graduated!

Coeducational Day and Evening Courses. Day and Evening Courses are available at Resident Schools in New York City and Los Angeles. You can prepare for a career in electronics while continuing your normal full-time or part-time employment. Regular classes start four times each year.



3 NEW LOCATIONS

In addition to RCA Institutes Inc. courses, Radio Corporation of America offers a limited selection of basic Resident School Courses in Electronics at three new locations . . . Chicago, Philadelphia, and Cherry Hill, N. J. (near Camden). For complete information, write the city of your preference next to your name on the attached postcard.

RCA INSTITUTES, INC. DEPT. PE-9, A SERVICE OF RADIO CORPORATION OF AMERICA, 350 WEST 4TH ST., NEW YORK 14, N. Y.
PACIFIC ELECTRIC BLDG., 610 S. MAIN ST., LOS ANGELES 14, CALIF.



The Most Trusted Name in Electronics

LATEST SAMS BOOKS FOR EVERYONE IN ELECTRONICS



USE THIS HANDY ORDER FORM

- Servicing Electronic Organs.** Describes typical circuits for each section of the organ. Includes special chapters on tuning, adjustment and accessories. Full troubleshooting details. Order **ORG-1**, only... **\$4.95**
- Having Fun with Transistors.** Thirteen fun-filled, useful construction projects using simple transistor circuits. Easy to build—wonderful variety of practical projects and games. Order **THF-1**, only... **\$2.50**
- Air Conditioning Installation & Maintenance.** Describes theory and operation of all types of air conditioners; central, room, auto—tells how to install, repair and maintain. Order **ACM-1**, only... **\$2.95**
- Sams PHOTOFACT Guide to TV Troubles.** Causes of more than 90% of TV troubles can be isolated in minutes by following the procedures described in this book; shows symptoms, analysis checks and where to look for troubles. Order **PFG-1**, only... **\$2.50**
- Transistor Substitution Handbook.** Shows over 13,600 direct substitutions; includes basing diagrams, polarity indications and manufacturers for over 4000 transistor types. Order **SSH-3**, only... **\$1.50**
- Computer Basics: Solid-State Computer Circuits.** Followup to the famous Sams "Computer Basics" 5-volume work. Describes latest use of semiconductors in today's computers. Order **CS5-6**, only... **\$4.95**
- All 6 "Computer Basics" Volumes.**... **\$27.00**
- Amateur Radio Antenna Handbook.** Tells how to select the best antenna system for optimum performance. Details theory, antenna design, construction and application. Order **AMA-1**, only... **\$2.95**

- How to Read Schematic Diagrams.** **RSD-1**... **\$1.50**
- Basic Electronics Series: Transistor Circuits.** **BET-1**... **2.95**
- 1962 Test Equipment Annual.** **TEA-2**... **1.50**
- Modern Dictionary of Electronics.** **DIC-1**... **6.95**
- ABC's of Radiotelephony.** **ABT-1**... **1.95**
- ABC's of Electronic Organs.** **ECO-1**... **1.95**
- ABC's of Synchros & Servos.** **ASE-1**... **1.95**
- Radio Receiver Servicing.** **RS-2**... **2.95**
- Tube Substitution Handbook.** **TUB-4**... **1.50**
- 101 Ways to Use Your Oscilloscope.** **TEM-2**... **2.50**

FREE! Ask for the Sams Booklist, describing over 200 important books.
FREE! Index to Photofact, world's finest circuit data on 53,000 TV & radio models.

HOWARD W. SAMS & CO., INC.

Order from any Electronic Parts Distributor, or mail to Howard W. Sams & Co., Inc., Dept. J-92 4300 W. 62nd St., Indianapolis 6, Ind.

Send books checked above. \$_____ enclosed.

Send FREE Booklist. Send Photofact Index

Name _____

Address _____

City _____ /zone _____ State _____

IN CANADA: A. C. Simmonds & Sons, Ltd., Toronto 7

Letter Tray

(Continued from page 14)

other example: in 1960, and again this year, we sponsored the Pacifica Radio Awards in Musical Composition for contemporary composers; the winning compositions are guaranteed a concert performance, and recordings of the performance are distributed to foreign, non-commercial broadcasting systems. These are but two of the reasons why we offer a resounding plea of "not guilty" to Mr. Angus' indictment.

LESLIE STRICKLAND
Promotion Director, KPFA

We regret that Mr. Angus neglected to report such notable exceptions to the rule, Mr. Strickland. Though we still feel—as I'm sure you'll agree—that much remains to be done to bring American FM programming up to the European level.

Fire Fighters Need Converter

■ We're writing on behalf of ten volunteer firemen who would like to have converters, covering 150-162 mc., for their auto radios. These units must be adaptable to cars with either 6- or 12-volt batteries. Commercially built models are too



expensive, so we offered to construct the converters in our shop—if we could find an appropriate schematic diagram and parts list. Can any of your readers help?

STOWE'S RADIO & TV
390 Vernon Ave.
Lebanon, Mo.

Checking Speakers

■ I take exception to the suggestion that a solder gun be used for checking speaker continuity (see "Tips and Techniques," June, 1962). A solder gun makes an effective demagnetizer, and moving the tip near enough to the speaker to touch its voice-coil terminals would probably result in a weakened magnet. A safer test might be to bring the gun tip near the output transformer and listen for speaker hum. I make it a practice never to place an energized solder gun closer than four inches to a speaker magnet.

LOUIS J. PHILIPP
Paulsboro, N. J.

Your objections are certainly theoretically correct, Mr. Philipp. We doubt, however, that the field around a solder gun is strong enough to weaken a speaker magnet in the short time required to carry out the test. The output transformer check might be a good one to try initially—but if you didn't hear any hum, you couldn't be certain whether or not the output transformer or the speaker was defective.

(Continued on page 22)

Always say you saw it in—POPULAR ELECTRONICS

**curious
about
computers?**



**FREE literature
available on request**

Are you intrigued by electronic brains... how they think, remember, react? Now, with MINIVAC 601 computer-simulator you can explore the fascinating world of thinking machines in your own home.

MINIVAC is not a toy. It is a scientific training device created by Dr. Claude Shannon of M.I.T. to teach the basic concept of the modern digital computer. It opens the way to exciting experimentation with circuitry that makes decisions and solves problems. MINIVAC can simulate missile control systems, data processing, play games, perform all basic operations of the modern computer. And, no knowledge of electronics or advanced mathematics is required.

MINIVAC 601 comes completely assembled, ready to operate, with comprehensive instruction manuals. Money-back guarantee if not completely satisfied. Price: f.o.b. Watertown, Mass., \$95.00

**SCIENTIFIC DEVELOPMENT CORPORATION
372 Main Street, Watertown, Mass.**

- Please send MINIVAC 601. Check for \$95 enclosed.
- Please send descriptive literature for my further evaluation.

Name

Address

City Zone State

I understand that if I am not completely satisfied, I can return MINIVAC in ten days and my money will be refunded in full.

Your Copies of POPULAR ELECTRONICS



**ARE
VALUABLE**



**KEEP THEM NEAT . . . CLEAN . . .
READY FOR INSTANT REFERENCE!**

Now you can keep a year's copies of POPULAR ELECTRONICS in a rich-looking leatherette file that makes it easy to locate any issue for ready reference. Specially designed for POPULAR ELECTRONICS, this handy file—with its distinctive, washable Kivar cover and 16-carat gold leaf lettering—not only looks good but keeps every issue neat, clean and orderly. So don't risk tearing and soiling your copies of POPULAR ELECTRONICS — always a ready source of valuable information. Order several of these POPULAR ELECTRONICS volume files today. They are \$2.50 each, postpaid—3 for \$7.00, or 6 for \$13.00. Satisfaction guaranteed or your money back. Order direct from:

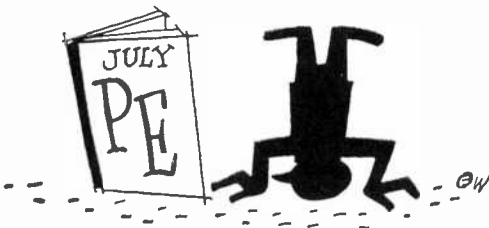
JESSE JONES BOX CORP. Dept. PE
(Established 1843)
Box 5120 Philadelphia 41, Pa.

Letter Tray

(Continued from page 20)

Collector's Item

■ I just received your July issue, and this time you've really outdone yourselves (or maybe your printer has). Look at the "Electronic Coupling Quiz" on page 80. Notice anything odd? You



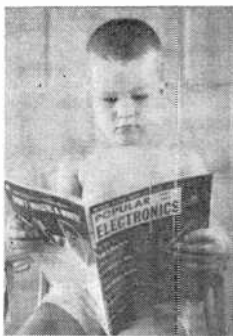
should. The schematics are printed upside down!

Seriously, though, I truly enjoy your magazine and I think it is tops in its field. Keep up the good work.

PHILLIP MILKS
Lancaster, N.Y.

You're one of our luckier readers, Phil! Our high-speed presses ran off only a few thousand copies of this collector's item before we caught the error. We don't even have a copy here in the office.

Youngest P.E. Fan



■ I enjoy your magazine very much—it's quite readable and easy to understand. As proof of the latter part of that statement, I'm enclosing a photo of Chris, my 2-year-old son, who is an avid P.E. reader. Keep up the good work and we'll keep reading.

N. F. LAVIGUE, JR.
Airman Third Class
Tyndall AFB, Fla.

Thanks for the bouquets, Airman Lavigue. We're sure that Chris's absorption in P.E. reflects his superior intelligence rather than the level of our articles.

—30—

CB Directory Change

On page 79 of the August 1962 issue, CB Directory section, a price of \$249.00 was given for Tram Electronics' Model TR-27B transceiver. This price pertains to the company's Model TR-27. The price of the TR-27B, with Turner microphone, is \$265.00. Also, the conversion frequency of the TR-27B, listed as 3.0 mc., is actually 4.5 mc.

Always say you saw it in—POPULAR ELECTRONICS



LOWER THE COST OF FUN WITH VERSATILE TARZIAN TAPE



Talk Long Distance for Only 10¢ per Hour

You can record a 24 minute conversation (at 3¾ i.p.s.) on a 225-foot reel of Tarzian Tape and mail it anywhere in the U.S. for 4¢ postage. No one worries about the telephone bill...and the same reel can be used again and again with no decrease in sound reproduction quality. That's a lot of friendly communication—the easy Tarzian Tape way. And you get a handy mailing carton as well!

Turn Free Sound Waves into a Complete Music Library

Have you an AM or FM radio, or a TV set? If so, you can tape music and variety programs being broadcast every day—or, for that matter, borrow your friend's records and put them on tape. You'll pay for your tape recorder with the money you save on records—one inexpensive 1200 foot reel of high fidelity Tarzian Tape holds a full hour of music recorded at 7½ i.p.s.



Make a Priceless Family Heirloom—The Easy Tarzian Way

Next time the family gets together for a special occasion... and everytime a high point comes along in the lives of the children and grandchildren...be sure to record the events on long-lasting Mylar*-base Tarzian Tape. The tape will last indefinitely—and so will your pleasure—with a priceless heritage of voices and events unique to your family. Such moments can seldom be repeated, but thanks to Tarzian Tape they can always be remembered.

Buy, Borrow or Beg

Buy, borrow, or beg a reel of Tarzian Tape—either Mylar or acetate base, on a 3, 5, or 7-inch reel, and compare its sound reproduction to that of *any other tape* on the market. Your own ears will tell you why Tarzian is the best buy for modern tape recording. While you're at it, send for our free 32-page booklet, "The Care and Feeding of Tape Recorders".



**DuPont trademark for polyester film*



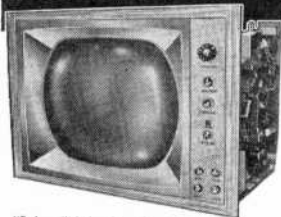
SARKES TARZIAN, INC.

World's Leading Manufacturers of TV and FM Tuners • Closed Circuit TV Systems • Broadcast Equipment • Air Trimmers • FM Radios • Magnetic Recording Tape • Semiconductor Devices
MAGNETIC TAPE DIVISION • BLOOMINGTON, INDIANA
Export: Ad Aurlenta, Inc., N. Y. • In Canada, Cross Canada Electronics, Waterloo, Ont.

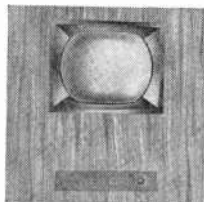
Build the finest professional color TV Set ever designed

WITH **color**

TV KITS by **TRANSVISION**



"DeLuxe" Color Chassis with controls mounted on rack in vertical position; also shown in Custom Wall Installation with horizontal controls separated from the chassis itself.



This Color Kit is designed around the most expensive, thoroughly engineered and newest RCA TV Color Receiver. Transvision has added improvements, features, and heavy-duty parts to this RCA licensed receiver in order to accommodate those who seek better quality than is commercially available.

WITH or WITHOUT REMOTE CONTROL

All critical circuitry is wired, aligned, pre-tested by RCA.

Anyone Can Assemble—No Special Knowledge Required. Buy Assembly Manual and See Easy, Complete Instructions.

Buy on Installment Plan. **PAY AS YOU WIRE:** \$50 gets you started on this fascinating TV Color Kit project.

Exclusive Features: All controls are mounted separately from chassis for flexibility in custom installation... Only the finest quality oversized, extra heavy-duty parts are used for long, trouble-free use, and they are **FULLY GUARANTEED** for ONE FULL YEAR.

The 21" Color Tube is RCA's newest and best tube. The safety glass is bonded to the tube face to reduce reflections and eliminate dust accumulation... **NEVER OBSOLETE**—Your Transvision TV Color Kit is always up-to-date because circuit improvements in Kit form are passed on to the Kit builder.

LEARN AS YOU BUILD: Learn Color TV Theory, Practice, and Servicing. Complete course of study available for use in conjunction with the Kit—no technical background required.

TRANSVISION Electronics, Inc., Grey Oaks Ave., Yonkers, N.Y.

- Send FREE Catalog on Color TV Kits... I enclose \$5 for Assembly Manual, refundable on purchase of TV Color Kit.
 I enclose \$50 for Starting Package on pay-as-you-wire plan. (Complete Kits range from \$419 to \$499). Dept. PEC-9

Name _____

Address _____

City _____ Zone _____ State _____

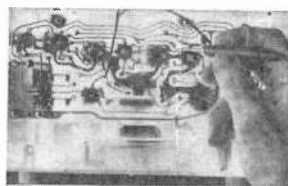
Visit us at the New York Hi Fidelity show. Oct. 3-7 1962

Tips and Techniques



SEEING THROUGH PRINTED-CIRCUIT BOARDS

Many printed-circuit boards have the leads on one side and the components on the other, making it difficult for a serviceman



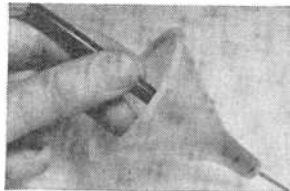
to trace the circuit—unless he has a way of looking at both sides of the board at once. Luckily, this is easy to arrange. Just

prop up the board on end and place a strong light behind the component side. The shadows of the components can then be plainly seen while tests are being carried out on the leads. Don't get the lamp too close to the board, though, or you may overheat some of the components.

—Art Trauffer

PLASTIC FUNNEL IS SHOCK PROTECTOR

When using test prods around activated transmitters or high-voltage power supplies, you can employ a 2-ounce plastic funnel as a shield to protect your hand (see photo). The "spout" of such a funnel is just the right size to slip over a standard test prod and can be cemented permanently in place if desired. Though this arrangement may seem unwieldy, it will save you from unpleasant (and possibly fatal) shocks and burns.



—Jerome Cunningham

ADAPTER FOR ABOVE-CHASSIS MEASUREMENTS

When you have to measure tube voltages during servicing, it's sometimes inconven-

(Continued on page 26)

Always say you saw it in—POPULAR ELECTRONICS

No More GOBBLE-DE-GOOK!



only \$59.95

MONOCALL Gives Privacy to Your Two-Way Radio

Introducing the Monocall, a selective call device for use with Citizens Band and Communication systems. No more gobble-de-gook. No need for continuous monitoring. Your set and those in your system are "silent" until you call them or they call you. Easy, single switch operation. Exclusive multiple tone burst and unique circuitry prevent false triggering. Available in 72 codes and can be field modified by changing just two wires to give any one of six code combinations.

Single switch, easy operation. Three positions: Selective Receive, Normal, and Call.

Multiple tone burst. Most selective call devices use a single tone burst. With a single tone system the decoder is subject to false triggering because of squeals and voices. Monocall's multiple tone burst and computer circuitry all but eliminate this undesirable property.

Inexpensive. Monocall Encoder - Decoder, \$59.95. Monocall Encoder, \$29.95.

The advance design of the Monocall provides a reliability superior to devices using conventional tube or transistor circuitry.

Easy to install. Only minutes required to attach Monocall to your existing Citizen Band or Communication unit. Also, a number of Citizen Band sets are already wired for immediate Monocall "plug-in" use. They include the Starcaster Citizens Band Units Mark I, Mark II, and Mark III; the Realistic TRC-8 Citizen Band Unit; and Metrotek Citizen Band Transceivers.



Metrotek Deluxe
Citizen Band Transceiver \$149.95

Eight crystal control channels on both transmitter and receiver. Fully tunable double conversion receiver provides reception on all CB channels. Complete with S-meter, dual power supply for either 12 volt d.c. or 110 volt a.c. operation. Includes "plug-in" for Monocall.

METROTEK ELECTRONICS, INC.



P. O. Box 9591 • Raleigh, North Carolina
Please send me complete details, including name of nearest supplier, for the:

- Monocall Selective Call Device
 Metrotek C.B. 2-Way Radio

Name _____

Address _____

City _____ Zone _____ State _____



If you've recently changed your address, or plan to in the near future, be sure to notify us at once. We'll make the necessary changes on your mailing plate, and see to it that your subscription continues without interruption. Right now—print the information requested in the spaces below and mail it to **POPULAR ELECTRONICS, 434 So. Wabash Ave., Chicago 5, Illinois.**

Name *Please PRINT!*

°Account No.

Old Address

City State

New Address

City Zone State

Mail copies to new address starting withissue.

*(Your Account Number appears directly above your name on the mailing label.)

YOU SAVE MONEY!

RUSH US YOUR LIST OF HI-FI COMPONENTS FOR A VERY SPECIAL GROUP QUOTATION WRITE FOR FREE AUDIO DISCOUNT CATALOG A-15

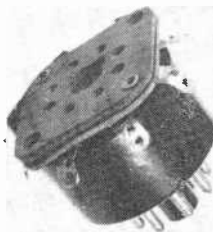
New low prices on tape recorders, amplifiers, tuners, loudspeakers, cartridges, etc.

**KEY ELECTRONICS COMPANY
120 LIBERTY STREET
NEW YORK 6, N. Y.**

Tips

(Continued from page 24)

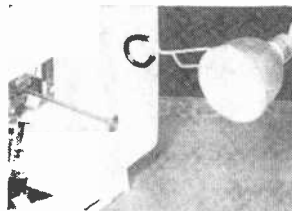
ient to do it under the chassis. But you can make an adapter (for octal tubes) that will allow you to do your measuring from above. Break off the base of an old octal tube, clean it out, and clear the pins of solder. Connections are then made from these pins to the corresponding lugs of a matching socket. Pull the wires tightly through the lugs, drawing the socket firmly against the base. To use the adapter, remove the tube in question from its socket, plug it into the adapter, and plug the adapter into the tube socket. Then turn on the equipment under repair and make your measurements at the lugs of the adapter socket.



—Stanley E. Bammel

REFLECTOR LAMP FACILITATES SERVICING

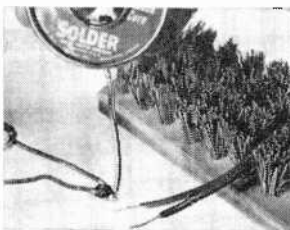
A small reflector lamp mounted on a spring clip (available at many hardware or photographic supply stores) makes a handy addition to any serviceman's kit of tools. It can easily be clipped to the back of a radio or TV set under repair and will provide much better illumination than the usual flashlight.



—H. Leeper

SCRUB BRUSH IS SOLDERING AID

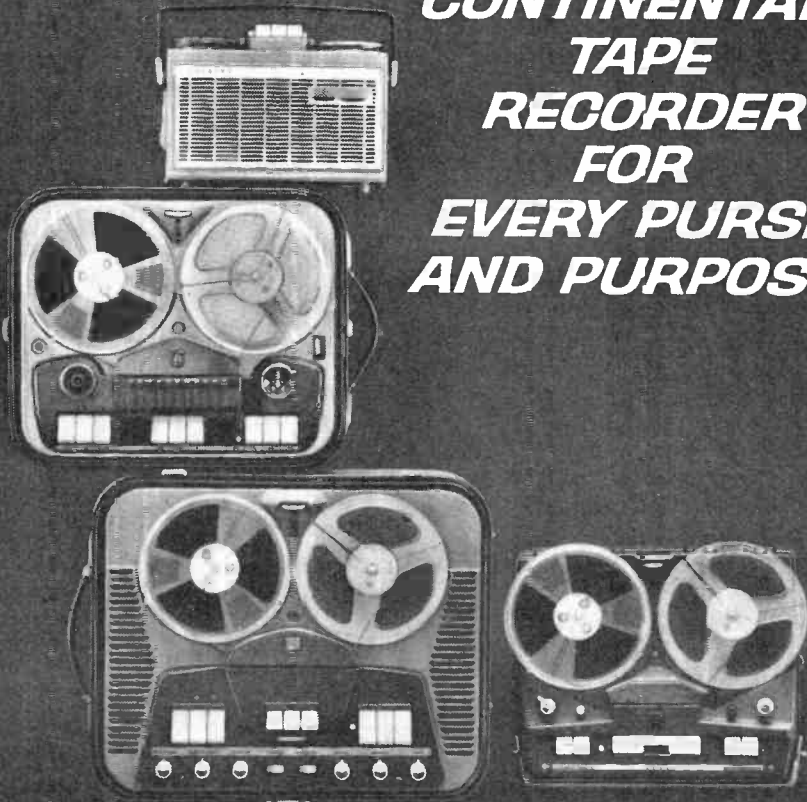
Next time you're looking for a way to hold wires to be soldered or tinned, use a scrub brush—the stiff bristles will firmly support a wire in whatever position you want it. This technique is particularly useful when soldering lugs to wire ends. And a scrub brush also makes a good support for a small chassis which must be uprighed for servicing.



—John A. Comstock

Always say you saw it in—POPULAR ELECTRONICS

**NOW...A NORELCO
'CONTINENTAL'
TAPE
RECORDER
FOR
EVERY PURSE
AND PURPOSE**



CONTINENTAL '100' (EL 3585) shown on top: transistorized 7 lb., battery portable • records 2 hours on 4" reel, from any source • plays back thru self-contained speaker as well as radio, TV or record player • response: 100-6000 cps • tapes interchangeable with other 2-track 1 $\frac{7}{8}$ ips machines • constant-speed operation • complete with dynamic microphone.

CONTINENTAL '200' (EL 3541) shown bottom right: 4-track stereo head output direct to external stereo preamp for portable high fidelity tape-deck applications • completely self-contained for 4-track mono record and playback • mixing facilities • lightweight, compact • dynamic microphone.

CONTINENTAL '300' (EL 3542) second from top: 4-track stereo playback (tape head output) • self-contained 4-track mono record-playback • 3 speeds • mixing facilities • dynamic microphone • self-

contained phono/P.A. amplifier/speaker system • ideal for schools, churches, recreation centers, etc.

CONTINENTAL '400' (EL 3536) bottom left: Four-track stereo and mono recording and playback • 3 speeds • completely self-contained, including dual recording and playback preamplifiers, dual power amplifiers, two loudspeakers (second in lid) and dual element stereo dynamic microphone • can also be used as a quality hi-fi reproducing system, stereo or mono, with tuner or record player • frequency response: 50 to 18,000 cps at 7 $\frac{1}{2}$ ips • wow and flutter less than .15% at 7 $\frac{1}{2}$ ips • signals-to-noise ratio: -48 db or better • cross-talk: -55 db

Compare the special features...Look at the low prices... Listen to the matchless quality... Choose the 'Continental' most suitable for your requirements... For literature and free demonstration, write: Dept. E-9.

Norelco[®]

NORTH AMERICAN PHILIPS COMPANY, INC., High Fidelity Products Division, 230 Duffy Ave., Hicksville, L.I., N. Y.
IN CANADA AND THROUGHOUT THE FREE WORLD, NORELCO CONTINENTAL IS KNOWN AS 'THE PHILIPS'.



Send
**POPULAR
 ELECTRONICS**
 Every Month

NAME.....

ADDRESS.....

CITY..... ZONE.... STATE.....

3 years for \$10

Check one: 2 years for \$7

1 year for \$4

in the U. S., and possessions.

Payment Enclosed Bill Me

Foreign rates: Canada and Pan American Union countries, add .50 per year; all other foreign countries, add \$1 per year.

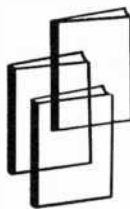
New Renewal

Mail to:

POPULAR ELECTRONICS

Dept. PE-962H, 434 S. Wabash Ave.

CHICAGO 5, ILL.



**POP'tronics
 Bookshelf**

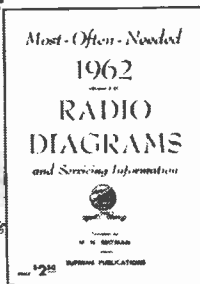
MOST-OFTEN-NEEDED 1962 RADIO DIAGRAMS AND SERVICING INFORMATION

compiled by M. N. Beitman

Volume 22 in the popular series of Supreme radio service manuals, this book contains material on 1962 models of all major manufacturers. All types of radios, including AM and FM sets, radio-phonograph combinations, stereo receivers, transistor portables, and auto models, are covered. The style of the preceding volumes in the series is followed, but

improved arrangement and reference systems conserve space, permitting the inclusion of a greater amount of servicing data. As usual, circuit diagrams, alignment techniques, printed-board views, voltage values, and other valuable data are given.

Published by Supreme Publications, 1760 Balsam Rd., Highland Park, Ill. 160 pages. Soft cover. \$2.50.



**USING THE SLIDE RULE IN
 ELECTRONIC TECHNOLOGY**

by Charles Alvarez

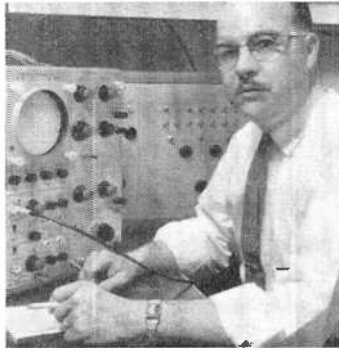
The slide rule provides a means for rapid solving and double-checking of mathematical problems. This book is intended for the student or technician who wants to develop speed and accuracy in using the slide rule by mastering the most efficient methods of doing so. Three basic types of slide rules are discussed here: the *general purpose*, or Manheim slide rule; the *duplex* slide rule; and the *log-log* slide rule. There are 20 chapters in the book, each including practice problems and examples. A separate section contains answers to the problems.

Published by John F. Rider Publisher Inc., 116 W. 14th St., New York 11, N. Y. 120 pages. Soft cover. \$2.50.

(Continued on page 30)

"A CREI Home Study Program helped me increase my salary by a factor of four (4)."

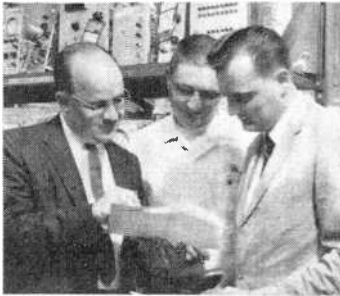
—Mearl Martin, Jr., SENIOR ENGINEER, Field Support Manager, Tektronix, Inc., Portland, Oregon



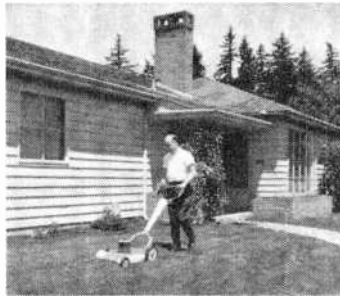
"I AM INDEED GRATEFUL TO CREI for my success," says Mearl Martin, Jr. "Since enrollment in a CREI Home Study Program in Electronic Engineering Technology, I have progressed from Junior Technician to licensed Senior Engineer. My present title is Field Support Manager and my salary has increased by a factor of four (4)."



DEMAND FOR CREI-PREPARED MEN today far exceeds the supply—and has for many years. CREI Home Study Programs, the product of 35 years' experience, include the latest advancements in the field. Here Martin discusses home study with company executive W. K. Dallas, V.P., Manager, Marketing Division, Tektronix, Inc.



WHEN YOU ENROLL in a CREI Home Study Program, you study courses to which a number of today's leading engineers and scientists have made substantial contributions. You are guided by qualified instructors. Robert Wruble, Group Manager (center) and Rollie Smith, (right) Field Training Manager at Tektronix, Inc., are shown here with Mearl Martin.



ASSURE A BETTER FUTURE and get more out of life with CREI Home Study. CREI alumnus Martin enjoys living in this comfortable home in Portland, Ore. CREI men are in such companies as Pan American Airways, Federal Electric Corp., The Martin Co., Northwest Telephone Co., Mackay Radio, Florida Power and Light, etc. This attests to the high calibre of CREI Programs.



YOUR WHOLE FAMILY BENEFITS when you achieve success through CREI Home Study. Here Martin relaxes with wife and family who share his success. Check the completeness of CREI Home Study Programs in Electronic Engineering Technology in our catalog, provided on request. For those who can attend, CREI maintains a Residence School in Washington, D.C.

INDUSTRY-RECOGNIZED CREI HOME STUDY PROGRAMS PREPARE YOU FOR INCREASED RESPONSIBILITIES, HIGHER-PAYING POSITIONS IN ELECTRONICS.

YOU CAN QUALIFY for a CREI Program if you have a basic knowledge of radio or electronics and are a high school graduate or the equivalent. If you are doubtful about your qualifications, let us check them for you.

JUST OFF THE PRESS! If you qualify, send for FREE 58-page book describing CREI Programs and career opportunities in advanced electronic engineering technology—the latest edition is just off the press. Mail coupon or write: The Capitol Radio Engineering Institute, Dept. 1209-K, 3224 Sixteenth St., N.W., Washington 10, D. C.

Mail coupon today for FREE 58-page book

CREI

THE CAPITOL RADIO ENGINEERING INSTITUTE *Founded 1927*
Dept. 1209 K, 3224 Sixteenth St., N.W., Washington 10, D. C.

Please send me details of CREI Home Study Programs and Free Book, "Your Future in Electronics and Nuclear Engineering Technology." My qualifications are noted to obtain immediate service.

CHECK Electronic Engineering Technology Nuclear Engineering Technology
FIELD OF Servo and Computer Engineering Automation and Industrial Elec-
GREATEST Technology tronic Engineering Technology
INTEREST: Aero and Navigational Engineering Technology

Name Age

Address

City Zone State

Employed by

Type of present work

Education: Years High School Other

Electronics Experience

Check: Home Study Residence School G.I. Bill 27





**START
EARNING
RIGHT
AWAY!**

Repair Electric Motors!

Cash in on this fast-growing repair field. The famous **ELECTRIC MOTOR REPAIR MANUAL** shows you, step-by-step, how to handle all repair jobs—including complete rewinding on practically any AC or DC motor or generator. 560 pages and over 900 how-to-do-it pictures. When a specific motor comes in for repairs, just look it up. Price only \$9.25—or see money-saving offer in coupon.

Fix Electric Appliances!

Save on repair bills—earn in spare time! This 370-page **ELECTRICAL APPLIANCE SERVICE MANUAL** shows you how to do the toughest repair jobs—even if you've never fixed an appliance before! Gives clear how-to-do-it instructions for every modern appliance. Handy charts help locate troubles fast. Simple home-made test tools are described. Gives the know-how you need to build a profitable full or part-time business. Price \$6.75—or see money-saving offer.

STUDY 10 DAYS FREE!

Dept. PE-92, HOLT, RINEHART & WINSTON, INC. 62300
P.O. Box 2334, Grand Central Station
New York 17, New York

Send books checked below for 10-day FREE EXAMINATION. In 10 days I will either remit price indicated (plus postage) or return books postpaid and owe you nothing.

- ELECTRIC MOTOR REPAIR (#708735)** Price \$9.25 separately.
- ELECTRICAL APPLIANCE SERVICE MANUAL (#708172)** Price \$6.75 separately.
- CHECK HERE FOR MONEY-SAVING COMBINATION OFFER . . . Save \$1.50!** Send both above big books at special price of only \$14.50 for both. (Regular price \$16.00—You save \$1.50)! (#709535)

Name

Address

City, Zone, State

Outside U.S.A.—Send cash with order. Add 50¢ to price of each book. (Above offer expires April 30, 1963)

**SELL YOUR USED
EQUIPMENT Through
POPULAR ELECTRONICS'
Classified Columns!**

The 400,000 readers of **Popular Electronics** are interested in your used electronic gear or components. If you have something to sell, let the readers of **Popular Electronics** know about it through the classified advertising columns. It costs very little—**60 cents a word**, including your name and address. Minimum message—10 words.

For further information write:

Martin Lincoln
POPULAR ELECTRONICS
One Park Avenue
New York 16, N. Y.

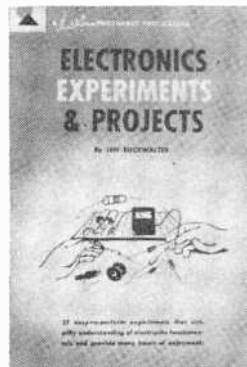
Bookshelf

(Continued from page 28)

ELECTRONICS EXPERIMENTS & PROJECTS

by Len Buckwalter

Electronics Experiments & Projects teaches the principles of electronics through experimentation and construction. The initial experiments demonstrate the design and purpose of all basic electronic components, and the reader actually builds some of them—including batteries, resistors, and capacitors. Later sections show how to incorporate these parts into practical devices, such as a burglar alarm, simple telephone, radio receiver, electroplating system, etc. Each project is illustrated with photographs and large diagrams, and the inexpensive components employed are re-used many times.

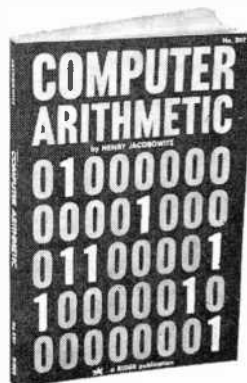


Published by Howard W. Sams & Co., Inc.,
1720 East 38th St., Indianapolis 6, Ind.
128 pages. Soft cover. \$2.50.

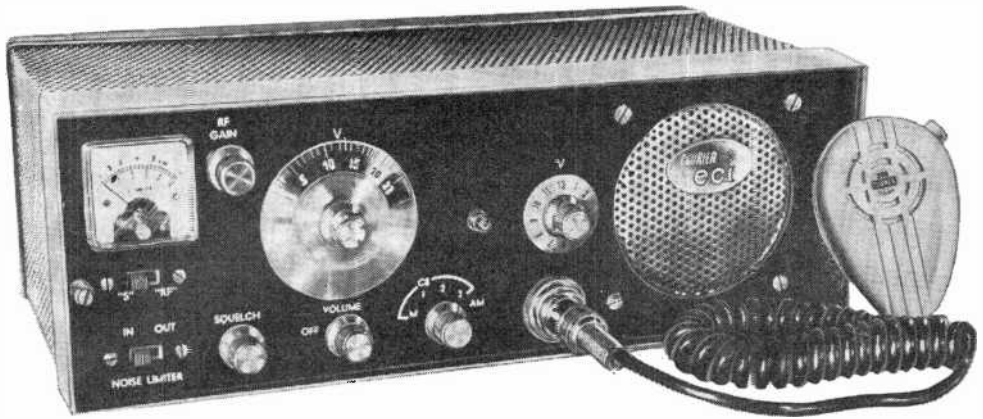
COMPUTER ARITHMETIC

by Henry Jacobowitz

Computer technology has grown greatly in recent years and in so doing has stimulated a need for personnel trained in the fundamentals of computer arithmetic. This book is designed to refresh trainees, and to interest other readers in the basic arithmetical operations of all positional number systems—the decimal and the binary, as well as other systems that find application in computers. After an initial survey, the book goes on to explain in detail the fundamentals of binary, octal, hexadecimal, and ternary arithmetic. Appropriate practice exercises



Always say you saw it in—POPULAR ELECTRONICS



COURIER 1-M

NOW!

QUIETEST

MOST POWERFUL

MOBILE

C.B. UNIT!

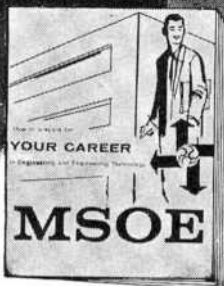
HEAR IT TO BELIEVE IT!

Write for Free Brochure \$199.50, list, slightly higher west of Rockies.



electronics communications, inc. 325 no. macquesten pkwy, mt. vernon, n. y.

FREE CAREER BOOKLET



To guide you to a successful future in

ELECTRONICS RADIO-TV COMPUTERS ELECTRICAL ENGINEERING

This interesting pictorial booklet tells you how you can prepare for a dynamic career as an Electrical Engineer or Engineering Technician in many exciting, growing fields:

**MISSILES • AVIONICS • AUTOMATION
SALES • DEVELOPMENT
ELECTRICAL POWER • ROCKETRY
RADAR • RESEARCH**

Get all the facts about job opportunities, length of study, courses offered, degrees you can earn, scholarships, part-time work — as well as pictures of the Milwaukee School of Engineering's educational and recreational facilities. No obligation — it's yours free.

MILWAUKEE SCHOOL OF ENGINEERING

MAIL COUPON TODAY!

Milwaukee School of Engineering
Dept. PE-962, 1025 N. Milwaukee St., Milwaukee, Wis.
Please send FREE "Your Career" booklet

I'm interested in

Electronics Radio-TV Computers
 Electrical Engineering Mechanical Engineering

Name _____ Age _____

Address _____ PLEASE PRINT

City _____ Zone _____ State _____

I'm eligible for veterans education benefits.

Discharge date _____ MS-117

Bookshelf

(Continued from page 30)

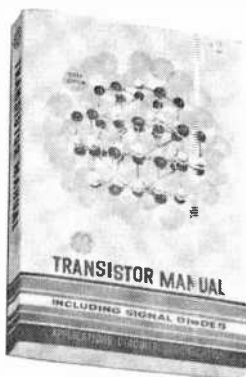
are included, and the final chapter describes several methods for converting one number system into another.

Published by John F. Rider Publisher, Inc.,
116 West 14th St., New York 11, N.Y. 128
pages. Soft cover. \$3.00.



GENERAL ELECTRIC TRANSISTOR MANUAL

The sixth edition of the *Transistor Manual* is a greatly expanded, up-to-date version of the 64-page publication which first made



its appearance in 1957, and it contains over 100 more pages than the fifth edition. The book discusses almost every aspect of transistors, including the many new developments that have taken place in the semiconductor field during recent months. There are chapters on basic semiconductor theory, how to

interpret a transistor specification sheet, and making transistor measurements. Hi-fi circuits, audio amplifiers, and radio receiver and tuner circuits are also discussed at length. In addition to many charts, diagrams and schematics, a current listing of JEDEC transistor types is provided—with specifications and interchangeability information.

Published by the General Electric Co.,
Semiconductor Products Dept., Electronics
Park, Syracuse, N.Y. 410 pages. Soft cover.
\$2.00.

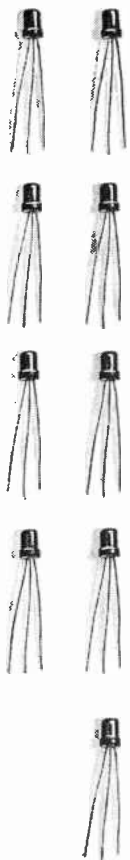


SINGLE SIDEBAND COMMUNICATIONS HANDBOOK

by Harry D. Hooton, W6YTH

Slanted toward the advanced radio amateur, this book opens with a discussion of basic SSB theory and practice. It then proceeds to a tube-by-tube, resistor-by-resistor analysis of several popular SSB transmitters and receivers. The equipment covered

Always say you saw it in—POPULAR ELECTRONICS



Down to the last transistor SONY CB-901 spells quality

Every transistor, from #1 through #9, in the SONY CB-901 transceiver, is a SONY transistor. All 9 transistors—and all transistors in every SONY product—are manufactured by SONY, in SONY's own plants, by SONY technicians, with SONY-grown germanium. So that when you buy the SONY CB-901 transceiver, you are sure of getting a system built to the same exacting specifications of all SONY electronic products. The CB-901 employs a separate speaker and microphone (instead of an all-in-one unit), which makes the difference between just reception and SONY's crystal clear reception. Designed for a range of up to 6 miles depending on



terrain, the CB-901, with telescoping whip antenna, 8 penlight cells, press-to-talk button, earphone for private listening and leather carrying case, lists for \$149.95 per pair.

SONY[®]

RESEARCH MAKES THE DIFFERENCE

Please send me more information on the remarkable SONY CB-901.

Name _____

Address _____

City _____ Zone ____ State ____

Sony Corp. of America, Dept. P-8
514 Broadway, New York 12, N.Y.

SONY CORPORATION OF AMERICA 514 Broadway, New York 12, N.Y.

INTRODUCTORY OFFER

FREE! **DOUBLE BONUS!**

BONUS #1
\$50.00 WORTH OF
 RADIO-TV
 PARTS!!!

BONUS #2
\$1 POLY PAK OF
 YOUR CHOICE
 LISTED BELOW

BOTH FREE WITH EVERY \$10.00 ORDER

WORLD FAMOUS POLY PAK KITS—BRAND NEW PARTS

- | | | |
|--|--|---|
| <input type="checkbox"/> 15 'TOP HAT' RECTIFIERS, 750 mil silicones | <input type="checkbox"/> 4 SUN BATTERIES, to 1½" sizes; lite sens. work | <input type="checkbox"/> 4 G.E. TRANSISTORS, 2N35 style PNP |
| <input type="checkbox"/> 10 MICRO SWITCHES, by G.E., 115VAC | <input type="checkbox"/> 10 TRANSISTOR ELECTROLYTICS, asst. values | <input type="checkbox"/> 25 SURPRISE PAK, collars-resistors-transistors-etc. |
| <input type="checkbox"/> 10 TRANSISTOR SOCKETS, For PNP, NPN's 10 for | <input type="checkbox"/> 60 COILS'n'CHOKES, r.f. occ. 1f. \$12-val. 60 for | <input type="checkbox"/> 300-ft. HOOKUP WIRE, asst colors-sizes-ins 300 ft |
| <input type="checkbox"/> 8 POWER RECTIFIERS, 2 amp stud type silicones 8 for | <input type="checkbox"/> 60 CARBON RESISTORS, ½-1-2W, 50 ohm—meg, some 1% \$20-val. 60 for | <input type="checkbox"/> 10 CRYSTAL DIODES, equal 1N34, 1N48, 1N60 |
| <input type="checkbox"/> 25 POWER RESISTORS, 5 to 50W, asst., \$19-val. | <input type="checkbox"/> 10 RCA PLUG'n'JACK SETS, for amps-tuners-etc. | <input type="checkbox"/> 60 CERAMIC CONDENSERS, tub'jrs-discs, 25mmf —.03 to 1KV |
| <input type="checkbox"/> 10 PANEL SWITCHES, power-rotary-micro-togzies | <input type="checkbox"/> 2 AMP 'TOP HAT', 600V silicon rectifier | <input type="checkbox"/> 60 SOCKETS—PLUGS, recp'ls, tube-power-audio, \$8 val. 60 for |
| <input type="checkbox"/> 60 MICA CONDENSERS, 25mmf—.01, \$12-val. 60 for | <input type="checkbox"/> 60 TUBULAR CONDENSERS .001—.5mf to 1 KV | <input type="checkbox"/> 50 TERMINAL STRIPS up to 12 points |
| <input type="checkbox"/> 15 SILICON DIODES, up to 75 mils | <input type="checkbox"/> 15 PRINTED CIRCUITS, transistor radios | |
| <input type="checkbox"/> 50 PRECISION RESISTORS, carbon'n'ww to 1-meg | | |
| <input type="checkbox"/> 50 RADIO'n'TV KNOBS, asst colors-shapes, \$15 val. | | |
| <input type="checkbox"/> 15 RAYTHEON TRANSISTORS, CK-722 PNP style | | |
| <input type="checkbox"/> 10 ELECTROLYTICS, 5mf to 1000 to 400V, \$18-val. | | |
| <input type="checkbox"/> 10 VOLUME CONTROLS, to 1 meg, worth \$15 10 for | | |
| <input type="checkbox"/> 30 DISC CONDENSERS to .02 to 1 KV | | |

Write for Catalog. Cut out and mail with check or money order: plus postage. C.O.D.'s 25%

POLY PAKS

P.O. Box 942E
 So. Lynnfield, Mass.

NOW AVAILABLE
 all new **LOW PRICE**

CAPACITOR TESTER

Pocket-Size - Unbreakable
 Factory Wired

Cappy[®]

U. S. PAT. PEND.

TESTS:

- paper • ceramic • mylar
 - electrolytic • motor
- CAPACITORS**

INDICATES:

- good • leaking • open
- shorted

CHECKS:

- diodes • rectifiers
- resistors • fuses

DETECTS:

- RF high voltage
- insulation leakage

Only

\$9.75
 Net

Complete with cord and leads, factory wired. MADE IN U.S.A. OF ALL AMERICAN COMPONENTS.

Part No. E-2
 110 AC DC operation

DISCARD

"BORDER-LINE" FILTERS
 CAPPY detects current leakage in HIGH MFD and WVDC electrolytics.



1800 WEST 4th AVE., HIALEAH, FLORIDA

Bookshelf

(Continued from page 32)

is restricted almost exclusively to Collins, Hammarlund, and Johnson products.

Published by Howard W. Sams & Co., Inc., 1720 E. 38th St., Indianapolis 6, Ind. 284 pages. Hard cover. \$6.95.

New Literature

Photoconductor characteristics and manufacturing techniques are outlined in a free booklet called "Sylvania Photoconductor Devices." The booklet places special emphasis on the Sylvania 8100, a device whose spectral response approximates that of the human eye. Write to Sylvania Electric Products Inc., 1100 Main St., Buffalo 9, N. Y., for a copy.

The Sams 32-page spring-and-summer 1962 "technical booklist," containing data on 147 currently available books on electronics, TV, radio, audio, and related subjects, can now be obtained free of charge by writing to Technical Book Division, Howard W. Sams & Co. Inc., 2201 East 46th St., Indianapolis 6, Ind.

For a free 8-page catalog on electrical clips and insulators, write to Mueller Electric Co., 1600V East 31st St., Cleveland 14, Ohio. The catalog (No. 250) lists sizes, capacities, and other characteristics, and gives complete shipping information.

Design considerations and application data for epoxy silver "solders" and conductive epoxy paint are given in a four-page bulletin available free from Joseph Waldman & Sons, Epoxy Products Division, 133 Coit St., Irvington, N.J. Included is a table containing complete specifications on the "solders" and paint.

"Data Sheet NC-105" includes complete details and specifications for the National NC-105 "general coverage" receiver as well as instructions on how to use the set. It can be obtained free of charge by writing to National Radio, Dept. RP, Melrose 76, Mass.

Descriptions and basic specifications for the full line of Amperex tubes are given in a 33-page catalog which is available at no charge. The types described include cold cathode trigger tubes, entertainment and audio tubes, rectifier diodes, and thyra-trons. Write, on company stationery, to Amperex Electronic Corp., Advertising Dept., 230 Duffy Ave., Hicksville, L. I., N. Y. for your copy.

-30-

Always say you saw it in—POPULAR ELECTRONICS

The power: 50 watts
The price: \$129.50
The builder: You



(It could only be a Fisher StrataKit.)

The new KX-100 stereo control-amplifier kit would be an astonishing value under any label — 50 clean watts for less than \$130 plus a few evenings of highly entertaining work. But the fact that it is a Fisher amplifier, with all the built-in quality that the name implies, makes it the most remarkable buy of the entire stereo era.

The KX-100 is an authentic StrataKit. The StrataKit method of kit construction is the exclusive Fisher development that enables a totally unskilled and inexperienced person to achieve the same result as a professional laboratory technician. You can't help ending up with a faultless Fisher product when you build a StrataKit.

In addition to more watts per dollar than any other top-quality amplifier, the KX-100 features all the standard control and switching facilities, plus a few remarkable extras: A front-panel headphone jack with speaker silencing switch... full tape monitoring facilities with the famous Fisher Tape-Play System... a High Filter switch... and a revolutionary new circuit that permits direct connection of a center-channel speaker without using an additional amplifier! Yes. All for \$129.50*.

THE FISHER

*Walnut or mahogany cabinet, \$24.95. Metal cabinet, \$15.95. Prices slightly higher in the Far West. Export: Fisher Radio International, Inc., Long Island City 1, N.Y. Canada: Tri-Tel Associates, Ltd., Willowdale, Ont.

**The
Kit Builder's
Manual**

FREE! \$1.00 VALUE! Just published! The Kit Builder's Manual: a new, illustrated guide to high-fidelity kit construction.

Fisher Radio Corporation
 21-52 44th Drive
 Long Island City 1, N.Y.

Please send me without charge The Kit Builder's Manual, complete with detailed information on all Fisher StrataKits.

Name _____

Address _____

City _____ Zone _____ State _____

10911

BEST BUYS IN STEREO AND MONO HI-FI

Transistorized Stereo/Mono 4-Track Tape Deck RP100 Semikit (electronics in kit form) \$299.95 Wired \$399.95



New Stereo FM Multiplex Tuner ST97 Kit \$99.95* Wired \$149.95*



FM-AM Stereo Tuner ST96 Kit \$89.95* Wired \$129.95* *Incl. FET

FM Tuner HFT90 Kit \$39.95 Wired \$65.95 Incl. FET Metal Cover \$3.95



70-Watt Integrated Stereo Amplifier ST70 Kit \$99.95 Wired \$149.95



40-Watt Integrated Stereo Amplifier ST40 Kit \$79.95 Wired \$129.95



28W Integrated Stereo Amplifier HF81 Kit \$69.95 Wired \$109.95

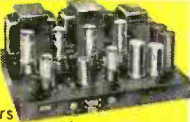


AM Tuner HFT94 Incl. FET Kit \$39.95 Wired \$65.95

Stereophonic Dual Preamplifier ST84 Kit \$59.95 Wired \$89.95



Stereo Power Amplifiers
 Kit Wired
 100W HF89: \$99.50 \$139.50
 70W HF87: \$74.95 \$114.95
 28W HF86: \$43.95 \$ 74.95



FM-Multiplex Autodaptor MX99 Kit \$39.95 Wired \$64.95 Cover Optional, \$2.95 (Patents Pending)

Bookshelf Speaker System HFS1 Kit \$39.95 Wired \$47.95



BEST BUYS IN CITIZENS TRANSCEIVERS, HAM GEAR, RADIOS

Citizens Band Transceivers 770 Series from Kit \$79.95 Wired \$109.95



U. S. Pat.



60W CW Transmitter #723 Kit \$49.95 Wired \$79.95

Walkie-Talkie Citizens Band Transceiver #740 Kit \$54.95 Wired \$79.95 Complete with rechargeable battery & charger



BEST BUYS IN TEST EQUIPMENT

Metered Variable Auto-Transformer AC Bench Supplies



Model 1073 (3 amps) Kit \$35.95 Wired \$47.95

Model 1078 (7½ amps) Kit \$42.95 Wired \$54.95

Peak-To-Peak VTVM =232 & Uni-Probe® (U.S. Pat.) Kit \$29.95 Wired \$49.95



VTVM =221 Kit \$25.95 Wired \$39.95

DC-5 MC 5" Scope #460 Kit \$79.95 Wired \$129.50



General Purpose 5" Scope #427 Kit \$69.95 Wired \$109.95

Tube Tester =625 Kit \$34.95 Wired \$49.95



RF Signal Generator #324 Kit \$26.95 Wired \$39.95



1000 Ohms/Volt V-O-M #536 Kit \$12.90 Wired \$16.90



6- & 12V Battery Eliminator & Charger #1050 Kit \$29.95 Wired \$38.95



Extra-filtered for transistor equip. =1060 Kit \$38.95 Wired \$47.95

AC Volt-Watt Meter #261* Kit \$49.95 Wired \$79.95 *Formerly called #260



Multi-Signal Tracer #145A Kit \$19.95 Wired \$28.95



EICO

EXCELLENCE IN CREATIVE ELECTRONICS

Over 2 MILLION EICO instruments in use throughout the world. Compare, take them home — right "off the shelf" — from 2000 neighborhood dealers, most of whom offer budget terms.



EICO, 3300 N. Blvd., L.I.C., N.Y. PE-9
 Send free Catalog describing over 106 top-quality products, free Stereo Hi-Fi Guide, free Short Course for Novice License, name of nearest EICO dealer. Send new 36-page GUIDEBOOK TO HI-FI for which I enclose 25¢ for postage & handling.

Name.....
 Address.....
 City.....Zone.....State.....
 Add 5% in the West

Listen to the EICO Hour, WABC-FM, N. Y. 95.5 MC, Mon.-Fri., 7:15-8 P.M. Visit EICO Rooms 518 & 522, New York Hi-Fi & Music Show, Oct. 2-7

© 1962 by EICO, 3300 N. Blvd., L.I.C. 1, N. Y.

THE LODESTAR

Transistorized metal locator pinpoints metals by a change in pitch

THERE'LL always be plenty of uses for metal locators in addition to the most "rewarding" one—prospecting for precious metals. During World War II and the Korean conflict, for example, metal locators used as mine detectors saved countless lives. Out West, weekend "prospectors" combing through "ghost" towns call on their trusty metal locators to uncover pistols, rifles, and dozens of similar "prizes."

Still other "prospectors" are busily ferreting out pipes and other metallic objects buried in the

By CHARLES CARINGELLA, W6NJV

COVER STORY



THE LODESTAR



ground or hidden in walls of buildings.

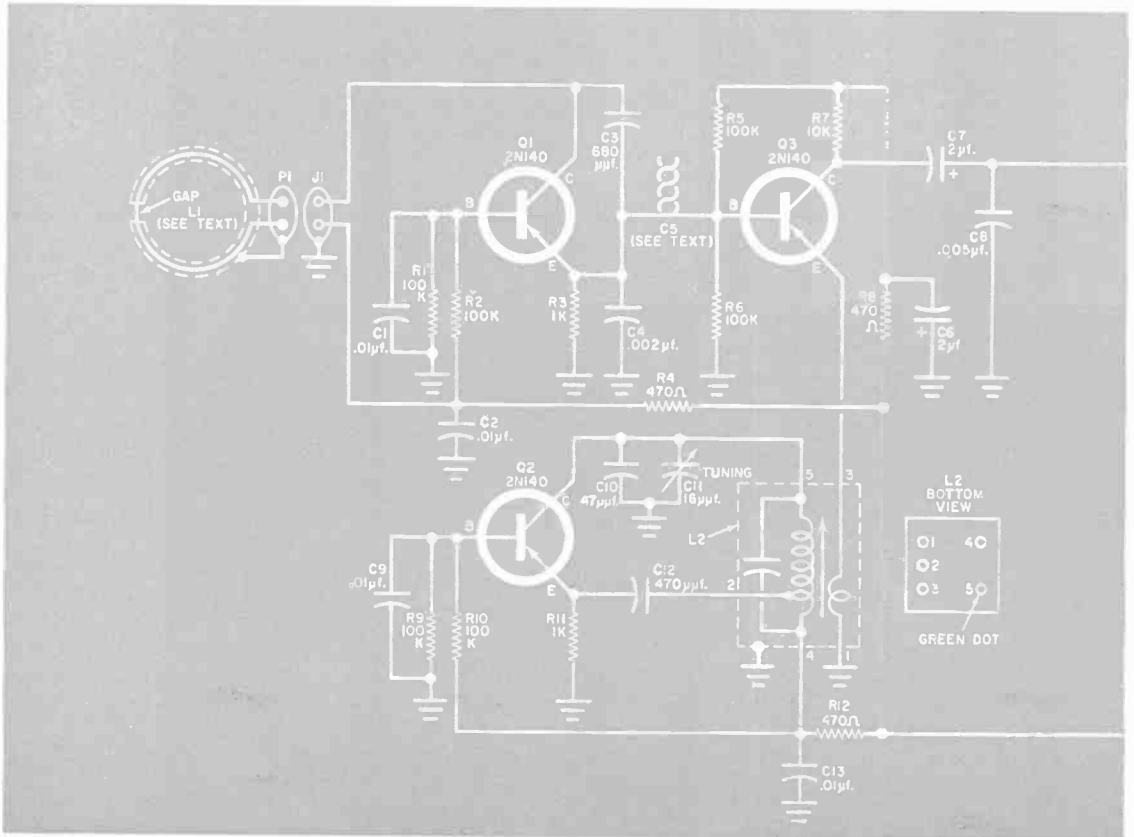
The transistorized metal locator pictured here operates on the "beat frequency" principle. Though this mode of operation is hardly new, the fact that transistors are used does update the device. The result is a metal locator that is compact, rugged, and easy to handle. In addition, its power requirements are decidedly low when compared to those of an equivalent vacuum-tube unit.

About the Circuit. The "Lodestar" 's "front end" consists of two oscillators (Q1 and Q2), each operating in the vicinity of 1000 kc. Each oscillator's output is fed to transistor Q3, which

PARTS LIST

B1—9-volt battery (Burgess 2U6 or equivalent)
 C1, C2, C9, C13—0.01- μ f. paper capacitor
 C3—680- μ f. silver mica capacitor
 C4—0.002- μ f. paper capacitor
 C5—Gimmick capacitor (optional—see text)
 C6, C7—2- μ f., 10-w.v.d.c. electrolytic capacitor
 C8—0.005- μ f. paper capacitor

C10—47- μ f. silver mica capacitor
 C11—16 μ f. variable capacitor (Hammarlund HFA-15B or equivalent)
 C12—470- μ f. ceramic or mica capacitor
 J1—2-conductor shielded jack (Amphenol 80-PC2F or equivalent)
 J2—Open-circuit phone jack
 L1—Sensing coil—see text
 L2—455-kc. transistor oscillator coil (Meissner 14-9006, J. W. Miller 2021, Stancor RTC-9080, etc.)



"mixes" the two signals in the same manner as a mixer in a superheterodyne receiver. The mixer output consists of both the sum and difference of the two signals fed into it, but the difference or "beat" frequency is the one of interest in this application. We'll see why in a moment.

If the two oscillators are oscillating at precisely the same frequency, the beat frequency will be "zero"—in other words, there won't be any "beat frequency!" However, if one of the oscillators is de-tuned slightly, the beat frequency will occur at an audible rate, and the beat note can be amplified and heard through a pair of phones or a speaker.

This is accomplished in the unit shown by the three-stage audio amplifier following the mixer.

Now here's how the unit succeeds in detecting the presence of metal. Note that the sensing coil (*L1*) is part of the resonant circuit or "tank" of the first oscillator. If a metallic object enters the field of the sensing coil, eddy currents are induced which effectively decrease the inductance of the coil; as a result, the frequency of oscillation is increased. The second oscillator, however, shielded within the enclosure, remains at a fixed frequency. Since the first oscillator has changed frequency with respect to the

P1—2-conductor shielded plug (Amphenol 80-MC2M or equivalent)

Q1, Q2, Q3—2N140 transistor (RCA)

R1, R2, R5, R6, R9, R10—100,000 ohms

R3, R11—1000 ohms All resistors

R4, R8, R12—470 ohms ¼ watt, 10%

R7—10,000 ohms

R13—10,000-ohm potentiometer with switch *S1*

S1—S.p.s.t. switch (part of *R13*)

1—Three-transistor subminiature audio amplifier (Lafayette PK-522—see text)

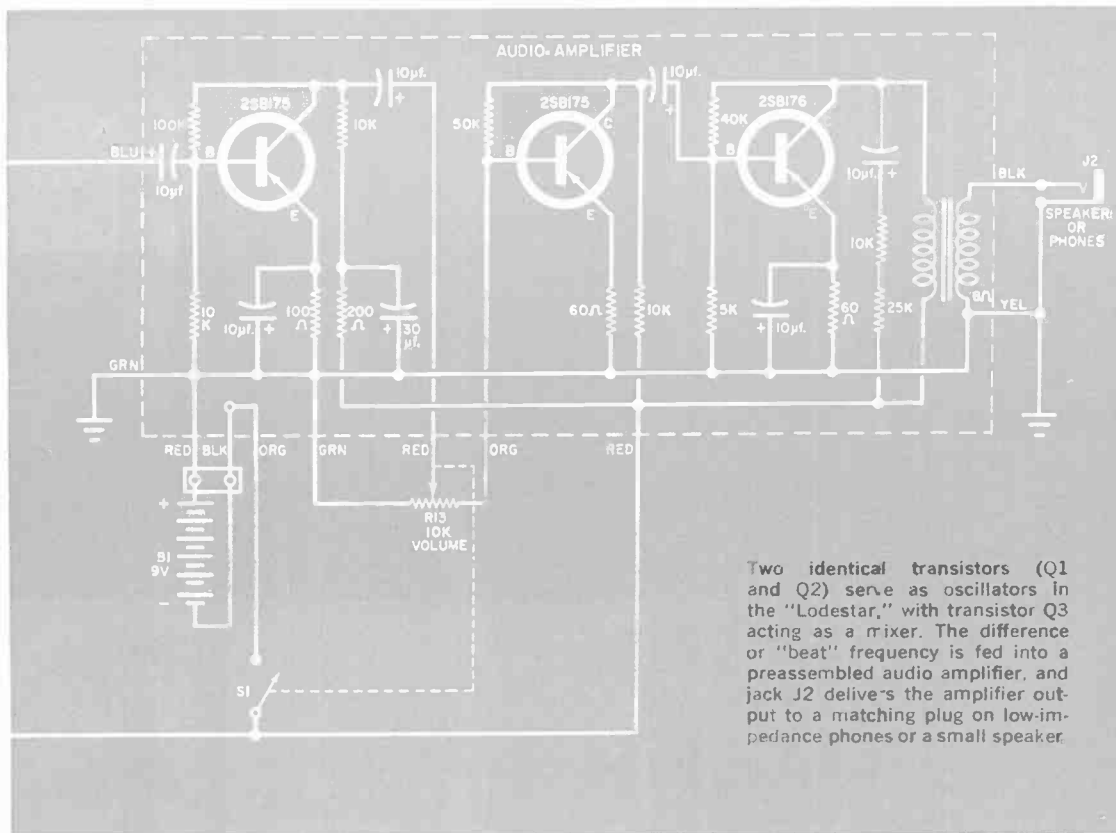
1—5¼" x 3" x 2½" aluminum utility box (Bud CU-2106-A or equivalent)

1—5' length of 2-conductor shielded microphone cable (Belden 8422 or equivalent)

1—6½' length of 5-conductor intercom cable (Belden 8445 or equivalent)

1—6½' length of ¾"-diameter copper or aluminum tubing

Misc.—Phenolic board, Masonite board, wooden handle, transistor sockets, knobs, screws, hook-up wire, solder, etc.



Two identical transistors (*Q1* and *Q2*) serve as oscillators in the "Lodestar," with transistor *Q3* acting as a mixer. The difference or "beat" frequency is fed into a preassembled audio amplifier, and jack *J2* delivers the amplifier output to a matching plug on low-impedance phones or a small speaker.

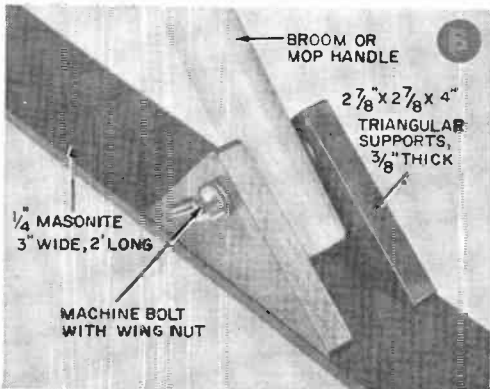
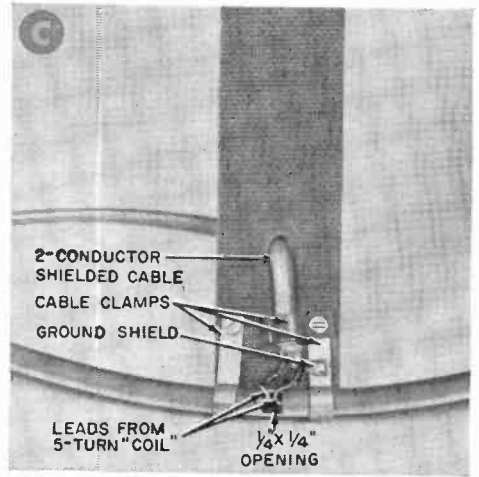
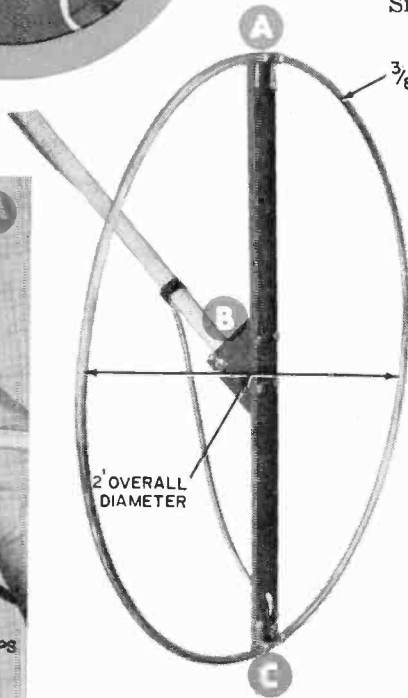
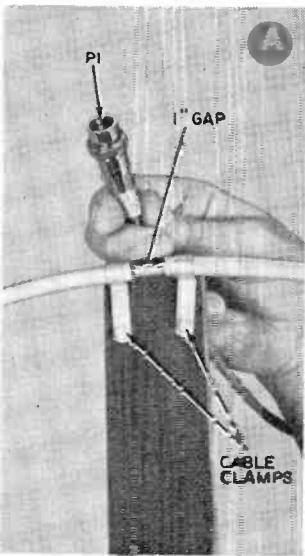
THE LODESTAR



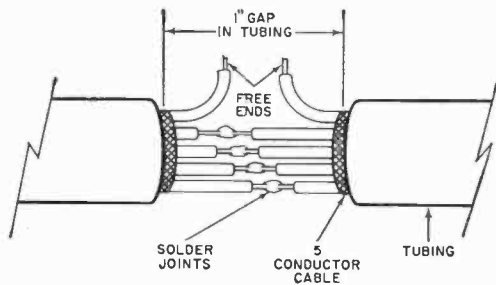
second, the presence of metal is then evident as a change in the audio pitch heard in the phones.

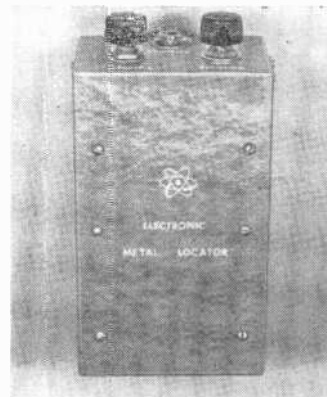
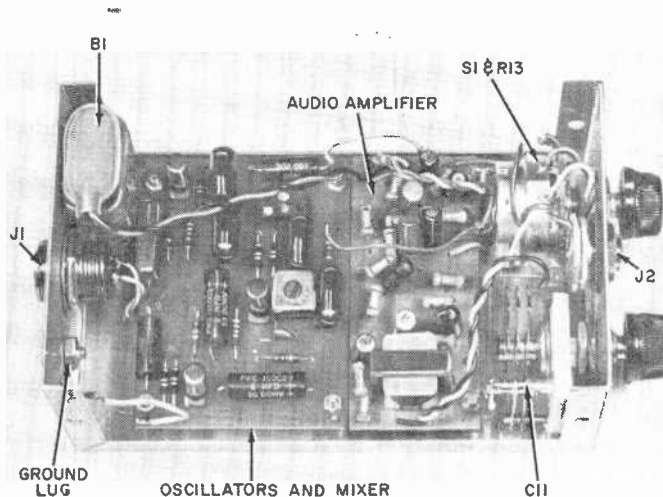
In actual operation, the second oscillator is initially tuned (by means of capacitor *C11*) to a frequency which beats with that of the first oscillator and produces a tone which is comfortable to your ear. (This adjustment, of course, must be made with the unit well away from metal objects). Then, as metal is approached, the pitch will go up or down, depending on whether the reference oscillator (*Q2*) is above or below the search oscillator (*Q1*) in frequency.

Since the d.c. biasing methods are



Sensing coil L1 will go together smoothly with aid of photos and drawing shown here. Details A, B, and C picture, respectively, 1" gap, pivot for wooden handle, and method of connecting coil to shielded cable. "Alternate" leads in 5-conductor cable are soldered together to form 5-turn coil (below).





Completed Lodestar fits snugly in a $5\frac{1}{4}$ " x 3" x $2\frac{1}{8}$ " box. To operate it, simply plug the sensing coil into jack J1, headphones or speaker into jack J2.

identical and the temperature coefficients of the transistors are the same, frequency drift between the two oscillators is minimized. The frequency drift of the two circuits will be nearly the same, and in the same direction, resulting in no apparent change in the beat note.

The operating frequency of 1000 kc. is actually a compromise between two important effects. At higher frequencies, a smaller change in inductance brings about a larger change in frequency; therefore, the higher the frequency of operation, the more sensitive the unit will be. However, beginning at frequencies of several megacycles, the depth to which the signal will penetrate begins to drop; therefore, a "happy medium" is reached at about 1000 kc.

So far, we've discussed only the effects of inductance on the unit's operation. However, non-metallic objects and the earth itself cause capacitive effects at these frequencies, and the audio beat note would change every time the search coil was brought near any object or near the ground if these effects weren't taken care of. Any capacitive effects are virtually eliminated with a shield which completely encloses the sensing coil except for a 1" "gap" which keeps the shield from acting as a shorted turn.

Putting It Together. The electronic portion of the Lodestar is housed in an aluminum utility box measuring $5\frac{1}{4}$ " x 3" x $2\frac{1}{8}$ ". The tuning capacitor (C11),

volume control (R13), and phone jack (J2) are mounted on one end, and the jack (J1) for the sensing coil on the other.

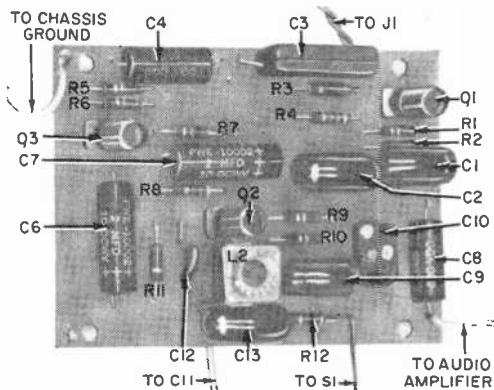
The "front end," which consists of both oscillators and the mixer, is assembled on a piece of phenolic board; the drawing shows how the components are secured to the board as well as how the board is mounted in the enclosure.

Direct, point-to-point wiring is used throughout, and the entire assembly should be rigid enough to be substantially free from mechanical vibrations. If it isn't, you'll find yourself troubled with frequency instability.

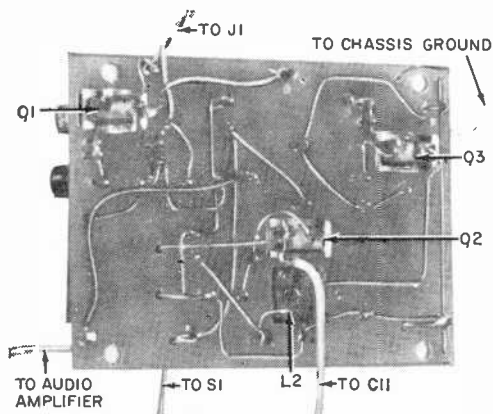
To make assembly that much simpler, a three-stage transistorized audio amplifier was purchased, factory-wired and ready-to-go. This amplifier* delivers enough power to drive a speaker directly, and phones can be used as well. (Unless you happen to have a pair of 8- or 10-ohm phones on hand, there will be some mismatch between the output transformer and the phones, but this won't be critical.) The audio section is mounted in the enclosure in the same manner as the board which holds the "front end."

The Sensing Coil. As in the balance of the unit, the leads to the "sensor" or

*Catalog number PK-522, the amplifier is available from Lafayette Radio Electronics Corp., 111 Jericho Turnpike, Syosset, L. I., N. Y., for \$3.75, plus postage.



"Front end" of Lodestar is mounted on a small phenolic sheet, about 2 1/16" wide and 2 13/16" deep. Top and bottom views show location of all components as well as details of interconnecting wiring.



search coil must be as rigid as possible to prevent slight motions or jarring from pulling the oscillator off frequency. The 3/8" tubing, which can be either copper or aluminum, serves a dual purpose—it acts as a shield, and it also rigidly supports the coil.

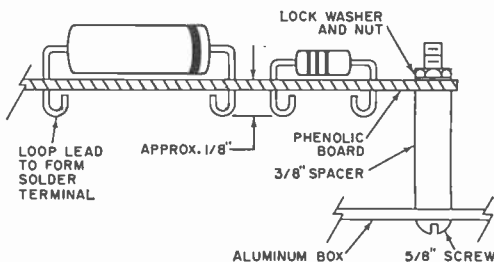
A 5-turn coil is fabricated from one length of 5-conductor cable by connecting the ends in such a manner that they form a single coil. The outer jacket holds the five conductors together, so that they are not allowed to move with respect to one another. Any movement of these wires would change the inductance and stray capacitance of the coil, and, again, the oscillator would be unstable and pull off frequency whenever the coil was jarred.

The first step in fabricating the search coil assembly is to form the 3/8" tubing into a loop about 2' in diameter with a

gap of about 1" between the ends (this will require a piece of tubing approximately 6' 3" in length).

Next, cut a 1/4" square in the tubing directly opposite the 1" "gap." Connections to the coil will be made through this opening a little later in the construction process.

Now, feed the length of 5-conductor cable into the tubing and trim it so that



Attach components to board by drilling holes, then inserting and looping leads to form solder terminals.

about 1" protrudes from each end of the tubing. Strip the outer plastic jacket from the ends of the cable, leaving the five wires, each 1" in length, exposed at each end of the tubing. Connect and solder the ends of alternate wires so that one continuous 5-turn coil is formed (there will be four solder joints and two free ends).

If you "stagger" the solder joints somewhat, you should be able to wrap one turn of plastic tape around each of the four wires and the respective solder joints to insulate them from each other and also from the metal tubing. Be sure to leave the two unsoldered wires free, since you'll need them to connect the coil into the circuit.

Once the cable has been taped, work it around inside the tubing so that the taped portion is located at the 1/4" x 1/4" opening. Next, "fish" the two free leads through this opening and connect them to the 2-conductor shielded cable. Keep the leads as short as possible so they won't vibrate, and ground the cable shield to the cable clamp near the opening in the tubing.

A piece of 1/4" Masonite, about 3" wide and 2' long, will serve to support the loop. Fasten a wooden handle to the

(Continued on page 108)

Throughout the past eight years, audiophiles—or “stereophiles” as they are now called—have avidly read the hi-fi equipment test reports furnished by the Hirsch-Houck Laboratories. This independent testing service specializing in audio and hi-fi products is presently supplying test reports for both *ELECTRONICS WORLD* and *HIFI/STEREO REVIEW* (our sister publications).

Beginning with this issue, certain Hirsch-Houck reports will become a part of our new monthly department, Hi-Fi Lab Check. In this department, you will find discussions on two or three new items of hi-fi and stereo equipment every issue. In the case of a kit, we will tell you how easy, or how difficult, it is to assemble. Special circuit innovations will be noted, and a few editorial observations passed along about functional design, operating ease, etc. Definitive results from the tests performed on the equipment by the Hirsch-Houck Laboratories will round out each installment.

In the next Hi-Fi Lab Check we will discuss the Scott LT-110 FM/multiplex tuner kit, the Harman-Kardon Award A-50K kit, and EICO's multiplex adapter kit. Subsequent installments will cover the Heath integrated transistorized stereo amplifier and a Heath basic stereo power amplifier. Allied Radio's Knight-Kit line will be represented by their 32-watt integrated stereo amplifier/AM/FM/multiplex receiver and new transistorized integrated amplifier.



FISHER KM-60 FM Tuner StrataKit

Manufactured by Fisher Radio Co., 21-21 44th Drive, Long Island City 1, N. Y.

Prices: \$169.50 (kit); \$219.50 (Model KM-61, factory-wired); \$24.95 (walnut or mahogany cabinet); \$15.95 (metal cabinet); slightly higher in far west.

THE KM-60 is one of the new family of hi-fi kits in which the assembly work load is divided into logical stages. The instructions pertaining to each stage occupy exactly one right-hand page in the manual while the facing page is a pictorial diagram of the work you must complete. The resistors, capacitors, etc., for each stage are packed in plastic bags, and each pack is numbered to correspond to the stage where the parts are used.

All tube sockets, jacks, tie strips, transformer tins, etc., have been neatly riveted in place by the manufacturer. The 2-tube tuner front end and the



Hi-Fi LAB CHECK

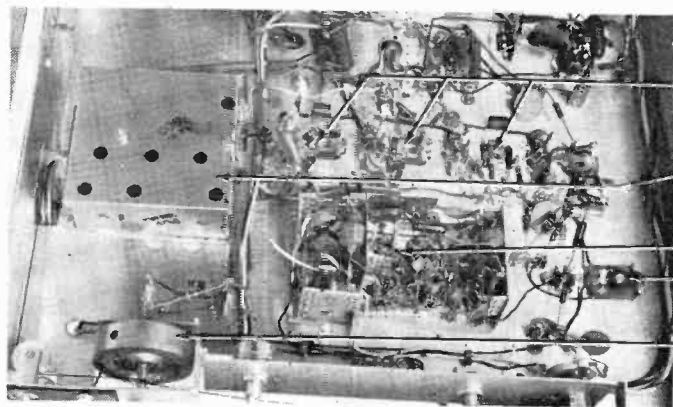
A NEW MONTHLY DEPARTMENT

**Assembly and factual test reports on new hi-fi/stereo equipment;
this month the Fisher KM-60 and Paco ST-26 kits are featured**



The Fisher KM-60 has a clean topside parts layout. Arrangement on rear skirt is (left to right): antenna terminals, switched a.c. socket, line cord, fuse, output jacks and level controls.

Under-the-chassis view further verifies the clean-cut appearance mentioned above.



I.F. STAGES

FRONT-END CHASSIS

MULTIPLEX CHASSIS

METER SWITCH

FLYWHEEL ON TUNING CONTROL SHAFT

3-tube multiplex demodulator are factory-wired and tested; you wire in the i.f. stages, filament and high-voltage leads, ratio detector, a.f. voltage amplifier, and power supply. Your total wiring time should range from 15 hours (experienced builder) to 21 hours (very careful builder).

CIRCUIT REPORT: The KM-60 has a sealed front end, tabbed the "Golden Cascade." It uses an ECC88/6DJ8 cascode low-noise r.f. amplifier and an ECC85/6AQ8 mixer-oscillator. This is followed by four stages of 10.7-mc. i.f. amplification using EF94/6AU6 tubes. The last two i.f. stages also serve as limiters before feeding a solid-state ratio detector.

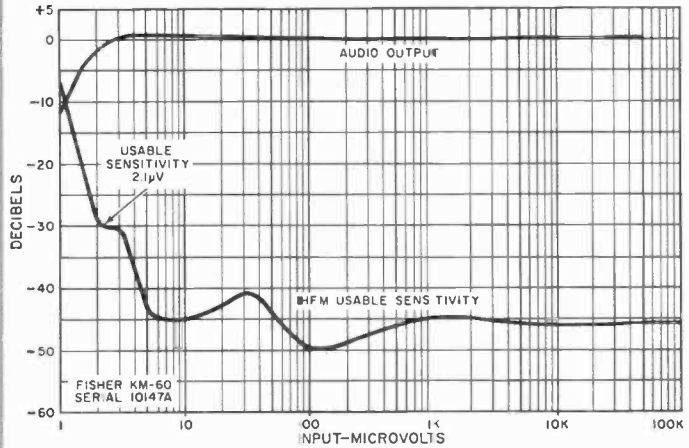
A selector switch on the front panel feeds the output of the ratio detector either into both triode sections of an ECC83/

12AX7 in parallel for *Mono*, or routes it through a multiplex demodulator for *Stereo*. Level controls permit setting up a balanced output to your amplifier. Also connected to the multiplex demodulator is an EM84A/6FG6 beam tube used to indicate whether or not a station is transmitting FM stereo.

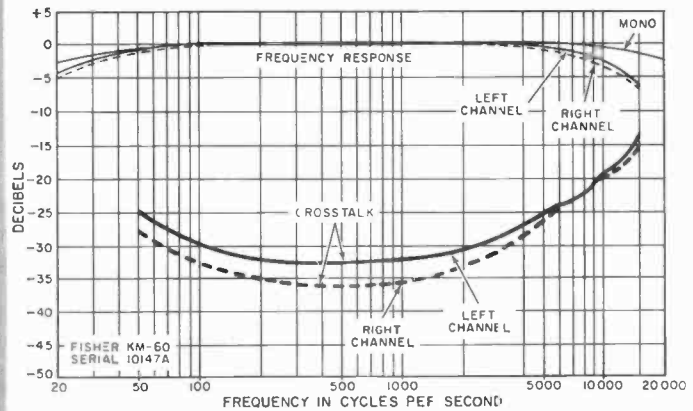
A tuning meter on the front panel measures second limiter grid current (approximate signal strength), or (via a chassis mounted switch) it can be used to set ratio detector and i.f. alignment.

HIRSCH-HOUCK LAB CHECK: The completed FM multiplex tuner met or exceeded all of the manufacturer's advertised specifications in all but one instance (see P. 45). It did so without the aid of a test instrument alignment—a very remarkable per-

Maximum output of the KM-60 was measured at 3.2 volts. The usable sensitivity curve plots total hum, noise, and distortion as referred to 100% modulation.



Frequency response curve suggests excellent listening quality of the KM-60. Not shown in this graph is the curve for left channel "Stereo Filter" that reduces stereo separation by about 13 db at 2500 cycles.



formance on the part of any FM tuner.

The difference between the manufacturer's claim of 1.8 μv . sensitivity and the tested 2.1 μv . (see graph at top of page) is negligible—and may easily be due to component tolerances and test instrument errors. With a 2.1- μv . value the KM-60 is still one of the most sensitive FM tuners on the market at this writing. Further alignment using test instruments made no measurable difference either in sensitivity or performance of this kit.

Audio frequency response from the KM-60 is excellent in *Mono* and very good in *Stereo* (see graph above). Some loss of high-frequency audio is to be expected when receiving multiplex, due to the inevitable use of ultrasonic filters to remove the 19-kc. pilot carrier. Stereo separation between right and left channels is also

excellent—about the best of any FM/multiplex tuner presently available.

A "Stereo Filter" can be used with the left channel to further eliminate very high frequency audio signals. This filter has a minor effect on frequency response in the audio spectrum and a slightly greater effect on separation (not graphed). However, the stereo effect is not particularly diluted.

IN CLOSING: The Fisher KM-60 is (in the words of our assembler) very easy to build and if you follow the wiring instructions to the letter, the manufacturer could eliminate the last paragraph in the manual, "In Case of Difficulty." The Hirsch-Houck Lab simply says that the KM-60 is a superb tuner.

(Continued on page 100)



"SEEING" INDUCTIVE REACTANCE

By ROY E. PAFENBERG

IT'S not too difficult for the novice to grasp the principles of simple d.c. circuits, but the relationships existing in a.c. circuitry are harder to visualize. The simple demonstrator described here is designed to "bring to life" the concepts of inductive reactance and transformer action in a way that no textbook could hope to do. Using a couple of replacement filter chokes and a few other inexpensive components, the unit costs little to put together and is ideal for a class demonstration or science fair project.

Choke Construction. The two filter chokes employed in the demonstrator have laminated cores composed of two basic sections—one of them shaped like an "E," the other like an "I." Each

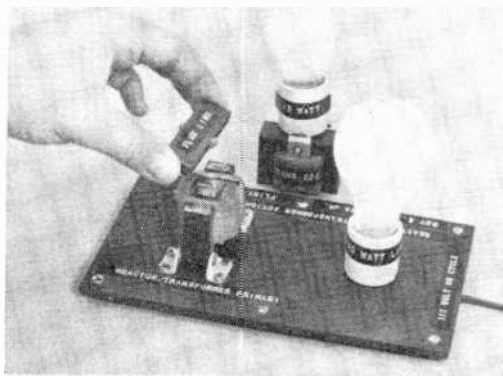


Fig. 1. Operator removes flux link from choke L_1 , reducing inductance of the choke and causing series-connected, 60-watt lamp L_1 to glow brightly.

choke coil is wound on the center leg of the "E" section, and the "I" section covers all three legs—closing off the open end of the "E."

In both of these chokes, the "I" section has been made removable from the "E" section. In the case of the choke mounted on the board (see Fig. 1), the open end of the "E" points upward and the "I" (marked "flux link") is held in the operator's hand. The choke with the bulb mounted on it is sitting on the open end of its "E" section.

How Demonstrator Works. Choke L_1 and lamp I_1 , the two components mounted on the demonstration board, are wired in series and connected across the a.c. line (see diagram on next page). The other choke and lamp (L_2 and I_2) are wired in parallel and fastened together to make a single unit.

The first part of the demonstration, illustrated in Figs. 1 and 2, requires only the demonstration board proper. Though L_2/I_2 appears in the background, it is not used.

In Fig. 1, the operator is removing the "flux link," or "I" section of choke L_1 . With the flux link removed, the magnetic flux path of the choke's core is not complete. Consequently, L_1 acts more like a resistor than a choke—the voltage drop across it resulting mainly from the d.c. resistance of its winding (approximately 100 ohms). Therefore lamp I_1 , having only about 100 ohms in series with it, lights fairly brightly.

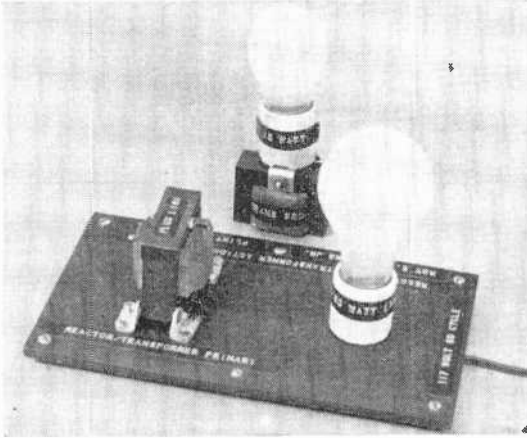


Fig. 2. With link replaced on $L1$, the choke regains full inductance and the voltage drop across it becomes high enough to cause lamp $I1$ to go out.

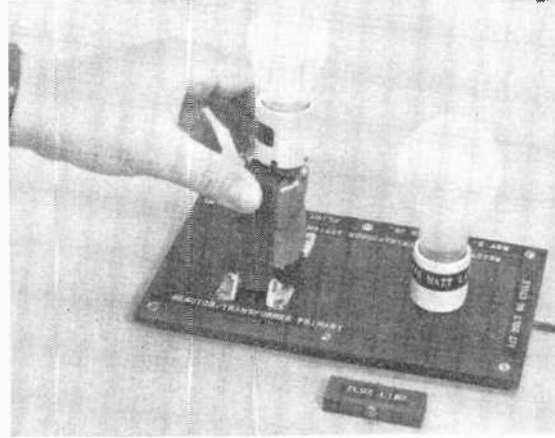


Fig. 3. Here transformer action is demonstrated by placing $L2/12$ atop $L1$. Enough voltage is then induced in $L2$ to make 15-watt lamp $I2$ glow brightly.

In Fig. 2, the flux link has been replaced on $L1$. Since the flux path is now completed, the voltage drop across the choke is much greater—being caused by the full inductive reactance of the choke as well as the d.c. resistance. Accordingly, lamp $I1$ goes out.

The last part of the demonstration, shown in Fig. 3, illustrates transformer action. With the open "E" section of $L2$ placed over that of $L1$, the flux path of $L1$ is completed as before and $I1$ goes out. At the same time, $L1$ becomes a transformer primary and $L2$ a secondary. Enough voltage is induced in $L2$ from $L1$ to cause $I2$ to glow at about half brilliance.

Building the Demonstrator. Though construction can follow any style, the breadboard mounting shown here is both simple and safe. Any material, as long as it is an electrical insulator, can be used for the board. Mount a rubber foot at each corner to provide clearance for the wiring and to avoid scratching furniture.

Choke $L1$ is a Thordarson 26C88 (2.5 henrys, 130 ma., 100 ohms); $L2$ is a Stancor C-2304 (2.3 henrys, 150 ma., 60 ohms). Remove from each choke the metal channel surrounding the core. Next, remove the "I" core sections from both $L1$ and $L2$. Both channels, and $L1$'s "I" section, can be discarded.

Drill out the two holes punched in $L1$'s "E" section to take No. 4 machine screws. Do the same for the single hole

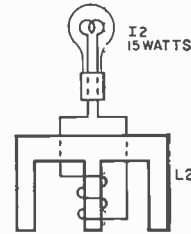
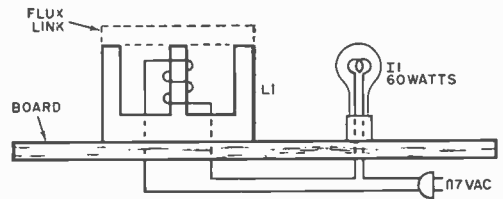
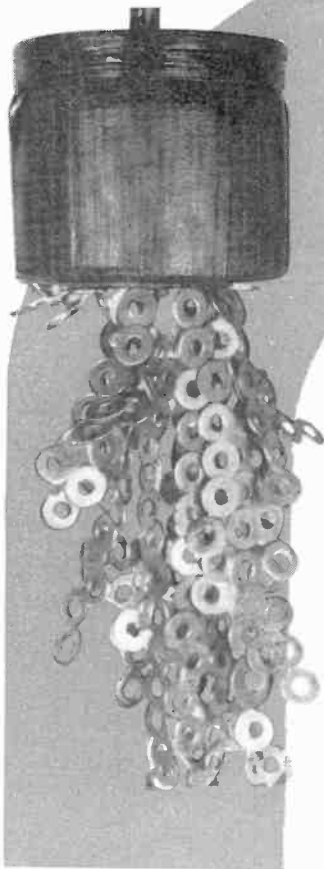


Diagram of demonstrator. Note simplicity of wiring.



in $L2$'s "E" section and that in $L2$'s "I" section. To make the flux link, pass a No. 4 machine screw through the "I" section and fasten it securely with a nut. This will hold the laminations together.

Four angle brackets, attached to $L1$'s "E" section by means of machine screws passed through the holes mentioned above, are used to mount the "E" section to the board. The socket for $I2$ is attached to $L2$'s "E" section by means of an angle bracket mounted via the hole in that section. (The sockets used for both $I1$ and $I2$, incidentally, are the ceramic-insulated type sold for replacement in lighting fixtures.) Always use a 60-watt lamp at $I1$ and a 15-watt lamp at $I2$.



The MASTER MAGNET

**Pick up aluminum, silver, or
other non-ferrous metals
with an a.c. electromagnet**

By WALTER B. FORD

EVERYONE KNOWS that magnets are supposed to attract only ferrous metals like iron or steel. That's why the unusual electromagnet described here makes such an excellent "crowd stopper" at science fairs or similar gatherings. Seeming to defy the laws of physics, it will pick up half-dollar-sized pieces of copper, aluminum, silver, gold, and other non-ferrous metals.

Of course the magnet will attract ferrous metals much more strongly. And the sight of a seething mass of nails, screws, or washers dangling a foot or more from its bottom is not easily forgotten. So, if you're looking for something different in the way of a demonstration unit, or if you'd just like to build a big electromagnet for your own pleasure, here are the details.

The Magnet's Secret. Since the electromagnet's windings are powered by a.c., an alternately increasing and decreasing

magnetic field is set up in its center core. When this varying field passes through a set of copper washers fastened at the end of the core, a large current is induced in them. The washers, then, act essentially as a transformer secondary.

The induced current sets up a strong, varying magnetic field in the washers. And the direction of this field is such that the washers and the core repel each other. If the washers were not anchored in place, they would spring out of their mounting as soon as the current was turned on.

The point is, though, that the varying field in the washers will induce, in turn, a large current in any metal object (ferrous or not) brought near them. This current, of course, sets up a magnetic field in the object. And the direction of the field will always be such that the part of the object in contact with the outside face of the set of washers will

have the opposite magnetic polarity from that face. Therefore, the object will be attracted.

Building the Magnet Cores. Begin construction by cutting a 3½"-long section from a mailing tube about 2" in diameter. Then make a frame for the inner core as shown in Detail "A." The diameter of the three wooden discs forming the frame should be such that they will fit snugly inside the tube. Four ¼"-diameter dowels pass through holes drilled in the discs and are glued in place—holding the assembly together. The ¾"-diameter holes drilled in the centers of the discs will later accommodate the core material.

Now slide the completed frame into the mailing tube and glue it in place. One end of the frame should be flush with one end of the tube—leaving a ½"-space at the other end of the tube. Three copper washers will later be installed in this space (see Detail "B"—side view).

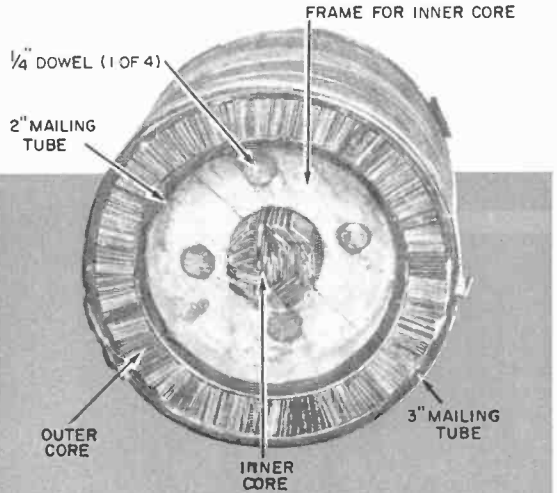
Set the tube on a table top with the "closed" end down and pack the center

of the frame with a core of 3½"-long, approximately ¼"-wide, laminations. The laminations can be taken from an old transformer but, if one is not available, 3½"-long pieces of 18- to 22-gauge soft iron wire may be substituted. Whether you use laminations or wire, the top ends of the pieces should be cut square so that they will present a smooth surface when packed together.

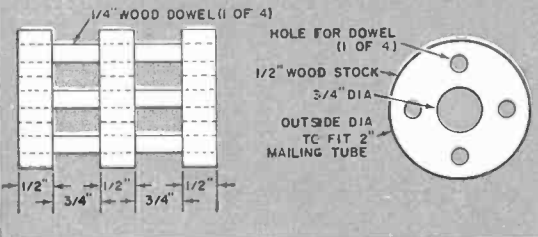
Slide a 3½"-long and approximately 3"-diameter piece of mailing tube over the finished inner core assembly and place the assembly at the exact center of the tube. Fill the space between the assembly and the tube with an outer core of 3½"-long pieces of transformer laminations or 18- to 22-gauge soft iron wire. If laminations are used, they should be wide enough to make a snug fit when packed radially around the inner core assembly (see Detail "B"—end view).

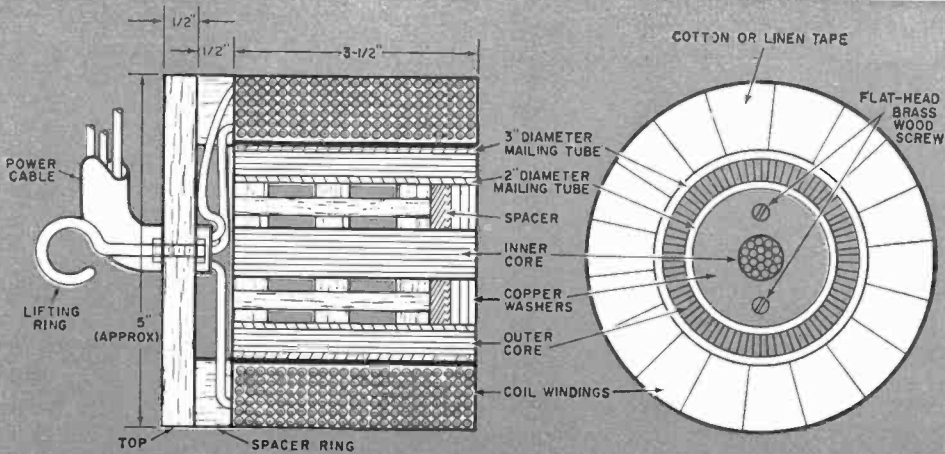
Winding the Coil. For this job you will need a jig similar to that shown in Detail "C." It consists of a wooden cylinder (3½"-long and ⅙" larger in diame-

Specifications for construction of frame for inner core are given in Detail A (at right, below). In photo below, inner core has been completed and the last few laminations are being installed in the outer core. At right is finished assembly containing both cores.



DETAIL A ▼

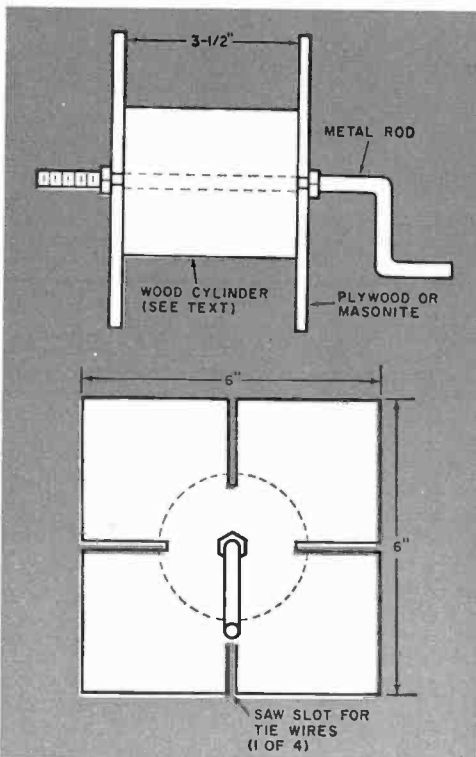




Drawings of side (in cross section) and bottom of magnet will give you a good idea of the construction.

DETAIL B ▲

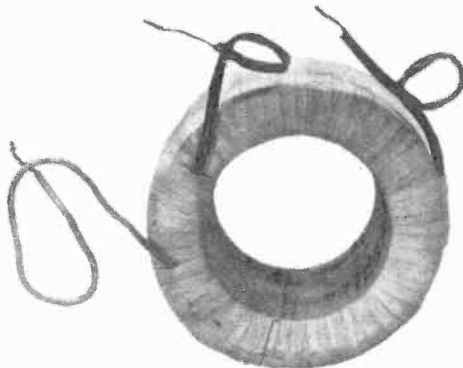
DETAIL C ▼

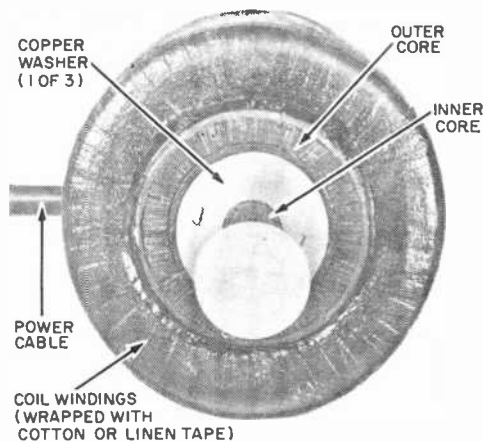


ter than the outside diameter of the mailing tube) fitted with two end-pieces. Slots are sawed in the end-pieces for the accommodation of temporary tie wires (see next paragraph), and a rod with a crank handle runs through the center of the cylinder as illustrated.

With the jig prepared, center a 12" piece of hookup wire across each of the four sets of slots and push it, through the slots, flat against the cylinder. The coil will be wound over these wires, and they will be used to hold the coil together temporarily when it is removed from the jig. Now drill a hole to fit the jig

Magnet coil is wound on a special jig (see Detail C at left). After windings are completed, they are wrapped with an overlapping layer of cotton or linen tape (below). Lead at left of coil is the tap.





Photograph of magnet bottom shows the coil, inner and outer cores, top washer. Circular object partially covering washer and cores is a half-dollar.

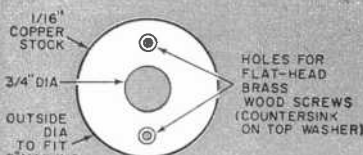
rod in a block of wood and clamp the block in a vise; this hole will serve as a bearing for the straight end of the rod while you crank the other end.

The coil consists of 600 turns of #14 cotton- or enamel-covered magnet wire tapped at the 350th turn; approximately nine pounds of wire will be needed. Push the end of the wire on your supply spool through a saw-slot in one of the jig's end-pieces (leave about 6" sticking out), insert the straight end of the jig rod into the block of wood, and begin winding the wire, in layers, onto the cylinder.

When you reach the 350th turn, tap on a 6" length of wire and bring it out through a saw-slot. The point of tapping can be varied as much as 10 turns in either direction in order to bring the tap out at the end of a layer and on the same side of the coil as the original 6"

DETAIL D

Three washers like that illustrated below are required (see Detail B). Countersink screw holes on one of them.



BILL OF MATERIALS

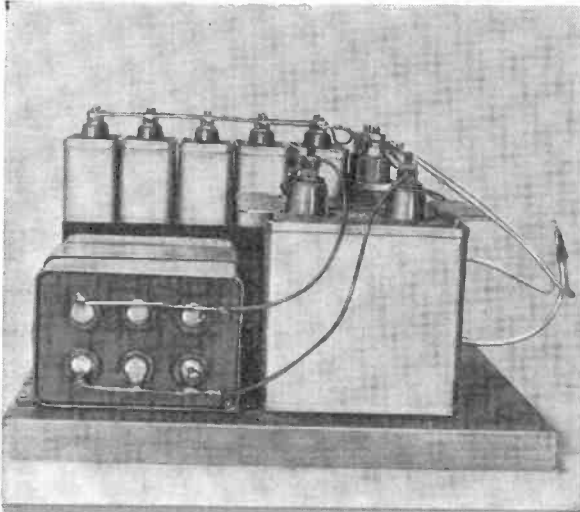
- 1—Cardboard mailing tube, 3½" long, approximately 2" in diameter
- 1—Cardboard mailing tube, 3½" long, approximately 3" in diameter
- 4—Wooden dowels, 3½" long, ¼" in diameter
- 1—Roll ½"-wide cotton or linen tape
- 1—Heavy brass or copper hook (for lifting ring)
- 1—Line plug
- 1—80-u.l., 250- or 600-volt capacitor bank—see text
- 1—Wood or metal enclosure for above
- 1—6' length of #14 stranded 3-wire cable (for magnet power cord)
- 1—6' length of #14 stranded 2-wire cable (for line cord)
- 9—pounds of #14 cotton- or enamel-covered magnet wire
- Misc.—½" wood stock for center core frame, magnet top and spacer ring, 1/16" sheet copper for washers, old transformer laminations or 18- to 22-gauge soft-iron wire for cores, parts for winding jig, flat-head brass wood screws, cement, insulating varnish or enamel, etc.

lead. Continue winding until you reach the 600th turn, bring the end of the wire out through a saw-slot on the same side of the coil as before, and cut it off (leaving another 6" lead).

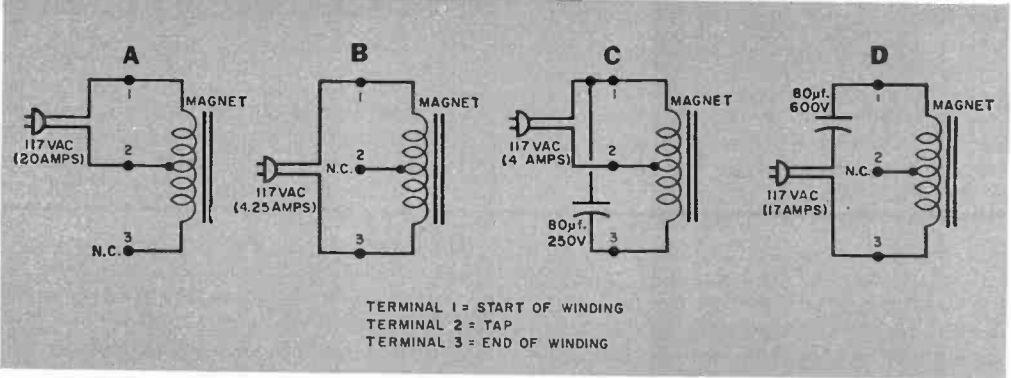
Final Assembly. Tie the windings together, using the wires previously inserted for this purpose—then disassemble the jig and remove the coil. The coil should now be completely wrapped, from the inside to the outside, with an overlapping layer of ½"-wide cotton or linen tape. Coat with glue the outside of the 3"-diameter mailing tube enclosing the magnet cores, and also coat the inside of the coil. Next, slip the coil over the cores (with the leads at the end opposite that on which the copper washers will be mounted) and allow the glue to dry.

Make a wooden ring, from ½" stock, with an outside diameter equal to the outside diameter of the coil and a 3" inside diameter. This will serve as a spacer between the coil and its wooden top (see Detail "B"—side view). Cut grooves in the spacer for the coil leads and glue it to the top of the coil, bringing the leads out through the hole in the center.

A circular wooden top having the same outside diameter as that of the ring is now cut from ½" stock. Mount a lifting ring (made of either brass or copper) on the center of the wooden top and also drill a hole for the power cable (a 6'



The four schematic diagrams below indicate various methods of connecting magnet coil to a.c. line. The hookup of "C" or "D" will give you a stronger pull than that of "A" or "B," but both the "C" and "D" hookups require the use of an 80- μ f. capacitor. This capacitance can be built up by paralleling a number of smaller units as shown in the photo at left.



length of #14 stranded, 3-wire conductor). Push one end of the cable through the hole, connecting the coil leads to the cable leads.

The leads at the free end of the power cable should be marked "start of winding," "tap," and "end of winding" for later identification. This done, the wooden top can be secured to the spacer ring with brass wood screws. Glue the cable into its hole so that the connections cannot be pulled apart by accidental flexing, and coat the entire magnet with black insulating varnish or enamel. The coating will give the unit a professional appearance, protect it from moisture, and help to secure the cotton or linen coil wrappings.

The last job to be done in the construction of the magnet is the forming and installation of the copper washers which fill the remaining space between the ends of the inner and outer magnet

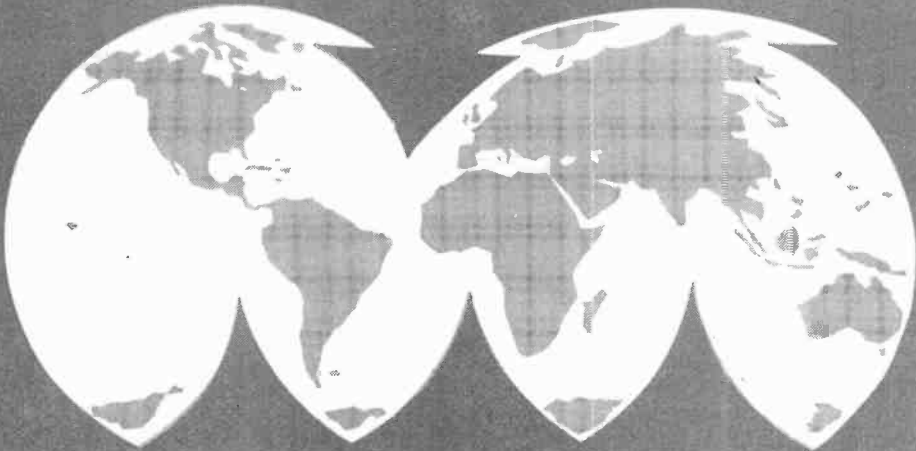
cores. Specifications for the washers are given in Detail "D." The author has found that three washers (each $\frac{1}{16}$ " thick) work well, but you might like to try a different number.

The washers are secured with flat-head brass wood screws driven into the frame of the inner core. Countersink the screwholes in the top washer so that the heads of the screws will be flush with the copper surface. Whatever space remains between the washers and the inner core should be filled with cardboard or wood spacers—so that the top washer will be flush with the ends of the inner and outer cores.

Do not, incidentally, substitute any other metal for the copper. The heavy current induced in the washers requires that they be made of extremely low resistance material. And, except in the unlikely event that you have silver
 (Continued on page 108)

EXCLUSIVE

DIRECTORY OF WORLD-WIDE NEWSCASTS



For the first time: a listing of 'round-the-clock short-wave broadcasts to let you tune in on the news direct from the world's trouble spots!

IT GOES WITHOUT SAYING that the news of the world is made up of facts. But it's also pretty well known that there's a world of difference in news from London, Melbourne, or Washington, and news from Moscow, Peking, or Havana. Want to find out what newscasters in other countries are saying about the United States and the rest of the world? Better yet, want to tune in on events *while they're happening*? The exclusive listing on the following four pages is a cross-section of foreign English-language newscasts, broadcast around the clock around the globe.

Not all of the newscasts listed here are intended for North American listeners, but these stations can often be picked up just the same. Other broadcasts, especially those beamed directly to North America, usually come in clear as a bell; the frequencies on which these stations are heard appear in boldface type. All times listed are Eastern Standard, and both times and frequencies are naturally subject to change. Good luck—and good listening!

By **STEWART WEST**, WPE2LH

SEE NEXT FOUR PAGES 

TIME (EST)	STATION LOCATION	NAME OR CALL	FREQUENCIES (kc.)
0340 ¹	Wellington, N.Z.	Radio New Zealand	11780, 6080
0400	Port Moresby, New Guinea	VLT6	6130
0400	Suva, Fiji	Fiji Broadcasting Service	4756
0400	Melbourne, Australia	Radio Australia	11710, 9570
0400	Tokyo, Japan	General Overseas Service	15195, 11855, 11725
0430 ²	Wellington, N.Z.	Radio New Zealand	9540, 6080
0450	Georgetown, Guiana	Radio Demerara	5980, 3265
0500 ³	Vatican	Vatican Radio	21490, 17840
0500	Delhi, India	All India Radio	17855, 15310, 15105, 11730, 11715
0510	Taipei, Taiwan	Voice of Free China	11825, 9720, 9660, 7130, 6095
0530	Bangkok, Thailand	HSK9	11910
0530	Kabul, Afghanistan	Radio Kabul	15425
0600	Tokyo, Japan	General Overseas Service	11780, 11725
0600 ⁴	Tokyo, Japan	Far East Network	15257, 11750, 6160
0615	Djakarta, Indonesia	Voice of Indonesia	11770, 9585
0700	Tashkent, Uzbek S.S.R.	Radio Tashkent	11952, 9600
0700 ⁵	Cap-Haitien, Haiti	Radio 4VEH	9770, 6120, 1035
0730	Port Moresby, New Guinea	VLT6	6130
0730	Pyongyang, North Korea	Korean Central Broadcasting Station	6250
0730 ⁶	Warsaw, Poland	Radio Warsaw	17800, 15120, 11800
0745	Melbourne, Australia	Radio Australia	11710
0800	Tokyo, Japan	General Overseas Service	11780, 11725
0800	Paris, France	This Is Paris	21620, 17765, 15290
0800	Colombo, Ceylon	Radio Ceylon	9520
0815	Dakar, Senegal	Radio Senegal	11895
0830	Lisbon, Portugal	Radio Lisbon	17895, 15125
0830 ¹	Delhi, India	All India Radio	15365, 11810
0830	Karachi, Pakistan	Radio Pakistan	15192, 11672
0900	Stockholm, Sweden	Radio Sweden	17840
0900	Hilversum, Holland	Radio Netherlands	17810, 15445
0900	Peking, China	Radio Peking	15410, 11740, 9660, 9480, 7335
0900	Tashkent, Uzbek S.S.R.	Radio Tashkent	11952, 9600
0905	Quito, Ecuador	HCJB—Voice of the Andes	17890, 15115
0910	Cologne, Germany	Voice of Germany	17815, 15275
0930	Seoul, Korea	Voice of Free Korea	15125
0945	Djakarta, Indonesia	Voice of Indonesia	11770, 9585
0948	Berne, Switzerland	Switzerland Calling	17795, 15315, 11865
1000	Vatican	Vatican Radio	15120, 11740, 9645

TIME (EST)	STATION LOCATION	NAME OR CALL	FREQUENCIES (kc.)
1000 ⁷	Copenhagen, Denmark	Voice of Denmark	15165
1000	Bucharest, Rumania	Radio Bucharest	15380, 15250, 11810
1015	Melbourne, Australia	Radio Australia	11710
1030	Belgrade, Yugoslavia	Radio Belgrade	15240, 11735, 9505
1100	London, England	BBC—North American Service	17810, 15310
1100	Vatican	Vatican Radio	17840, 11740
1140	St. George's, Grenada	Windward Islands Broadcasting Service	15235, 9520
1200	Montreal, Canada	Radio Canada	17820, 15320, 11720
1230	Athens, Greece	Radio Athens	15345, 11720
1300	Peking, China	Radio Peking	15095, 12055, 11715, 9785, 9755, 9550
1315	Vatican	Vatican Radio	15120, 11740, 9645
1330	Lisbon, Portugal	Radio Lisbon	17880, 11915
1345	Abidjan, Ivory Coast	Radio Abidjan	11820
1530	Berne, Switzerland	Switzerland Calling	9545, 7210
1545	Cairo, Egypt	Radio Cairo	17690
1545	Brazzaville, Congo Republic	Radio Brazzaville	15190
1600	Delhi, India	All India Radio	11955, 9690, 9635, 7235
1630	Damascus, Syria	Damascus Calling	15165
1630	Jerusalem, Israel	Voice of Israel	11915, 9520, 9009
1348	Brussels, Belgium	ORU	15335, 11850, 9745
1415	Tehran, Iran	Tehran Calling	15105, 9660, 7024
1430	Accra, Ghana	Radio Ghana	11805
1445	Havana, Cuba	Radio Havana Cuba	15285
1515	Hilversum, Holland	Radio Netherlands	11730, 9715, 6020
1515	Leopoldville, Republic of the Congo	Radio Leopoldville	11755
1630	Cairo, Egypt	Radio Cairo	11915
1645	Ankara, Turkey	Radio Ankara	7285
1650	Jerusalem, Israel	Voice of Israel	9009
1700 ⁸	Moscow, U.S.S.R.	Radio Moscow	12010, 11965, 11790, 11730, 9740, 9680
1700	Budapest, Hungary	Radio Budapest	9833, 7220, 6236
1700	Seoul, Korea	Voice of Free Korea	11950
1700	Belgrade, Yugoslavia	Radio Belgrade	9505, 7100, 6100
1730	Bucharest, Rumania	Radio Bucharest	9570, 7195
1740	Cologne, Germany	Voice of Germany	9605, 6100
1800	London, England	BBC—General Overseas Service	15375, 15070, 12040, 11780, 11750, 9510
1800	Montreal, Canada	Radio Canada	15190, 11760, 9740
1800	Buenos Aires, Argentina	Argentina Calling	11730
1815	Ankara, Turkey	Radio Ankara	9515
1845	St. George's, Grenada	Windward Islands Broadcasting Service	9820, 3280

TIME (EST)	STATION LOCATION	NAME OR CALL	FREQUENCIES (kc.)
1900	Brussels, Belgium	ORU	9705, 9745, 6000
1900	Budapest, Hungary	Radio Budapest	11910, 9833, 9770
1900	London, England	BBC—General Overseas Service	11780, 11750, 9510, 7230
1930	Tokyo, Japan	Radio Japan	17895, 15390, 15135
1930	Delhi, India	All India Radio	11895, 9765
1930	Rome, Italy	Radio Rome	11905, 9575
2000 ⁹	Peking, China	Radio Peking	17765, 15115, 11975, 11730, 11945, 9480
2000	Prague, Czechoslovakia	Radio Prague	15285, 11990, 9795, 9550, 7345
2000 ¹⁰	Moscow, U.S.S.R.	Radio Moscow	12030, 12010, 11870, 11820, 11730, 11690, 9740, 9720, 9680, 9570
2000	Sofia, Bulgaria	Radio Sofia	9700
2000	Cologne, Germany	Voice of Germany	9605, 6145
2000	Cap-Haitien, Haiti	Radio 4VEH	9770, 6120, 1035
2000 ¹¹	Montreal, Canada	Northern Service	11720, 9585
2015	Brazzaville, Congo Republic	Radio Brazzaville	11725
2015	Amman, Jordan	This Is Amman	9560
2030	Melbourne, Australia	Radio Australia	25735, 21540, 17870
2030	Bucharest, Rumania	Radio Bucharest	15380, 11900, 11810, 9510, 7195, 6190
2030	Hilversum, Holland	Radio Netherlands	9590, 6035, 5985
2033	Berne, Switzerland	Switzerland Calling	11865, 9535, 6165
2045	Stockholm, Sweden	Radio Sweden	11805 (or 9725)
2100	London, England	BBC—General Overseas Service	11780, 11750, 9510, 7230
2100	Lisbon, Portugal	Voice of the West	9740, 6025
2100 ¹²	Tokyo, Japan	General Overseas Service	17755, 15195, 15105
2100	Colombo, Ceylon	Radio Ceylon	15265
2100 ¹³	Monrovia, Liberia	ELWA	11825, 9590
2100	Leopoldville, Republic of the Congo	Radio Leopoldville	11755
2100	Cologne, Germany	Voice of Germany	9640, 6100
2100 ¹	Copenhagen, Denmark	Voice of Denmark	9520
2100	Belize, British Honduras	British Honduras Broadcasting Service	3300
2145	Taipei, Taiwan	Voice of Free China	15225, 11825, 9665, 6095
2200	Havana, Cuba	Radio Havana Cuba	11875, 11840
2200	Bucharest, Rumania	Radio Bucharest	11900, 11810, 9570, 9510, 7195, 6190
2200 ¹⁴	Moscow, U.S.S.R.	Pacific Coast Service of Radio Moscow	15140, 11755, 11850, 11705, 9540
2200	Buenos Aires, Argentina	Argentina Calling	9690
2205	Rome, Italy	Radio Rome	11905, 9575

TIME (EST)	STATION LOCATION	NAME OR CALL	FREQUENCIES (kc.)
2215	Madrid, Spain	Voice of Spain	9363, 6130
2215	Stockholm, Sweden	Radio Sweden	11805 (or 9725)
2230	Leopoldville, Republic of the Congo	Radio Leopoldville	11755
2230	Budapest, Hungary	Radio Budapest	9833, 9770, 7220
2230 ^{1,2}	Moscow, U.S.S.R.	Radio Moscow	12010, 11960, 11820, 11730, 9700, 9680, 9660
2230 ¹	Copenhagen, Denmark	Radio Denmark	9520
2245	Cologne, Germany	Voice of Germany	9735, 6145
2245	Lisbon, Portugal	Voice of the West	9740, 6025
2300	Sofia, Bulgaria	Radio Sofia	9700
2315	Madrid, Spain	Voice of Spain	9363, 6130
2315	Tokyo, Japan	Radio Japan	15235, 11780, 11705, 9505
2315	Bangkok, Thailand	HSK9	11910
2318	Berne, Switzerland	Switzerland Calling	11865, 9535, 6165
2330	Prague, Czechoslovakia	Radio Prague	11990, 11745, 9795 9550, 7345
2330	Bucharest, Rumania	Radio Bucharest	11900, 11810, 9570, 9510, 7195, 6190
0000	Cologne, Germany	Voice of Germany	9640, 9575, 6100
0000	Havana, Cuba	Radio Havana Cuba	11875, 11840
0015	Brazzaville, Congo Republic	Radio Brazzaville	11725, 9730, 7105, 5970
0015	Madrid, Spain	Voice of Spain	9363, 6130
0025	Cologne, Germany	Voice of Germany	9735, 6145
0030	Seoul, Korea	Voice of Free Korea	15125, 11925
0030	Ibadan, Nigeria	Western Nigeria Broadcasting Service	3204
0100	London, England	BBC—General Overseas Service	11955, 9640, 9620, 9510, 7230, 6110
0100	Port Moresby, New Guinea	VLT9	9520
0100	Buenos Aires, Argentina	Argentina Calling	9690
0100	Monrovia, Liberia	ELWA	11975
0155	Freetown, Sierra Leone	Sierra Leone Broadcasting Service	3316
0200	Melbourne, Australia	Radio Australia	11710, 9570
0200	Monrovia, Liberia	ELWA	11975, 4770
0200	Monrovia, Liberia	ELBC	3255
0230 ¹	Wellington, N.Z.	Radio New Zealand	11780, 6080

1. Not broadcast on Sundays.

2. Sundays at 0400.

3. Repeat at 0520.

4. Other news every hour on the hour.

5. Sundays at 0615.

6. Repeat at 0830.

7. Tuesdays, Thursdays, and Saturdays.

8. Repeated at 1830.

9. Repeated hourly through 2300.

10. Also at 2100.

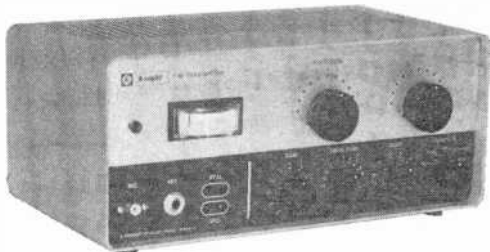
11. Other news every hour through 0200.

12. Repeated every hour through 0000.

13. Tuesdays only.

14. Repeated hourly through 0200.

FREQUENCIES IN BOLD FACE INDICATE STRONG SIGNALS EASILY HEARD IN NORTH AMERICA



FIRST RIG

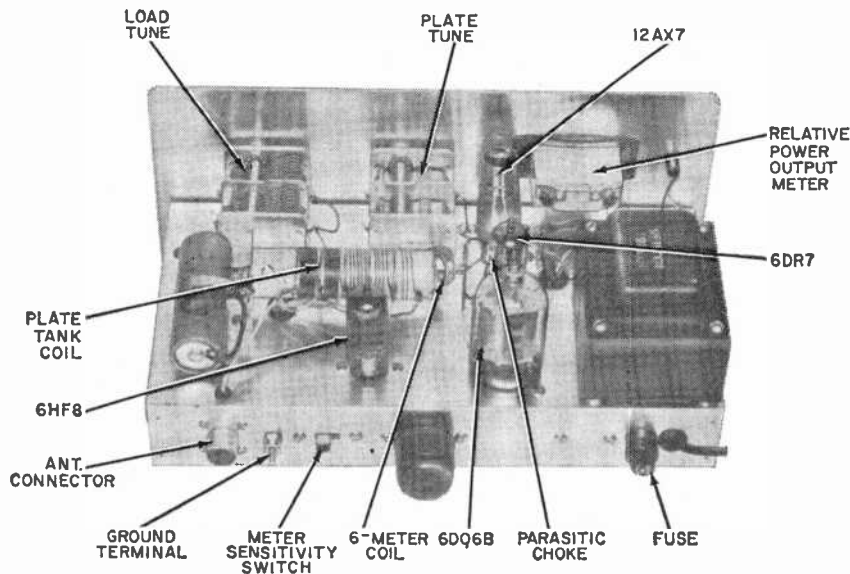
for the "plan ahead" Novice

IF you're a brand-new Novice, you can run down to the local radio supply house and pick up a rig easily enough, but putting your first transmitter together yourself is an exciting and educational experience. Allied Radio (100 N. Western Ave., Chicago 80, Ill.) has come up with an ideal "first rig" kit that you can grow with. Reasonably priced at \$49.95, the Knight-Kit T-60 transmitter is designed for 80- through 6-meter operation. Its 60 watts input power and frequency coverage make it suitable for the Technician and General Class ham as well.

The circuit uses the triode section of a 6HF8 as a crystal oscillator and the pentode section as a buffer and frequency-multiplier amplifier. A tuned band-switched pi-network between the pentode section and the power amplifier (6DQ6B) serves as a series tuned circuit for the plate of the former and control grid of the latter. The 6HF8 multiplier provides all the necessary frequency step-up except on 6 meters where the plate circuit of the final acts as a doubler. Phone operation requires the use of two tubes, a 12AX7 and a 6DR7, which provide controlled-carrier operation. The carrier is suppressed in the absence of voice signals and increased by the audio up to 100% modulation.

Easy to assemble and even easier to get on the air, the T-60 performs handsomely on 6 meters as well as on the 80- to 10-meter bands.

Packing a lot of parts in its 5" x 12" x 7" cabinet, the Knight-Kit T-60 has a neat and uncluttered chassis. Output meter in antenna circuit indicates relative r.f. output.





The following satellites, launched by the United States and the Soviet Union, were reported to have beacon and telemetry transmissions as of July 10, 1962. The satellites are listed by their code names, according to frequency; because some transmit on more than one frequency, they appear more than once.

Explorer VII*	19.990 mc.
Cosmos II (Sputnik XII)	20.005 mc.
Discoverer XXXVI	20.005 mc.
Cosmos V (Sputnik XV)	20.008 mc.
Transit IVB	54.000 mc.
Cosmos II (Sputnik XII)	90.011 mc.
Courier IB	107.970 mc.
TIROS I	107.997 mc.
TIROS III	108.000 mc.
Vanguard I*	108.022 mc.
TIROS III	108.030 mc.
Telstar	136.050 mc.
Transit IVA	136.200 mc.
TIROS IV	136.230 mc.
TIROS V	136.235 mc.
Ariel	136.410 mc.
Injun SR-3	136.500 mc.
OSO I	136.744 mc.
Transit IVB	136.800 mc.
TIROS IV	136.920 mc.
TIROS V	136.922 mc.
Transit IIA	161.990 mc.
Transit IIA	215.990 mc.

*Signal may be very weak

At least six more satellites are in orbit and known to be transmitting. However, these are so-called "secret" satellites launched by the U.S. Air Force.

If you're interested in eavesdropping on satellites, and missed our June 1962 article on the NASA-136 converter, we recommend that you look it up. Easy to construct, this sensitive converter can intercept the satellites operating in the 136-137 mc. band.

(Continued from preceding page)

volume control in the "Messenger" quiets the receiver output during periods when the unit is being used for p.a. work.

As you may already know, switching over from receive to transmit in the "Messenger" disconnects the speaker in the unit and grounds the cathode circuits of tubes V7 and V8 (the crystal oscillator and r.f. power amplifier, respectively). Therefore, to add the p.a. provision, one side of the d.p.d.t switch (S1) is wired to preclude grounding the cathode circuits, and the other side is wired to connect the auxiliary speaker to the secondary of output transformer T4.

Making the Modification. First, remove the "Messenger" from its cabinet by taking out the three machine screws at the rear. Then, a hole for mounting the switch should be drilled in the bottom center of the front panel (there is plenty of room behind the panel at this point for mounting a good-sized switch without crowding).

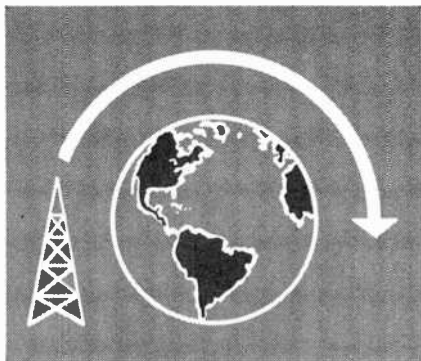
This done, locate the terminal strip near the front panel and the black wire which runs from it to the cathode circuits of tubes V7 and V8 at the rear of the set. This lead should be cut and the two ends "spliced out" so that they are long enough to reach the newly installed "p.a./normal" switch. Switch S1a should now be wired as shown.

Turning the set right side up again, the green wire running to the speaker should be cut and the ends spliced in a like manner. They should then be connected to switch S1b, and the lead to the auxiliary speaker run along the inside of the chassis and out through one of the several unused holes at the rear.

Now, hook up a speaker, and your "Messenger" is ready to operate as a CB transceiver and a mobile p.a. unit. Incidentally, while almost any speaker will work, it's best to use one of the weatherproof paging units especially designed for this kind of operation.

Note that the above modification refers specifically to the Johnson "Messenger" transceiver. There are obviously far too many CB rigs on the market to permit presenting detailed instructions for modifying all of them in this manner. However, most of them can be rewired just as easily and made to do double-duty as a mobile p.a. system.

-30-



Monthly Short-Wave Report

By **HANK BENNETT**, W2PNA/WPE2FT
Short-Wave Editor

UP-TO-DATE SCHEDULE FOR VOA PROGRAM

EVERY SUNDAY the *Voice of America* broadcasts the *VOA Amateur Radio Program* to all parts of the world at various times throughout the day. The program consists of 15 minutes devoted to the latest ham-band "gossip," interviews with radio amateurs around the globe, propagation forecasts, and discussions of the latest technical news of interest to both hams and short-wave listeners.

While we covered the operation of this program thoroughly in a previous column (December, 1961), there have been many changes in times and frequencies—and even stations—used since that date. Because of the great interest in the *VOA* broadcasts, we feel it worthwhile to bring our readers up to date on them.

To review briefly, the broadcasts are all in English and are written and voiced by Bill Leonard, W2SKE, one of

America's leading news commentators and an active ham operator. Gene Kern, W2BAK, produces the show; and the propagation forecasts are given by Bill Dulin, W4ETT, and George Jacobs, W3ASK. Amateurs and SWL's everywhere are invited to participate.

Generally speaking, the target areas are as follows: Europe, Africa, and the Middle East at 0230-0245; Far East and Oceania at 0245-0300; Oceania, East and Southeast Asia at 0345-0400; Europe, Middle East, and Central and West Africa at 1730-1745; and Latin America at 2230-2245. We will not indicate the exact target areas for each transmitter in the schedule listing since the large majority of our readers are in North America and should have little difficulty in picking up the program. All of the times given are Eastern Standard.

Here, then, is the complete current

Equipment in the listening post of Luis R. Mateo, WPE2FJQ, includes a National NC-190 shown on top of a Hallicrafters S-77 receiver. A retired ship operator—he spent some 20 years at sea, Mr. Mateo now operates out of New York City. To date he has 39 countries logged, 19 verified. His antenna is 61 feet long.



schedule of the VOA Amateur Radio Program: times when it can be heard (on Sundays only); frequencies used; and station call-signs or locations.

At 0230-0245: 6025 kc. (WLWO); 6080 kc. (Tangier); 6180 kc. (WDSI); 9545 kc. (Munich); 9720 kc. (Tangier); 9740, 9770 and 11,805 kc. (all WLWO); 11,875, 15,270, and 15,380 kc. (all Tangier); and 17,780 kc. (Munich).

At 0245-0300: 5985, 6145, 9545, and 9700 kc. (all KNBH).

At 0345-0400: 6010 kc. (Okinawa); 6075 kc. (Honolulu); 7155, 7235, and 9615 kc. (all Okinawa); 9650 kc. (Honolulu); 11,785, 11,895, 15,210, 15,250, and 15,335 kc. (all Philippines).

At 1730-1745: 1259 kc. (Courier); 3980 and 5975 kc. (both Munich); 6015 kc. (Courier); 6185 and 7205 kc. (Thessaloniki); 7130 kc. (Courier); 9530, 11,770, 15,170, and 15,225 kc. (all Munich); and 17,710 and 21,610 kc. (both WLWO).

At 2230-2245: 9650 kc. (WLWO); 9750, 11,955, and 15,325 kc. (all WBOU); 15,270 kc. (WDSI); and 15,405 kc. (WLWO).

The VOA has a distinctive QSL card which program listeners can obtain by forwarding their QSL cards and/or reports to either of two addresses: Bill Leonard, P. O. Box 29, Geneva 12, Switzerland; or Amateur Radio, Box 922, Washington 4, D.C.

Station TGQB. A recent feature of this column was a list of short-wave stations in Guatemala. In our June issue, one of them, TGQB, *R. Nacional*, Quezaltenango, 11,700 kc., was described as "Not heard at present; last noted, Spring, 1961."

This comment was based on information supplied us by a POP'tronics monitor in Guatemala City and "documented" by a glaring absence of any other reports on the station. Since the June issue was published, however, many DX'ers have written in to tell us that it is being heard.

Station TGQB is indeed back on the air, but on a very irregular schedule, and judging from the signal, with a low-powered transmitter. Recent reports indicate that it is on around 1230-1400 and 1515-1615 some days with frequent ID's and all-Spanish programming.

(Continued on page 109)

SHORT-WAVE MONITOR CERTIFICATE APPLICATION

To become a Short-Wave Monitor registered with POPULAR ELECTRONICS, just follow these simple directions:

1 Fill out the form below. (You must be a short-wave listener presently active in the hobby to be eligible for a Short-Wave Certificate.)

2 Send us 10 cents in coin to cover the cost of the certificate as well as the handling and registration

costs. If you live outside the United States and cannot obtain U.S. coins, send either 15 cents in Canadian currency or two International Reply Coupons (IRC's).

3 Insert the application form, coins (or IRC's) and a stamped, self-addressed envelope in another envelope and mail it to:

Monitor Registration, POPULAR ELECTRONICS
One Park Avenue, New York 16, N. Y.

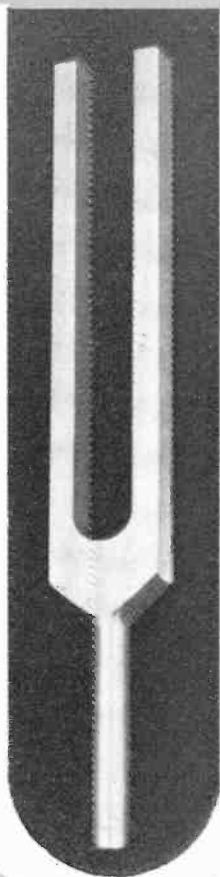
(Please Print)				Ham Call-Area Prefix
Name			
Address		City	Zone	State
.....	
Receivers	Make	Model		
.....		
	Make	Model		
.....		
Principal SW Bands Monitored	Number of QSL Cards Received		
.....	
Type of Antenna Used			
.....			
Signature			Date	
.....			

The 440 Fork

*Two-transistor
tuning fork oscillator
makes an ideal
frequency standard*

By
FRED IPPOLITO
and
PAT BROCATO

Sylvania Electronic
Systems-Central
Sylvania Electric Products Inc.



AS you no doubt know, a tuning fork is a steel instrument designed to produce a pure musical tone of a definite pitch. But while it's a familiar object in piano tuners' tool kits, the tuning fork is seldom used to full advantage by electronics experimenters and hobbyists.

Usually, a tuning fork is set into vibration by striking it with a mallet; then, its stem can be rested against a sounding box or musical instrument to amplify its output. The disadvantage of this method, of course, is that you have to strike the tuning fork repeatedly in order to keep it going. Furthermore, there's no ready way of coupling its output into electronic circuits.

The tuning fork oscillator pictured on the following pages has no such shortcomings. It vibrates continuously and is therefore much more useful as a tone source or a frequency standard. Its design not only takes advantage of the well-known frequency stability and accuracy of a tuning fork, but it also incorporates provisions for feeding the signal into a variety of equipment. Finally, the little "440 Fork" is relatively in-

expensive to put together.

Since the oscillator is intended primarily for tuning musical instruments, it is built around a 440-cycle tuning fork (this frequency corresponds to the "A" above middle "C" on the musical scale). But don't think the unit is limited to tuning musical instruments—it can also be used to calibrate audio oscillators, serve as a master oscillator

for frequency divider or multiplier circuits, and so on.

About the Circuit. Transistor *Q1* is connected as a conventional common-emitter amplifier and functions as an audio oscillator; transistor *Q2*, also a common-emitter amplifier, serves as a buffer and amplifier stage. Coils *L1* and *L2* are the coil-and-magnet assemblies removed from a pair of 2000-ohm earphones; they act as "driver" and "pickup" coils, respectively.

When the circuit is first turned on, current flows through coil *L1*, which exerts a pull on the tuning fork, tending to set it in motion. Any movement of the fork will affect the magnetic field around coil *L2*, which, you'll notice, is coupled back into the base of transistor *Q1* through capacitor *C1*. The varying magnetic field around *L2*

THE 440



results in a small output from the coil, which is amplified by *Q1* and again transmitted to the tuning fork through *L1*. This process continues to repeat itself, with the tuning fork vibrating at its natural frequency.

Since *Q1* is substantially overdriven, the waveshape at its collector is distorted. However, it was found desirable to overdrive *Q1* in order to obtain maximum signal through *L1*—this tends to set the tuning fork in motion much more quickly when the circuit is first turned

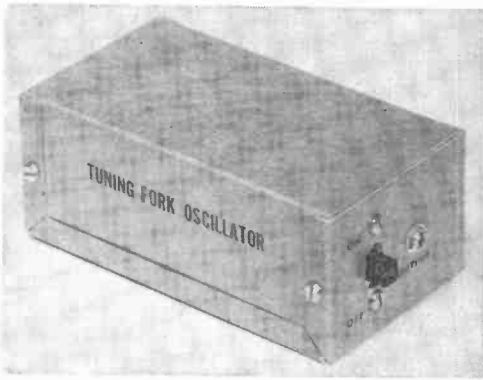
on, and it also reduces the unit's sensitivity to shock and vibration.

Capacitor *C2* couples the 440-cycle signal picked up by *L2* into *Q2*. Due to the close proximity of *L1* and *L2*, a certain amount of unwanted coupling exists. As a result, the input waveshape to *Q2* is also somewhat distorted.

To correct this situation and deliver a sine-wave signal at the output of *Q2*, emitter resistor *R6* was not bypassed and capacitor *C3* was shunted across the output of *Q2*. This arrangement reduces *Q2*'s gain quite a bit, but *Q2* was inserted primarily for isolation and waveshaping.

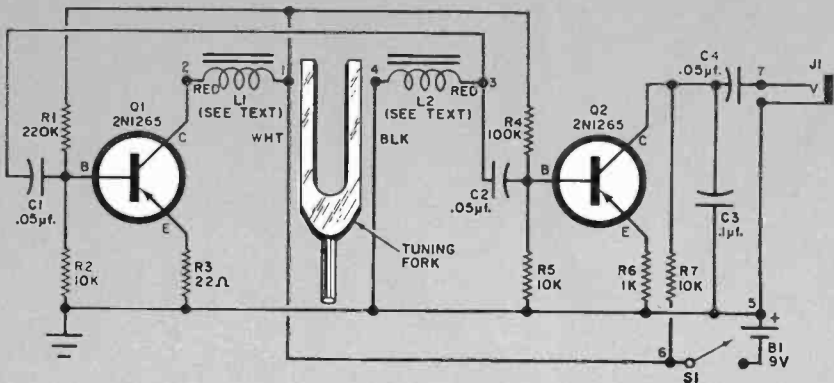
Construction Tips. As mentioned earlier, coils *L1* and *L2* are removed from a pair of 2000-ohm earphones.* To modify the earphone set, first unscrew the ear caps and remove the diaphragms. Next, unscrew the magnet and coil assemblies from their holders and remove them from the headset. Save the screws and nuts, since they'll come in handy for

Completed tuning fork oscillator is self-contained and has but one control—a s.p.s.t. on/off switch.



*The earphones used by the authors were purchased from Olson Electronics Inc., 260 S. Forge St., Akron 8, Ohio. These earphones (Cat. No. PH-6) are no longer available, but another earphone set, The Calrad RH-40 (Olson Cat. No. PH-10) can be used instead (\$1.95 plus postage). The latter phones, which have an impedance of 4000 ohms, contain a double-magnet coil and will require the use of two mounting brackets per coil.

Circuit of oscillator relies on interaction between coils *L1* and *L2* and tuning fork for its of Vectorbord; numbered points on schematic (left) correspond to those on pictorial (right)



Coils and fork are supported by "L" brackets. Placement of other parts isn't critical, but author also mounted Vectorbord on brackets.

mounting the coils to their brackets.

The three brackets which hold the coils and the tuning fork can be made from 1/8"-thick aluminum strips bent to form an "L"; naturally, the dimensions of the brackets will depend on the particular earphones and tuning fork you have selected for use in the devise.

Mount the tuning fork on its bracket as rigidly as possible. If desired, a small metal strip can be bent around the tuning fork base, much like a cable clamp, to facilitate attaching it to the bracket.

When mounting the coil brackets to the chassis, be sure to make some provision for adjusting the position of the coils relative to the tuning fork; the easiest way to do this is to drill out slots rather than holes. Position the coils near the tips of the tuning fork and as close to the fork as possible without allowing the magnets to actually touch it.

None of the circuit wiring is critical except for connecting up the leads to coils L1 and L2; phasing is important here to obtain oscillation. The schematic

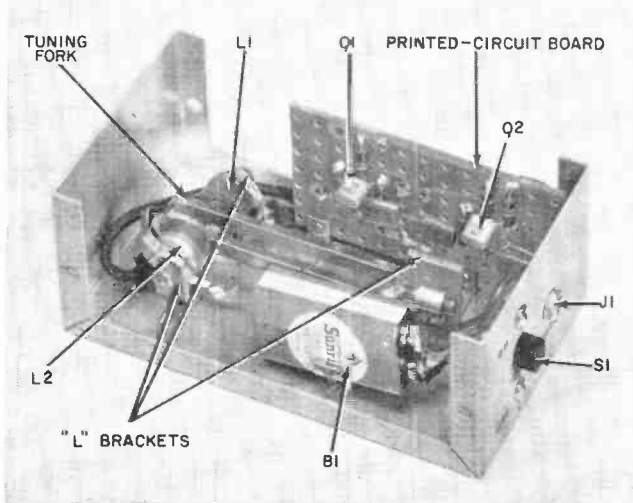
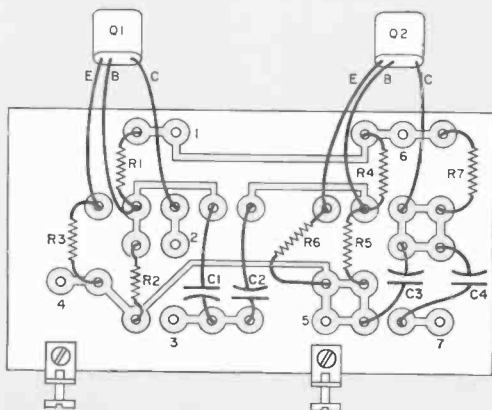


diagram indicates the color coding and hookup for the coils used in the author's unit.

Operation. Once the oscillator has been assembled, it's a simple matter to put it in operation. A high-impedance earphone (1000 or 2000 ohms) should be connected to the output jack for monitoring the output signal while making final adjustments. Alternatively, you can feed the output into an oscilloscope or into an audio amplifier and speaker.

Switch the unit on and tap the tuning fork lightly with your finger or a pencil. You should hear a 440-cycle signal,
(Continued on page 107)

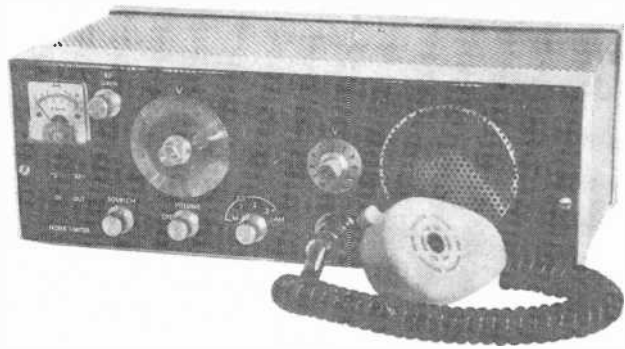
operation. Many components are mounted on piece and show where coils and battery should be wired in.



PARTS LIST

- B1—9-volt battery (Burgess 2U6 or equivalent)
 - C1, C2, C4—0.05- μ f., 75-volt ceramic capacitor
 - C3—0.1- μ f., 75-volt ceramic capacitor
 - J1—Open-circuit phone jack, miniature type
 - L1, L2—Coil and magnet assembly removed from earphone—see text
 - Q1, Q2—2N1265 transistor (Sylvania)
 - R1—220,000 ohms
 - R2, R5—10,000 ohms
 - R3—22 ohms
 - R4—100,000 ohms
 - R6—1000 ohms
- } All resistors
1/2 watt, 10%
- S1—S.p.s.t. slide switch
 - 1—440-cycle tuning fork
 - 1—5 1/4" x 3" x 2 1/8" aluminum utility box, gray hammerstone finish (Bud CU-2106-A or equivalent)
 - Misc.—Mounting brackets for tuning fork, L1, and L2; battery holder; 1 3/4" x 3 3/8" section of Vectorbord; wire, solder, hardware, etc.

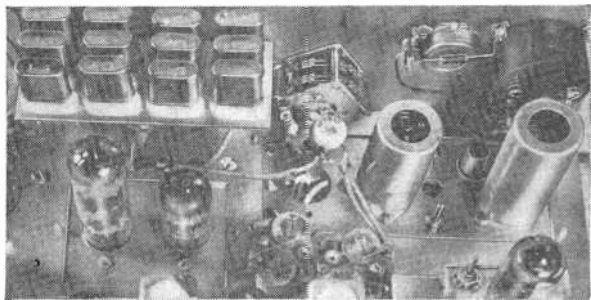
Equipment Report



Courier 1 has many extras



R.f. meter which doubles as S-meter is useful in loading down your antenna for maximum power output; r.f. gain control prevents overloading by strong signals.



Twelve transmit crystals (top, left) and transmit selector switch permit rapid channel switching. Shielded tubes, with Nuvistors between them, are set's r.f. amplifier and first two converters.

IF you're looking for a CB set that's rated tops for both mobile and base station use, you will soon learn that few of the many models on the market can fill the bill. One set in this select group is the "Courier 1." Priced to sell at \$189.50, this transceiver is a product of E.C.I. Electronics Communications, Inc. (325 N. Macquesten Parkway, Mount Vernon, N.Y.). Considering all the features the Courier 1 packs in, it's surprising that the all-chrome cabinet can be tucked neatly away under the dash of your car—even if it's a "compact."

The transmitter half of the transceiver is limited only by FCC regulations, and the input to the final r.f. stage was measured by the POP'tronics staff at a full CB gallon. More important, 100% modulation was obtained with 3.2 watts delivered to the antenna. That's equivalent to batting 400 in the Majors.

It is the receiver half of the Courier 1 that is chock full of features suitable for

just about any and all CB applications and situations. Utilizing triple-conversion with i.f.'s at 10.4 mc., 1505 kc., and 262 kc., and with a front end consisting of a EF183/6EH7 r.f. amplifier and 6CW4 Nuvistor first converter, receiver sensitivity is below .25 μ v. Superhet converter noise is at a new design low, and adjacent channel rejection is better than 70 db down. In other words, you just don't hear the other guy on channel 14 when you are tuned to a weak signal on 15. Noise on the CB channels can be minimized, if not eliminated, by a super-acting squelch control plus a noise limiter which knocks off the peaks of those nerve-shattering noise bursts.

Besides manual tuning for all 23 channels, the Courier 1 has four fixed-tuned receive channels, which are considered vital for rapid-switching multi-channel communications. The main tuning dial is used as a vernier during fixed-tuned reception to pull in those off-frequency stations.

-30-

COMPUTERS CAN THINK



By HAROLD ARNOLD

An introduction to logic circuits and how they work

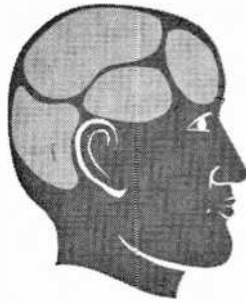
CAN a computer really think? The answer to that question hinges on how we define the thinking process. If we agree that thinking is following a series of programmed steps which are logically related and which lead to a solution of a problem, then our answer must be "yes"—in this sense, a computer definitely can "think." However, if we define thinking as a creative process in which ideas are conceived, then a computer does not "think."

In other words, a computer must be "programmed" to perform each step in

the solution of a problem, and it can only do what its operator or programmer tells it to do. Even so, the ability of a computer is certainly nothing to sneeze at. Although we may not know the solution to a problem, we can decide what logical steps should be taken to reach the solution. And if we program a computer to perform these logical steps, it will do the necessary "thinking" and "crank out" the answer for us.

Logic. To understand how a computer can "think," we must first resort to a very simple example in logic and then

COMPUTERS CAN THINK



convert our "thinking process" into electrical "hardware" that can do the thinking for us.

As an example of logical operation, let's consider the following series of statements:

- A—If I press the button
and
- B—If the batteries are good
then
- C—The flashlight will light.

Here we have three statements which combine in a "logical" way to produce a conclusion that is "true." Let us discount the trivial possibilities involved, such as either a defective button or lamp, or other abnormal conditions, and keep the discussion limited to these three simple statements.

You can quickly see that the three statements are related in such a way that the last one is a *valid conclusion* for the information given in the first two statements. To put it another way, if the first two statements are true, then the third statement *must* be true. On the other hand, neither the first nor second statement alone can lead to the third statement or logical conclusion.

To make the facts in the previous paragraph clearer, let's restate the three statements in the following form:

- A—*If it is true that*
I press the button
AND
- B—*If it is true that*
The batteries are good
THEN
- C—*It will be true that*
The flashlight will light.

Now, if we ignore the content of the

three statements and look at only the relationships which exist between A, B, and C, we can state the general condition that

If A is true
AND
If B is true
THEN
C is true.

The relationships linking statements A, B, and C establish an exclusive set of conditions which is satisfied only when statements A and B are *both* true. Therefore, if one or both statements are false, then C must be false. Simply stated:

If A is false
AND
If B is true
THEN
C is false.

or:

If A is true
AND
If B is false
THEN
C is false.

or:

If A is false
AND
If B is false
THEN
C is false.

Switches and Relays. In the examples given above, it would be quite easy to convert the verbal statements to electrical signals for use in computers. Figure 1 shows two simple circuits which can receive two statements and indicate by means of a lighted lamp whether a third statement is true or false. The

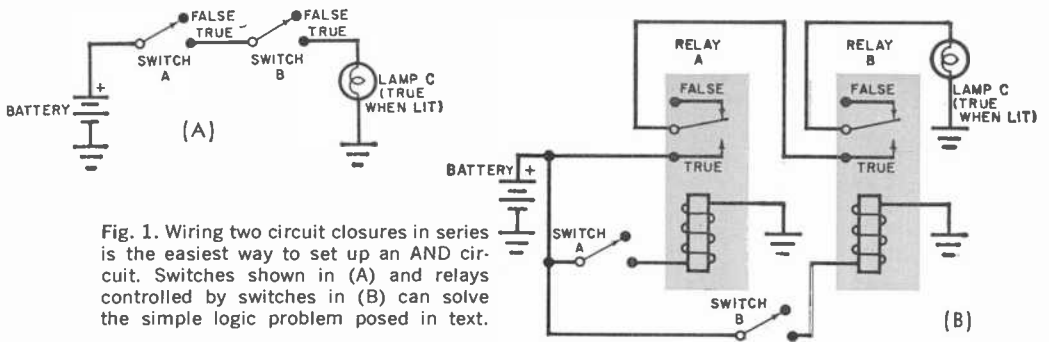


Fig. 1. Wiring two circuit closures in series is the easiest way to set up an AND circuit. Switches shown in (A) and relays controlled by switches in (B) can solve the simple logic problem posed in text.

circuit “closures” occur only for “true” statements and are accomplished by the *closing* contacts on switches in Fig. 1(A) and relays in Fig. 1(B). Actually, computers prefer faster-acting on/off switching devices such as vacuum tubes, transistors, tunnel diodes, etc. For the purpose of this article, however, switches and relays are used because they are easier to breadboard and understand while learning.

The switch-circuit shown in Fig. 1(A) can think for you when presented simple problems in logic similar to the one discussed previously. When statement A is true, switch A is closed or set to TRUE. Likewise, when statement B is true, switch B is set to TRUE. With both A and B set at TRUE, lamp C lights to indicate that conclusion C is TRUE.

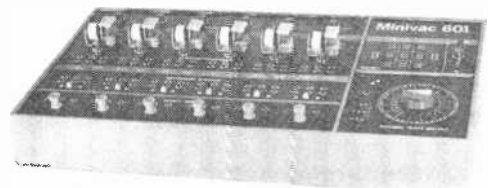
In Fig. 1(B), relays have replaced switches to do the job of lighting lamp C. The solenoids of relays A and B are energized by their respective switches, and in turn close their contacts to energize lamp C.

“AND” Circuit. Computer programmers refer to the circuits in Fig. 1 as *AND* circuits. That is, the two bits of information supplied to the switches or relays, A and B, must both be true in order for C to be true. To see how programmers say this in simple symbolic language, let's go back to the statement:

If A is true
AND
 If B is true
THEN
 C is true.

Now, let's replace *AND* with the symbol “x” and replace *THEN* with the symbol “=.” Thus, we get: $A \times B = C$, which simply means, “If A is true *AND* if B is true, *THEN* C is true.” Remember, in the language of computer programmers “x” means *AND* and “=” means *THEN*.

“NOT” Circuit. In the case of the *AND* circuit, we are concerned with things happening together. In the *NOT* circuit, however, we are dealing with something



Science Fair runner-up and potential physicist Joseph Wiesefeld (left) shows how he used a MINIVAC 601 computer (above) made by Scientific Development Corporation to program a schedule for a model railroad system.

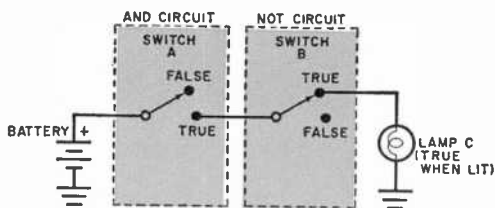
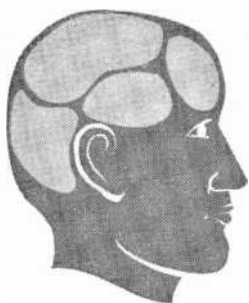


Fig. 2. Grouping of series AND and NOT logic circuits sets up a program that requires one event to occur and another not to occur for lamp C to light.

that will happen *if* something else does *not* happen. Let's return to the now familiar example concerning the switching on of a flashlight and consider the following series of statements:

A—If I press the button

AND

B—If the batteries are *NOT* dead

THEN

C—The flashlight will light.

Symbolically, the above statements can be stated as

$$A \times \overline{B} = C$$

The line over the symbol (\overline{B}) is used to express the concept *NOT* in symbolic form.

The programmed circuit representing the verbal and symbolic statements given above is shown in Fig. 2. Switch A functions as it did for the operation of the circuit in Fig. 1(A). Shown in its normal position for the beginning of a problem, switch A must be set to the TRUE position to provide a circuit closure. However, switch B functions in the circuit in the reverse of switch A. That is, since it is wired for *NOT* operation, lamp C will light only if switch A is closed and switch B is *not* "closed" or flipped from its normal position.

Mind-Reading Computer. By grouping several *AND* and *NOT* logic circuits into a computer that you can build, you may make others believe that your computer can read minds.

Say you ask a person to think of a whole number between 0 and 7 (zero being a whole number). It is possible, by then asking him three "yes-no" questions, to determine the number he is thinking of. Through a careful choice of questions all but the correct answer can

be eliminated. The questions which provide the key to the problem are:

A—Is the number greater than 3?

B—When the number is divided by 4, is the *remainder* greater than 1? (e.g., 6 divided by 4 is 1 plus a *remainder* of 2; similarly, 1 divided by 4 is zero plus a *remainder* of 1.)

C—Is the number odd?

Exactly how these three questions can find the undisclosed number is demonstrated in the flow chart in Fig. 3. This chart indicates each step in the decision process and shows the sequence which leads to the final result. To understand how the flow chart works, pick a number from 0 to 7 and follow the chart, starting from the top.

In the flow chart, the answer to question A separates the possible numbers into two groups: those greater than 3 (4, 5, 6, 7) and those not greater than 3 (0, 1, 2, 3). Then, the answer to question B separates each of these groups into pairs. Finally, question C determines which number in the appropriate pair is not excluded, or, in other words, determines the number you originally picked.

Back to Logic. Using the symbolic language of computer programmers, we obtain the following definitions:

A—The number is greater than 3

\overline{A} —The number is *not* greater than 3

B—The remainder is greater than 1

\overline{B} —The remainder is *not* greater than 1

C—The number is odd

\overline{C} —The number is *not* odd

Using these definitions, we can express as logical operations the conditions for

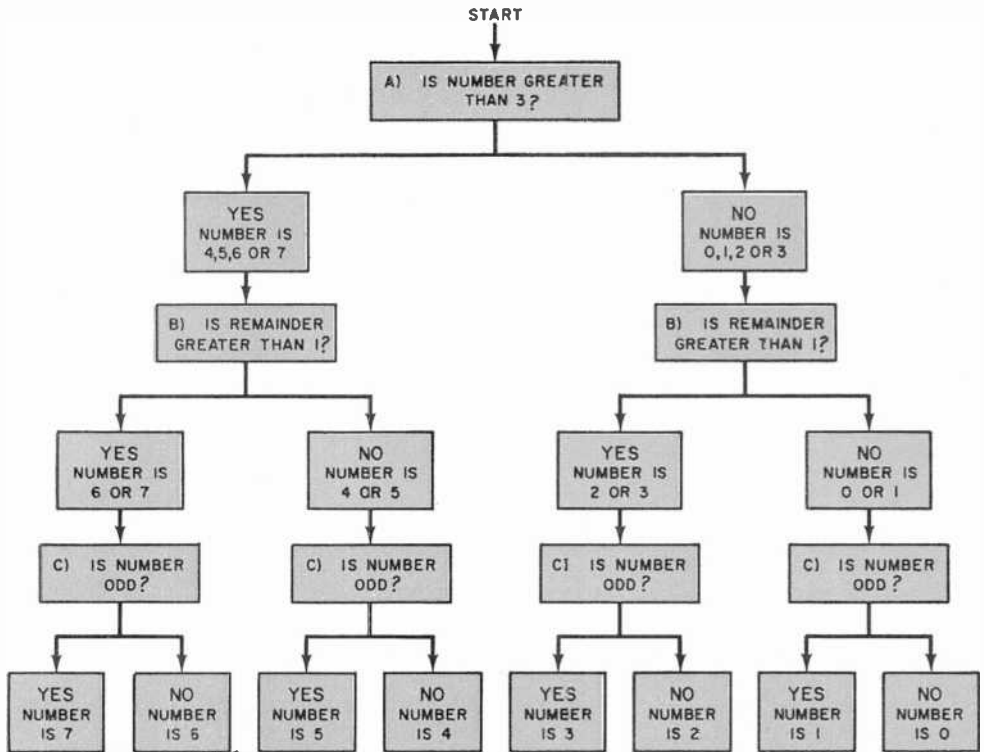


Fig. 3. Flow chart shows each step in decision process and how it leads to solution of problem.

each number of the mind-reading operation as follows:

$$\begin{aligned}
 A \times B \times C &= 7 \\
 A \times B \times \bar{C} &= 6 \\
 A \times \bar{B} \times C &= 5 \\
 A \times \bar{B} \times \bar{C} &= 4 \\
 \bar{A} \times B \times C &= 3 \\
 \bar{A} \times B \times \bar{C} &= 2 \\
 \bar{A} \times \bar{B} \times C &= 1 \\
 \bar{A} \times \bar{B} \times \bar{C} &= 0
 \end{aligned}$$

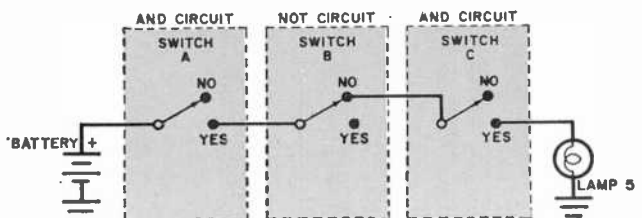
To program the "mind-reading" problem for solutions on a computer, each of the above equations is first connected into a circuit representing the equation.

Then, these circuits must be combined into one large circuit for a complete program.

The circuits for the individual equations are simply combinations of the *AND* and *NOT* circuits. For example, the circuit representation for an answer of 5 is shown in Fig. 4. In order to light lamp 5, the equation tells us to set switch A at YES, leave switch B at NO, and set switch C at YES. No other combination of switch settings will light lamp 5.

Now, by setting up eight circuits for each equation, and combining common circuit elements, the computer program-

Fig. 4. The circuit for solving $A \times B \times C = 5$ requires a series circuit consisting of two AND circuits and one NOT circuit connected across a battery and a lamp.



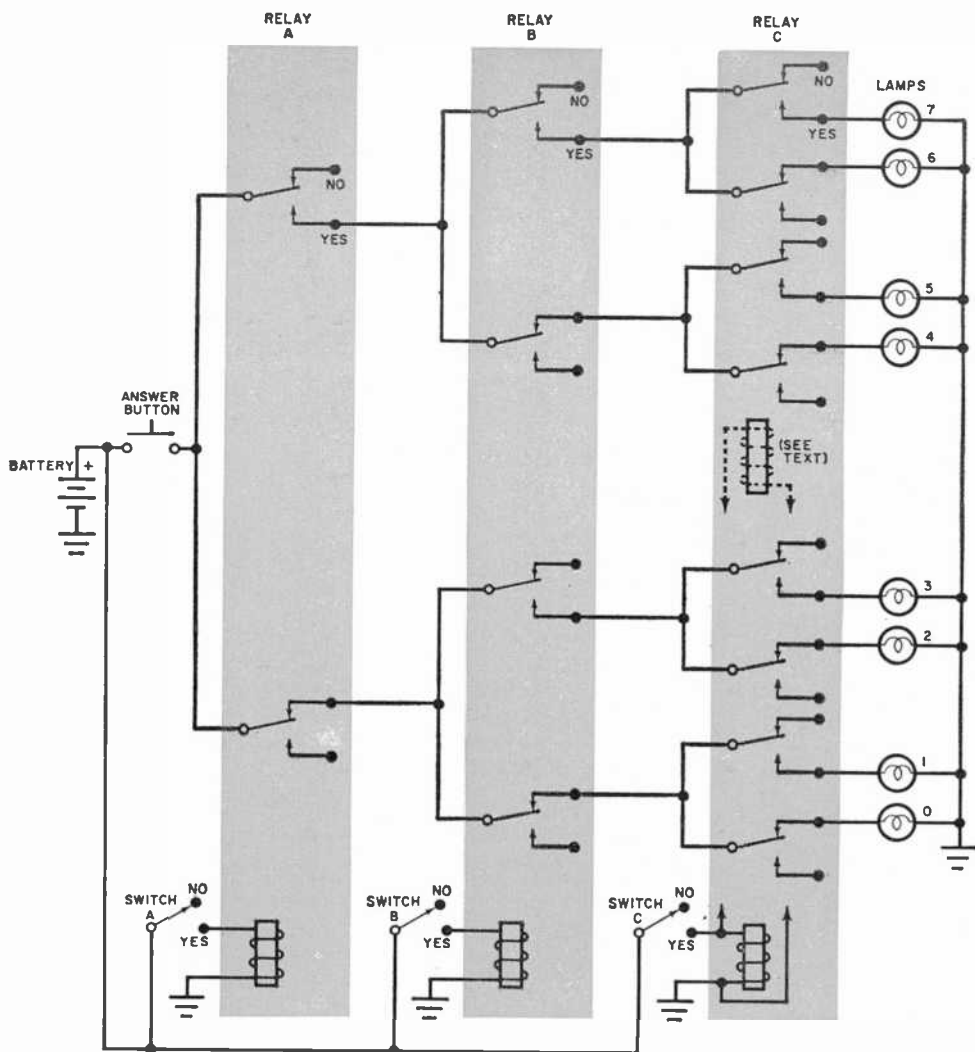


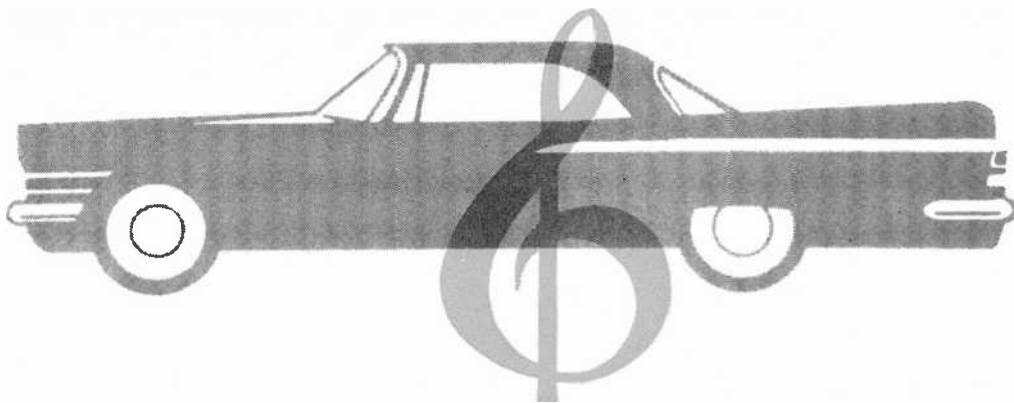
Fig. 5. The circuit for the solution of the "mind-reading" problem has the same fan-shaped appearance as the flow chart.

mer can set up the complete circuit for the solution of the "mind-reading" problem as shown in Fig. 5. Instead of switches, relays are used to make the desired circuit connection to the lamp which will reveal the correct number. Also, an ANSWER button is added to the circuit to eliminate any false answers until switches A, B, and C are set correctly to position the relay contacts.

When answer A is "yes," switch A is closed and relay A is energized. Thus, relay A, as well as relays B and C, will be energized whenever the answer to its corresponding question is "yes," and de-

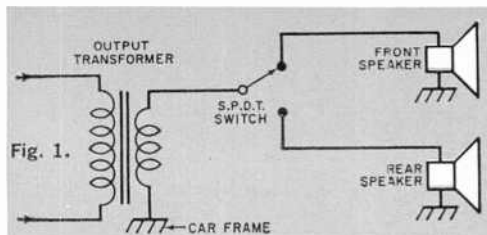
energized when the answer is "no." To become familiar with the circuit's operation, pick a number and follow the flow chart in Fig. 4 while tracing the circuit in Fig. 5. Press the ANSWER button and the battery will be connected across the lamp corresponding to the unknown number.

The circuit in Fig. 5 can be breadboarded using multi-contact relays. Relay C calls for an eight-pole double-throw (8-p.d.t.) relay—an item seldom carried by electronic parts supply houses. Instead, two four-pole double-throw (4-p.d.t.) relays can be used in parallel to simulate an 8-p.d.t. relay. (Continued on page 104)



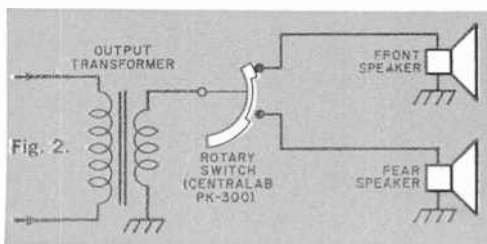
ALTHOUGH a good many automobiles sold these days come with back-seat speakers already installed, an even greater number depend on auto-radio service shops and experimenters for that additional "music maker." Are you thinking about installing such a speaker? If you are, a little background material on the different types of rear-speaker hookups is in order.

The simplest type of rear-speaker system (shown in Fig. 1) involves a s.p.d.t.



switch which allows you to activate either the front or the rear speaker—but never both. A slightly more complex arrangement (shown in Fig. 2) calls for a special three-position switch. With this system, you can still select either speaker, and you can also operate both of them simultaneously.

Both of the switch-controlled speaker

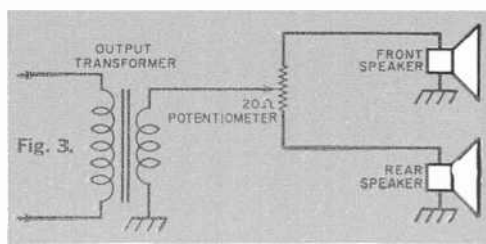


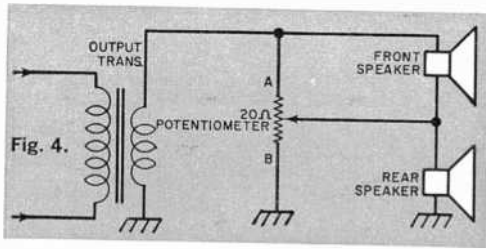
BACK-SEAT MUSIC MAKERS

*Tips on
what to look for
in rear-seat
speaker hookups*

By B. VAN SUTPHIN

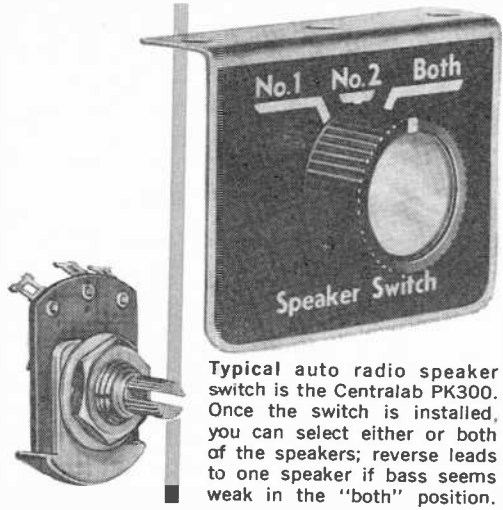
systems have one major disadvantage, however—there is no way to adjust the volume of the two speakers independently. As a result, the system shown in Fig. 3 was developed. It enables you to control the relative volume levels from each speaker, although it doesn't permit you to silence either speaker completely. In view of the latter fact, many car owners





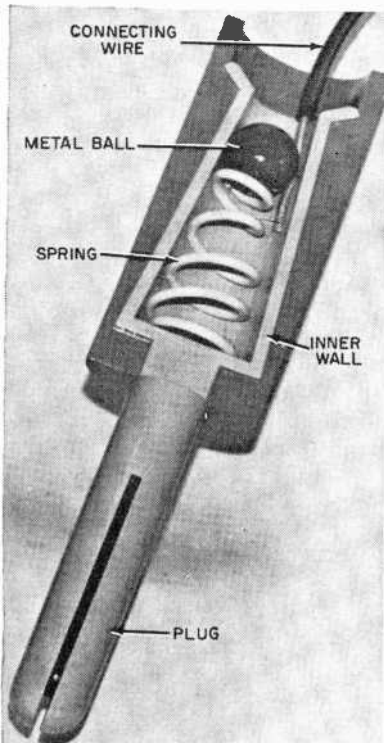
feel that even this system is still not good enough.

Figure 4 shows a circuit that can "kill" the output of either speaker and that also permits controlling the relative sound levels of both. With the potentiometer set at point A, the front speaker is shorted out, and full power is applied to the rear speaker. Similarly, with the potentiometer set at point B, the rear speaker is shorted out and power is applied only to the front speaker. Any intermediate setting feeds a portion of the output to both speakers, of course, and you can adjust the relative level of the two speakers by simply turning the knob.



Typical auto radio speaker switch is the Centralab PK300. Once the switch is installed, you can select either or both of the speakers; reverse leads to one speaker if bass seems weak in the "both" position.

Kits of parts for mounting and switching rear speakers are available at electronics parts distributors and mail order houses at reasonable prices. For best results, though, check the schematic diagram of your kit against Fig. 4 (above, left) to insure that the speaker you install will do the best possible job. —30—



Solderless Banana Plug

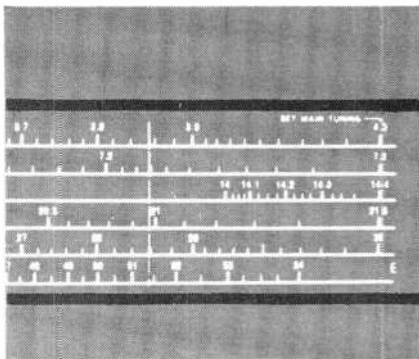
FROM the tiny principality of Liechtenstein comes an unusual banana plug for experimenters. Known as the "Kaye Text Contact" (Kaye Text Products Trust, 22 Hauptstrasse, Vaduz, Liechtenstein), it's designed for quick insertion and release of the connecting wire.

Instead of being attached via solder or screw, the wire is merely wedged in place. A spring-loaded ball riding in a conical metal casing (see photo) constitutes the wedging mechanism. Too large to escape from the mouth of the casing, the ball is tightly forced against it.

To make the connection, the wire is pushed between the ball and the inner wall of the casing, as shown. And any attempt to pull it out again will just jam it in more tightly. There are no sharp edges to cause accidental shearing and an extremely good electrical connection is made.

It's not difficult to release the wire, though—when you know how. Just insert a small screwdriver or similar tool into the top opening, retract the ball slightly, and slip the wire out.

—Hans F. Kutschbach



Across the Ham Bands

By **HERB S. BRIER**, W9EGQ
Amateur Radio Editor

"SIX AND TWO" FOR THE NEWCOMER

FOR many people, the six- and two-meter bands are the most logical ones in which to begin a ham career. Novices who want to operate on phone, for example, can do so only on two meters. Technicians are not permitted to operate below 50 mc., and so generally use "six" as well as "two." And even General Class licensees spend much time here. This month, therefore, we're going to survey some of the advantages and disadvantages of operating on the 50- and 144-mc. bands.

Range. The usual objection to VHF bands such as "six and two" is the limited range. Under present propagation conditions, the average distance covered per contact is under 100 miles on six meters and under 60 miles on two meters. Yet most six-meter operators work 20 to 30 states a year, and many of them have worked 48 states or more.

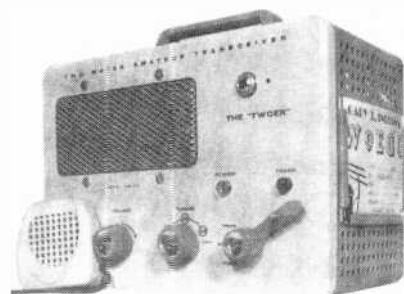
These records are made by taking advantage of the sudden, unpredictable changes in the VHF propagation conditions which often occur. Sometimes stations up to 1200 miles away can be heard and worked on six meters for periods ranging from a few minutes to many hours. Similarly, on two meters, the normal range is frequently increased up to ten times.

Economy. Commercially built equipment for the six- and two-meter bands, as you'll soon see, is available for very little money. Literally thousands of hams are successfully operating 5-watt transceivers purchased for less than \$50.00. Used with a good antenna, such rigs allow you to work the "locals" with little trouble and even provide an occasional DX contact.

Speaking of antennas, it's possible to

install efficient ones for six and two in locations which could not accommodate the larger low-frequency units. A half-wave antenna for two meters measures only about 39"—for six meters, about 112". And being small, these VHF antennas are inexpensive to build or buy.

Equipment. Among the commercially available equipment in the under \$50 class are the "Sixer" and "Twoer" transceivers offered by the Heath Company (Benton Harbor, Mich.) in kit form. These units each feature a 5-watt, crys-



Priced at only \$44.95, the Heath "Twoer" transceiver kit is a complete, inexpensive, 2-meter station.

Lafayette HE-35 AWX 6-meter transceiver boasts a superheterodyne receiver, is not a kit. Price, \$57.50.





**NEW ARRL
PRESIDENT**

Herbert Hoover, Jr., son of the former U.S. President, has been elected President of the American Radio Relay League—the well-known society of U.S. and Canadian hams founded by Hiram Percy Maxim in 1914. Mr. Hoover has been interested in ham radio since 1915, and holds the call letters W6ZH. He served as Undersecretary of State from 1954 to 1957 and is now a consulting engineer with offices in Los Angeles.

tal-controlled transmitter, a superregenerative receiver, and a built-in power supply. Connected to a simple antenna in an average location, their range is 5 to 10 miles; a beam antenna can increase this distance two to four times. The actual price is \$44.95 for either

the six- or the two-meter model—including microphone, but less transmitting crystals.

For a bit more money, you can pick up a transceiver with a superheterodyne, rather than a superregenerative, receiver. And the superhet's greater selectivity is a big help when the band is crowded. Two factory-wired, six-meter transceivers with superheterodyne receivers are the "Lincoln," from Allied Radio (100 N. Western Ave., Chicago 80, Ill.), and the HE-35 AWX by Lafayette Radio (111 Jericho Turnpike, Syosset, L. I., N. Y.). Both units have a 7-watt, crystal-controlled transmitter and built-in power supply, and both sell for \$57.50—complete with mike and crystal.

Still more sophisticated VHF transceivers are available from Gonset (801 S. Main St., Burbank, Calif.), manufacturer of the well-known "Communicators." And such companies as Heath, Lafayette, Allied, etc., also put out transceivers at prices up to well over \$300.00.

If you happen to possess a good low-frequency ham receiver, a different approach to six- or two-meter operation is to add a VHF converter to your receiver and obtain a separate VHF transmitter. Converter prices start at around \$35.00 and transmitters start at about \$75.00.

Converting FM Units. In many areas, there are six- and two-meter ham nets using second-hand, commercial FM equipment such as is employed by police

Novice Station of the Month

Vern Cherwinski, WN8DFG, 1597 W. Stroop Rd., Dayton 39, Ohio, sent in this month's prize-winning photograph. Vern "played" with hi-fi equipment and other electronic gear for years before becoming a ham and now wishes that he had discovered amateur radio sooner. Operating on 40 meters, he uses a Knight T-60 transmitter and a Hallicrafters S-53A receiver. Being the manager of a photo-supply store makes it easy for him to turn out his own photographic QSL cards.

Vern will receive a one-year subscription to P.E. for his photo. If you would like to try for a similar award, send us a picture of your station—preferably showing you at the controls, and include with your entry some information about yourself, your equipment and your activities. You may be one of the lucky winners. Non-prize-winning photos will also be published as space permits. Entries should be sent to Herb S. Brier, Amateur Radio Editor, POPULAR ELECTRONICS, P.O. Box 678, Gary, Indiana.



departments, taxi companies, etc. While the extreme range of an FM signal is not quite as great as that of an AM signal, the converted FM equipment provides reliable, noise-free communications over distances of 20 to 30 miles.

For more information on this subject, we recommend a brand-new book: "Wide-Band FM for the Amateur" by James Aagaard, K9OJV, and John L. DuBois, K96HQ. It's available at \$1.75 from James Aagaard, % Northwestern University Electrical Engineering Department, 2145 Sheridan Rd., Evanston, Ill., and tells exactly how to convert old Motorola VHF FM equipment to ham use. It also gives many tips on converting similar equipment made by various other manufacturers.

SIMPLE TVI FILTERS

If your transmitter interferes with a nearby TV receiver every time you go on the air, one of the simple TVI filters described below should help take you out of the public eye. The high-pass filter will cope with interfering signals in the 10-meter band and below, while a quarter-wave stub should take care of 6- and 2-meter interference.

High-Pass Filter. The filter shown in the schematic diagram is designed to be installed in the feed line of a TV receiving antenna. It will pass TV signals but attenuate signals below 30 mc. at least 20 db.

The filter components are supported by an "L"-shaped bracket which also provides shielding between coils *L1* and *L2* (see photo). This bracket is formed from a 1½" x 2½" piece of stock aluminum, but the dimensions are not critical. Two 2-lead terminal strips, one located

on each side of the bracket, are mounted with a single screw. And a ½" hole drilled near the terminal strips passes the leads from capacitors *C1* and *C2*.

To prepare coils *L1* and *L2*, measure off two 25" lengths of #18 enameled wire. Remove approximately ¼" of enamel insulation from the center of one length and solder on a short piece of #28 or #30 wire to serve as a center tap for *L2*.

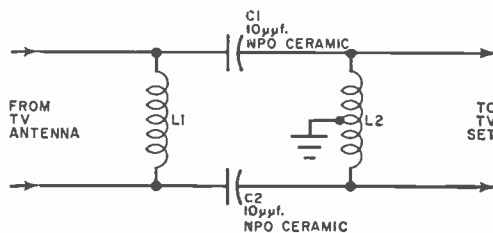
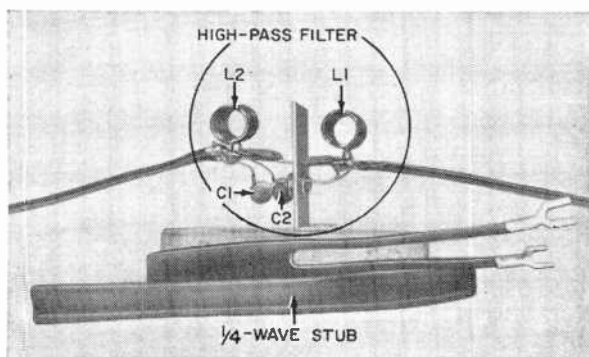
From each of the 25" lengths of wire, make a 20-turn, close-wound coil. Use a ⅜"-diameter drill shank, or any convenient rod having similar dimensions, as a form. Leave a ¾" lead at each end of each coil; before trimming *L2*'s leads, however, accurately position its center tap by winding or unwinding a fraction of a turn at the ends.

Mount each coil on a terminal strip, grounding *L2*'s center tap to the bracket and connecting *C1* and *C2* as shown on the schematic. Wire in a short length of 300-ohm twin-lead to serve as the filter's output connection.

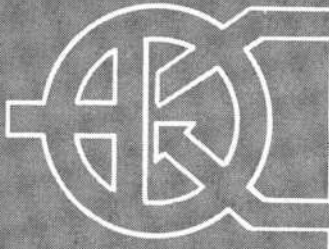
To install the filter, mount the bracket directly on the chassis of the TV set being interfered with (as close to the tuner section as possible). Disconnect the antenna lead-in at a point close to the tuner and wire it across *L1*. The filter output lead should now be wired to the tuner in place of the disconnected lead-in.

Quarter-Wave Stubs. Interference from 6- or 2-meter signals can often be reduced by connecting a quarter-wave stub (at the interfering frequency) of 300-ohm twin-lead across the antenna terminals of the TV set. The normal connections from the TV antenna are, of course, left undisturbed.

(Continued on page 113)



Quarter-wave stub and high-pass filter pictured at left are two simple devices for fighting TVI. Stub eliminates 6- and 2-meter interference, filter is designed for 10 meters and below. Circuit of filter couldn't be simpler, as shown in schematic above.



Transistor Topics

By **LOU GARNER**, Semiconductor Editor

AS YOU CAN well imagine, the editors of POPULAR ELECTRONICS—including yours truly—receive a goodly number of requests for “made-to-order” transistorized circuits. It’s impossible for us to comply with such requests, however, since we don’t have the facilities to do so. But there *are* numerous sources of diagrams for special transistor projects open to serious experimenters and hobbyists. And a little time spent checking these sources can be quite rewarding. You may not only uncover the particular project you’re looking for, but you’re likely to run across a number of other interesting projects as well.

Two primary sources, of course, are back issues of POPULAR ELECTRONICS and its sister publication, ELECTRONICS WORLD. Back issues are on file at many public libraries, or you can order individual issues from our Circulation Department in Chicago.* A useful “tip”: instead of “wading through” every back issue, try checking the “Volume Index” issues of the magazines; as far as POP’tronic is concerned, these are the June and December issues.

Other important sources of special circuits are standard books, such as Coyne’s *Transistor Circuit Handbook*, Gernsback’s *Transistor Circuits*, McGraw-Hill’s *Modern Transistor Circuits*, and Sams’ *Transistor Circuit Manual*.

In addition, many semiconductor manufacturers—such as General Electric, International Rectifier, RCA, Raytheon, and Sylvania—issue booklets of practical circuits featuring their products. Quite often, these booklets include construction hints as well as circuit diagrams and

detailed parts lists. They are generally available through local and mail-order parts distributors at prices ranging from 25 cents to \$2.00.

Most manufacturers also publish extensive “application notes” describing tested and proven circuits. As a general rule, these “notes” are furnished on a “no charge” basis, but they must be requested individually in writing. Many companies will furnish lists of currently available publications to interested individuals or firms.

Application Notes. Abstracted from an “application note” issued by Honeywell Semiconductor Products (2753 Fourth Ave. S., Minneapolis 8, Minn.), the circuit diagram in Fig. 1 shows a 5-watt audio amplifier. (This circuit is typical

C1, C2—100- μ f., 25-w.v.d.c. electrolytic capacitor

C3—500- μ f., 12-w.v.d.c. electrolytic capacitor (or two 250- μ f. units in parallel)

C4—4000- μ f., 25-w.v.d.c. electrolytic capacitor

C5—3000- μ f., 15-w.v.d.c. electrolytic capacitor (or three 1000- μ f. units in parallel)

D1—1N1227 diode

D2, D3, D4, D5—1N1217 diode

F1—1-amp. fuse

F2—3-amp. fuse

J1—Input jack

L1—Auto transformer (Audio Development Co. A11649—available from ADC Products, 6405 Cambridge St., Minneapolis 26, Minn., for \$45.40, plus postage)

Q1, Q3—2N1502 transistor (Honeywell)

Q2—G1C3 transistor (Honeywell)

R1—3900-ohm, $\frac{1}{2}$ -watt resistor

R2—330-ohm, 1-watt resistor

R3—4.7-ohm, 1-watt resistor

R4—270-ohm, 2-watt resistor

R5, R12—120-ohm, 2-watt resistor

R6, R9—47-ohm, $\frac{1}{2}$ -watt resistor

R7—1000-ohm potentiometer

R8—150-ohm, $\frac{1}{2}$ -watt resistor

R10—220-ohm, $\frac{1}{2}$ -watt resistor

R11— $\frac{1}{2}$ -ohm, 10-watt resistor

R13—1000-ohm, $\frac{1}{2}$ -watt resistor

S1—S.p.s.t. switch

T1—Power transformer (for bridge rectifier power supply): primary, 117 volts a.c.; secondaries, 13 or 18 volts @ 900 ma. (Stancor TP-1 or equivalent)

*Address your inquiry for back issues of P.E. to: Circulation Department, POPULAR ELECTRONICS, Ziff-Davis Publishing Co., 434 S. Wabash Ave., Chicago 5, Ill., enclosing 35 cents for each copy of issues less than six months old, 40 cents for each copy of older issues.

of those found in manufacturers' literature.) The amplifier employs three *pnp* transistors—two (*Q1* and *Q2*) are in the amplifier proper, while the third (*Q3*) serves as a ripple filter in the power supply, eliminating the need for a heavy (and expensive) filter choke. In operation, *Q1* acts as a driver stage, and *Q2*, a tetrode, as a class A power amplifier. Choke, rather than transformer, output coupling is used. Designed for 117-volt a.c. operation, the amplifier has an input impedance of 300 ohms, an output impedance of 10 ohms, and a power gain of 12 db at 50,000 cycles.

In addition to the application note on the audio amplifier, Honeywell has recently issued similar "notes" on a voltage sensing switch (for battery chargers) and a mobile power supply (delivering 115-volt, 60-cycle a.c. at 200 watts from a 12-volt d.c. source).

Pacific Semiconductors, Inc. (14520 Aviation Blvd., Lawndale, Calif.) has issued application notes on: "Citizens Band Transmitters" (No. 1A); "VHF Transistor Oscillator" (No. 2A); "A Class C 100-Watt 10-Mc. Power Amplifier" (No. 6A); "A 20-Mc. 100-Watt Class C Power Amplifier" (No. 7A); "A Class C 100-Watt 3-Mc. Power Amplifier"

(No. 9A); "Transistorized Relay Drivers" (No. 1S); and "Inverter Design" (No. 3S).

Another firm, Solid State Products, Inc. (One Pinegree St., Salem, Mass.), has issued a series of eight "Design Ideas" featuring circuits for such devices as silicon-controlled switches, Trigistors, and Photran light-controlled semiconductors.

Still other firms that have issued extensive application notes in the past include: Fairchild Semiconductor Corp. (545 Whisman Rd., Mountain View, Calif.); Motorola Semiconductor Products, Inc. (5005 E. McDowell Rd., Phoenix, Ariz.); and Texas Instruments, Inc. (13500 N. Central Expressway, Dallas 22, Texas).

To obtain copies of a manufacturer's application notes, first write to the firm and request a list of currently available literature. Then write them again and ask for individual copies of specific publications. Since most firms have only a limited number of copies available, few—if any—will honor requests for "all your application notes and literature."

Reader's Circuit. A number of readers have pointed out that the "click" of an automobile's directional turn indicator

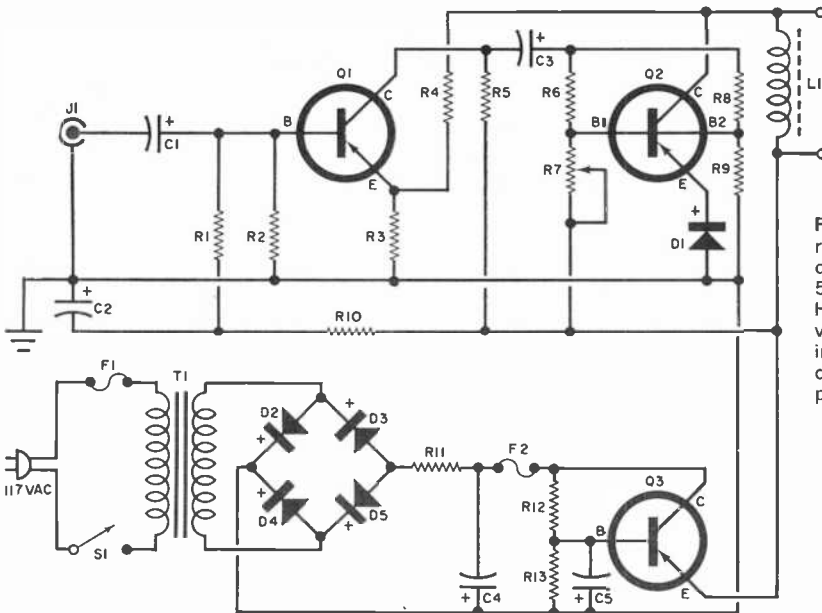


Fig. 1. A power tetrode transistor (*Q2*) delivers 5 watts at 50,000 cycles in this Honeywell circuit. Device has an input impedance of 300 ohms, an output impedance of 10 ohms.

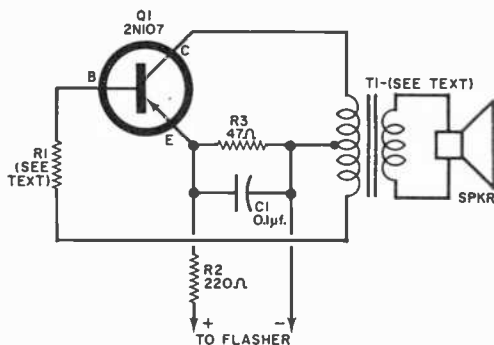
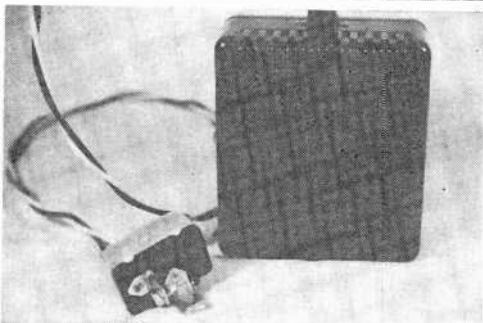
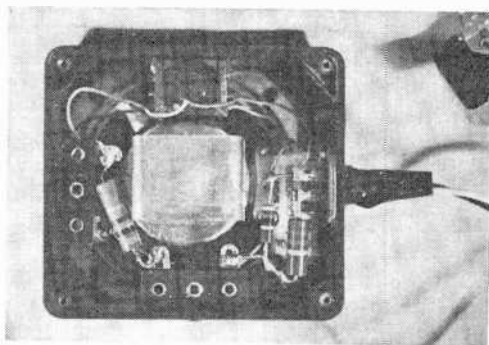


Fig. 2. A handy auto accessory, this audio "beeper" for directional turn indicators is built around a single transistor and will operate from either a 6- or 12-volt source.

Interior and exterior views of reader W. J. Fisher, Jr.'s audio "beeper" show the unit mounted in plastic speaker box.

may be inaudible against traffic noises; this is evidenced by the large number of drivers who leave their direction indicators flashing after they have completed a turn. One solution is a transistorized "beeper" which will provide an easily heard audio tone whenever the flasher is operating.

Reader W. J. Fisher, Jr. (Bernard Rd., Armonk, N. Y.) has come up with a circuit for such a device, as shown in Fig. 2. This is essentially a modified Hartley audio oscillator using a single *pnp* transistor in the common-emitter configuration to drive a small PM speaker. The components are standard and readily available through regular suppliers.

Resistors *R1* and *R3* are ½-watt units, while *R2* is rated at 1 watt. Capacitor *C1* is a 0.1- μ f., 200-volt tubular unit; transistor *Q1* is a Type 2N107 (GE). The output transformer, *T1*, has a center-tapped 500-ohm primary winding and a 3.2-ohm secondary (an Argonne Type AR-119 will do very nicely). Almost any size PM speaker can be used, although a small (2½" to 4") unit with a 3-4 ohm voice coil is preferred. The value of *R1* will fall somewhere between 500 and 1000 ohms, and should be determined

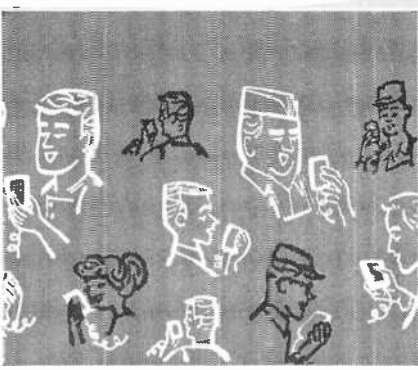
experimentally for best tone and volume when the unit is fully wired and ready for installation.

Since neither layout nor lead dress is critical, you may follow whatever assembly technique suits your fancy. It's a good idea, though, to construct the entire circuit in a small wooden, metal, or plastic box which will also serve as the speaker baffle. Some firms can supply small PM speakers with matching plastic cases; such a combination would be ideal for this project.

Once the wiring is completed, circuit operation can be checked by temporarily connecting a standard flashlight battery across *R3*, with the positive terminal to the emitter. Proper operation is indicated by a steady tone.

After check-out, install the "beeper" in your car wherever it is convenient—clamp it to the steering post, for example, or mount it below the dash. Flexible leads should be used for connecting the unit to the "pulsating line" leading to the flasher terminals, with special care being taken to observe the indicated d.c. polarity.

Transistorized Oscilloscopes. Some months ago (in February 1961, to be
(Continued on page 106)



On the Citizens Band

with **DICK STRIPPEL**, 2W1452, CB Editor

FOR THE PAST several years, hurricanes have battered the eastern and gulf coasts all too frequently during the month of September. Last year, in many locations, a number of CB clubs with emergency programs gave valuable assistance during such periods of natural disaster.

While it may be too late to whip up a good emergency CB communications setup for the hurricane season now upon us, we have been receiving enough mail on the subject to warrant a discussion of such an organization for the benefit of those clubs that have no clear-cut plans of their own. The following setup is based upon what some clubs have already done, plus various ideas "swiped" from public safety and military sources.

A base station, designated as the master control point, should supervise the entire operation. Wherever possible, this station should be in the same building as the headquarters of police, fire, Civil Defense, and other emergency agencies

which may be involved. Second best would be to have the base station tied in with these organizations by direct, secure telephone lines. In any event, the full cooperation of the public service officials must be assured.

"Master control" should consist of a transceiver plus a receiver for each of the channels which subordinate units use, as outlined below. In addition, it is wise to have the station equipped to receive all local police, fire and "ham" emergency frequencies—one receiver and one operator per frequency.

Depending upon the area involved, the "master control" would communicate either directly with a group of no more than seven mobiles, or up to four or five subordinate control points. If subordinate control units, or "area stations," are employed, they would communicate directly with mobile, temporary-fixed, and walkie-talkie units, up to about ten in number (more than ten might prove a hardship to the operators). The mo-



.....Growing Up With CB.....

Getting off to a good start is Shoreline Chapter 1 of the Citizens Band Association of Connecticut. The parent organization, C.B.A.C., grew up too quickly—it boasts about 150 active members. So, Shoreline Chapter 1, the first offshoot of the C.B.A.C., was organized, now has 35 members, and is still growing strong. In May, the Chapter's first slate of officers was elected, the club's newspaper was in its second issue, and various activities were planned—in general, the wheels of this club began to turn. One sure sign of success was the planning of meetings during the summer, a time of the year when weaker CB clubs fade away.

Club officers are: (left to right, standing) Robert C. Wilcox, 1Q3523, Secretary and Editor; Charles Palmer, 1W7911, Treasurer; Charles Collins, President of C.B.A.C.; and (seated) Nelson King, 1W8078, President of Shoreline Chapter 1. Robert A. Stevens, Sr., KBA1632, Vice President, missed the shutter session.

bile and walkie-talkie units should be assigned certain strictly designated areas, and each should cruise an area small enough so that any point in it can be reached within three minutes.

To insure strict channel discipline, each area should be on a separate channel (full duplex operation). As an example, the "master control" might receive on channel 1 and transmit on channel 3. "Area control #1" would transmit to "master control" on channel 1, receive from "master control" on 3, and transmit to mobiles on, say, channel 2, while receiving from mobiles on channel 4.

This system allows a one-channel "guard" between similar groups. Assuming that reasonably good receivers are used, it will prevent "horseplay" between like units. If your setup requires more than one area control station, you can use the same channels between it and the master control station, but add channels as required to insure that mobiles on the south side, for example, cannot communicate directly with mobiles on the north side.

Roll calls, initiated by "master control," should be held every hour. Under such a system, each "area control," after checking all of its mobiles, reports back to "master control." Both the master control and area control stations should announce the time every 15 minutes.

Mobile units should be staffed by at least two persons; one to drive the car and the other to operate the transceiver. (Let's not go whipping around town with one hand on the wheel! As a matter of fact, many localities have laws prohibiting the operation of a mobile radio while driving.) A third person in the mobile unit could assist in the actual emergency activities, leaving one person to man the transceiver at all times.

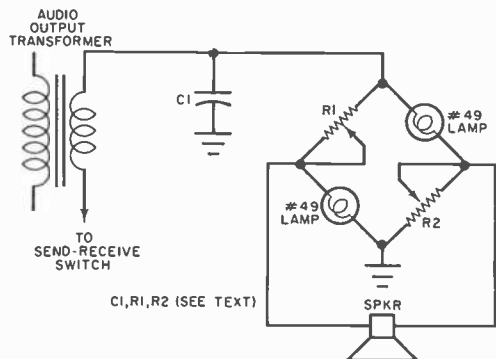
Basically, that's all there is to an effective emergency CB setup. But, that's only a small part of the story. Just how well the organization performs depends upon the amount of training each member has and what duties are assigned to him.

Tech Notes. Having trouble snaking weak signals out of the hiss and noise? Here are a couple of hints for you if your units often get out to the "fringe areas" of communication.

First, try lowering the high-frequency

response of your receiver's output. One way to do this is by connecting a capacitor across your set's loudspeaker terminals. It's the simplest way, and it won't change the frequency response of your modulator, which might lower your set's modulation figure. The value of capacitance you use will depend a lot on your own preference as to how natural you want the signal to remain. The capacitor will cut out a lot of noise because noise is made up of many high audio-frequency components. Try values of $.05\mu\text{f.}$ and greater. For a 3-4 ohm speaker, we personally prefer about $.47\mu\text{f.}$, but the receiver characteristics and even car acoustics also enter the picture.

Another "QRN-cutter" is the simple, lamp-bulb audio squelch which was popular a few years ago when everyone was using superregenerative receivers; it was described in this magazine then (November 1958 issue) and was also available commercially. Basically, the unit is a bridge circuit (see diagram) which is inserted between the output transformer and the loudspeaker of your set. Most previously published circuits of this type use #47 pilot bulbs, but we prefer #49's



because they have a shorter "off-to-on" time. When used to back up the squelch already in most superregen receivers, this circuit will follow voice at a syllabic rate, instead of the longer word or phrase "rate" which is more useful in non-squelch-equipped receivers. The net result is an effective "background hiss remover" which allows any signal louder than the hiss to come through at normal volume.

The diagram shows you how to con-
(Continued on page 104)

NOW!
at a price
you can afford!

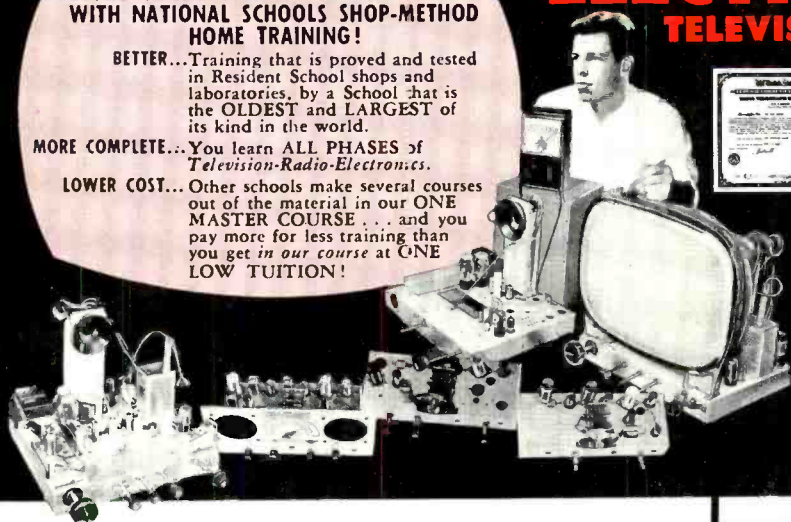
MAKE MORE MONEY in ELECTRONICS TELEVISION-RADIO

**BETTER...MORE COMPLETE...LOWER COST...
WITH NATIONAL SCHOOLS SHOP-METHOD
HOME TRAINING!**

BETTER... Training that is proved and tested in Resident School shops and laboratories, by a School that is the **OLDEST** and **LARGEST** of its kind in the world.

MORE COMPLETE... You learn **ALL PHASES** of *Television-Radio-Electronics*.

LOWER COST... Other schools make several courses out of the material in our **ONE MASTER COURSE . . .** and you pay more for less training than you get in our course at **ONE LOW TUITION!**



**Prepare
for your
F.C.C. LICENSE**

- Be prepared for secure future in
- INDUSTRIAL ELECTRONICS
 - COMPUTERS
 - GUIDED MISSILE SYSTEMS
 - ELECTRONIC CONTROLS
- or go into . . .
- COLOR TV REPAIR
 - HI-FI AND SOUND SYSTEMS
 - BROADCASTING STUDIOS
 - INSTALLATION

TOP PAY... UNLIMITED OPPORTUNITIES LIFETIME SECURITY CAN BE YOURS!

You are needed in the Television, Radio, and Electronics industry! Trained technicians are in growing demand at excellent pay—in **ALL PHASES**, including Servicing, Manufacturing, Broadcasting and Communications, Automation, Radar, Government Missile Projects.

NATIONAL SCHOOLS SHOP-METHOD HOME TRAINING, with newly added lessons and equipment, trains you in your spare time at home, for these unlimited opportunities, including many technical jobs leading to supervisory positions.

YOU LEARN BY BUILDING EQUIPMENT WITH KITS AND PARTS WE SEND YOU. Your National Schools course includes thorough Practical training—**YOU LEARN BY DOING!** We send you complete standard equipment of professional quality for building various experimental and test units. You advance step by step, perform more than 100 experiments, and you build a complete TV set from the ground up that is yours to keep! A big, new TV picture tube is included at no extra charge.

EARN AS YOU LEARN. We'll show you how. Many students pay for their course—and more, while studying.

**GET THE BENEFIT OF OUR
OVER 55 YEARS EXPERIENCE**

APPROVED FOR
GI TRAINING



ACCREDITED
MEMBER



NATIONAL TECHNICAL SCHOOLS

World-Wide Training Since 1905
Write to Dept. R2G
4000 So. Figueroa Street
Los Angeles 37, California

YOU GET...

- 19 Big Kits—**YOURS TO KEEP!**
- Friendly Instruction and Guidance
- Job Placement Service
- Unlimited Consultation
- Diploma—Recognized by Industry
- **EVERYTHING YOU NEED FOR SUCCESS!**



THESE TWO FREE BOOKS TELL HOW

SEND FOR FREE FULLY-ILLUSTRATED BOOK AND ACTUAL LESSON TODAY. Your own copy of "Your Futura In Electronics-Television-Radio" will be mailed to you at once. No salesman will call; there is no obligation. Cut out card along dotted lines, fill in and rush air-mail today! **NO POSTAGE NECESSARY.**

CUT OUT AND MAIL THIS CARD TODAY

Yes, I want to make more money in Electronics-TV-Radio. Send me your **FREE** Fully-Illustrated Opportunity Book and Actual Lesson today.

RUSH TODAY—NO POSTAGE NECESSARY



Name _____ Age _____

Address _____

City _____ Zone _____ State _____

Check here if interested only in Resident Training at Los Angeles.
Veterans: Give date of discharge _____

R2G-92

NO SALESMAN WILL CALL; NO OBLIGATION ON YOUR PART

DON'T BE HALF-TRAINED

Be a MASTER TECHNICIAN in ELECTRONICS-TV-RADIO

Only N.T.S. offers you ALL 8 PHASES in
ONE MASTER COURSE



**SUCCESS IS THEIRS;
IT CAN BE YOURS TOO!**



I cannot praise N.T.S. enough. I've just graduated and already I have started repairing radios and servicing TV's . . . At 53, I'm starting a new life and my diploma from National Technical Schools is my proudest possession.

William E. Eckenrod

As field director of Berean Mission Inc., I have complete charge of our radio work.

With the expert advice and training I am receiving from you I can do my own repairs on our recorders and P.A. systems, besides keeping our radios going. My training from N.T.S. helps keep us on the air. I feel privileged to be a member of such a fine institution.

Rev. Enoch P. Sanford



Thanks to N.T.S. I have a business of my own right in my home. I have paid for all my equipment with money earned servicing TV sets. Yes, N.T.S. gave me my start in television.

Louis A. Tabat

I have a TV-Radio shop in Yorkville, Illinois, about 4 miles from my home, and it has been going real good. I started part-time but I got so much work that I am doing it full-time. Thanks to National Technical Schools.

Alvin Spera



ALL 8 PHASES IN ONE MASTER COURSE

**PHASE 1
TELEVISION
INCLUDING COLOR TV**
90% of homes have at least one set. Color TV is becoming more popular daily. TV Stations grow in number, need technicians. Maintenance and repair offer big opportunities.

**PHASE 5
FCC LICENSE
PREPARATION**
FCC License holders have a wide range of top jobs open to them. FCC License now a requirement for most Communication jobs.

**PHASE 2
RADIO—AM & FM**
Radios in homes, cars, schools, all need expert upkeep. Stations expand as FM becomes popular. Now transistors boom entire field.

**PHASE 6
RADAR AND
MICROWAVES**
These are the communications systems of the future, already used in tracking and contacting satellites.

**PHASE 3
INDUSTRIAL
ELECTRONICS**
Computers, Data-Processing machines, Electronic Controls, Guided Missile Systems are new fields where Electronics play a vital role.

**PHASE 7
AUTOMATION
& COMPUTERS**
Automation and Computer electronics are the new tools of industry and commerce. Skilled Technicians in these fields are in great demand at top pay.

**PHASE 4
SOUND SYSTEMS**
New popularity of Hi-Fi Stereo, as well as industrial sound systems and business intercoms make this a highly specialized and important field.

**PHASE 8
BROADCASTING &
COMMUNICATIONS**
In the entertainment industry, or in commerce, communications and broadcasting have great importance. Installation and maintenance of equipment requires trained technician know-how.

SEE OTHER SIDE

FIRST CLASS

Permit No. 3087

Los Angeles, Calif.

BUSINESS REPLY MAIL

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

— POSTAGE WILL BE PAID BY —

NATIONAL TECHNICAL SCHOOLS

WORLD-WIDE TRAINING SINCE 1905

4000 So. Figueroa Street
Los Angeles 37, California

**RESIDENT TRAINING
AT LOS ANGELES**

If you wish to take your training in our famous Resident School in Los Angeles—the oldest and largest school of its kind in the world—check special box in coupon.



Approved for GI Training

NATIONAL TECHNICAL SCHOOLS

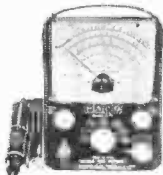
WORLD-WIDE TRAINING SINCE 1905

Address correspondence to Dept. R2G
4000 So. Figueroa Street
Los Angeles 37, California

National Technical Schools also offers Complete Home Study Training Programs in Auto Mechanics & Diesel, Air Conditioning, Refrigeration-Electrical Appliances, and Home Appliances Repair. For information and FREE BOOK write the School, Dept. RDC, stating course desired.



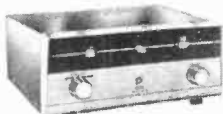
C-25. IN-CIRCUIT CAPACITOR TESTER KIT. Reveals shorted or open capacitors in the circuit, including electrolytics. Also reveals dried-out electrolytics through the Electrolytic Capacitance Dial. **Kit: \$19.95; Factory Wired, ready to operate: \$29.95.**



V-70. VACUUM TUBE VOLTMETER KIT. Uses stabilized bridge circuit to provide measurements on 7 DC and 12 AC voltage ranges, plus 7 decibel and 7 wide-spread electronic ohmmeter ranges. **Kit: \$31.95; Factory Wired, ready to operate: \$49.95.**



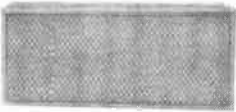
G-30. RF SIGNAL GENERATOR KIT. Highly accurate, stable. Also designed for use as a Marker Generator in sweep-alignment procedures. Eight frequency ranges: 160 kc to 240 mc. **Kit: \$32.95; Kit with Prealigned Tuner: \$39.95; Factory Wired, ready to operate: \$44.95.**



MX-100. STEREO MULTIPLEX ADAPTER KIT. All critical circuitry factory adjusted and prealigned. Maximum stereo separation between 20-15,000 cps, with low distortion. Stereo switch permits either front-panel separation control or maximum separation adjusted at factory. **Kit: \$49.95; Factory Wired, ready to operate: \$69.95.**



ST-26. FM TUNER/AMPLIFIER KIT. Low-cost combination hi-fi FM music system. Requires only the addition of external speaker (see L-3) to complete system. Pre-Built Front End fully adjusted and prealigned at factory. **Kit: \$54.95; Factory Wired, ready to operate: \$69.95.**



L-3. SPEAKER SEMI-KIT. Ultra-compact, graciously styled system. Lifelike response from high-efficiency speakers. Walnut-finished cabinet. Size: 13 1/4" L x 6 1/2" H x 7 1/4" D. **Semi-Kit: \$19.95.**

PACO KITS

THE KITS YOU BUILD IN 1/3 LESS TIME



FROM BOX...



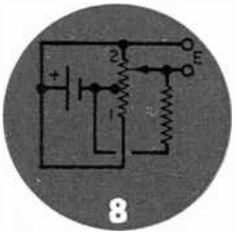
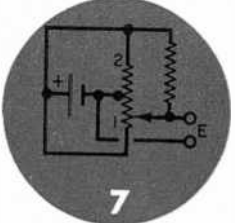
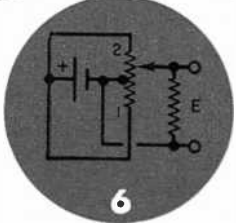
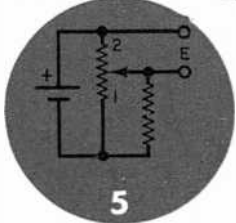
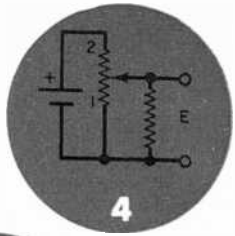
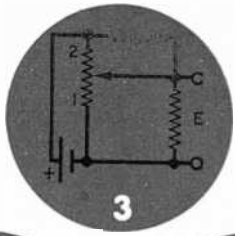
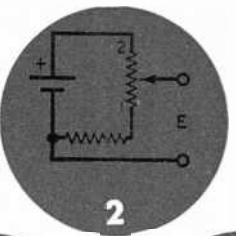
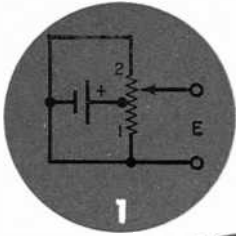
TO BEETHOVEN IN 1/3 LESS TIME!

In timed, competitive tests, twin brothers — with twin backgrounds and skills — proved that Paco kits are faster, easier and more fun to build than almost-identical kits sold by other kit makers. They discovered that there's no guessing with Paco: parts are neatly packaged and precisely labeled; instruction books are complete and easy to follow. Accurate drawings to actual scale and fold-out diagrams are printed right next to step-by-step directions. ■ The twins also proved that Paco pleasure doesn't end with the wiring. The ST-25 MX FM Stereo Multiplex Tuner®, for example, looks and performs like twice the price: frequency response is 30 to 20,000 cps within 2 db; sensitivity is 1.5 μ v for 20 db quieting. It features self-contained, prealigned and fully shielded front end. FM Stereo multiplex circuitry, dual limiters, AFC with panel switch for AFC defeat and "eye"-type tuning indicator. Why not put Paco to your test. **Kit: \$69.95 net.** (factory wired, ready to operate: \$99.95). See your dealer or write today for details to Paco Electronics Co., Inc., 70-31 84th Street, Glendale 27, New York, a division of Precision Apparatus Company, Inc. Export: Morhan Corporation, 458 Broadway, New York 13, New York. In Canada: Atlas Radio Corporation, 50 Wingold Avenue, Toronto, Canada.

*AS PICTURED ABOVE

PACO KITS

THE KITS YOU BUILD IN 1/3 LESS TIME

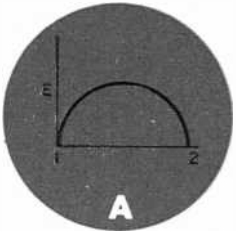


When the potentiometer wiper arm is moved from point "1" to point "2" in each of the circuits above (1 through 8), the output voltage, "E," varies as shown by one of the curves below (A

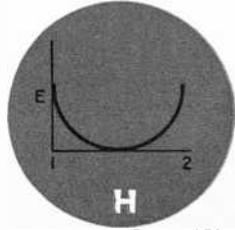
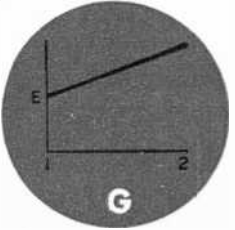
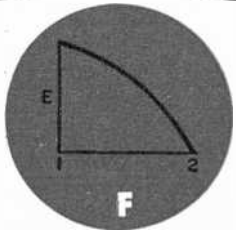
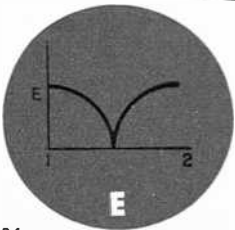
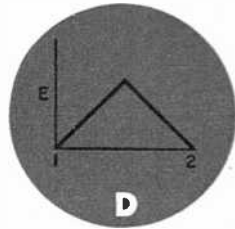
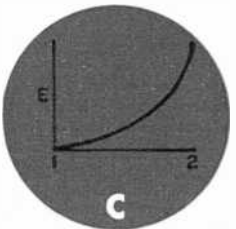
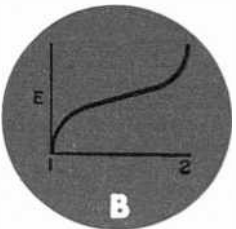
- | | | | |
|---|---|---|---|
| 1 | — | 5 | — |
| 2 | — | 6 | — |
| 3 | — | 7 | — |
| 4 | — | 8 | — |

Potentiometer Quiz

through H). See if you can match them up. All resistors and linear potentiometers (some with center taps) are of the same resistance value. The correct answers appear on page 104.



By ROBERT P. BALIN



BUY 20 RADIO

only **\$29.95**

CIRCUITS AT HOME
with the New

PROGRESSIVE RADIO "EDU-KIT"®

A Practical Home Radio Course

Now Includes

- ★ RECEIVERS
- ★ TRANSMITTERS
- ★ SQ. WAVE GENERATOR
- ★ SIGNAL TRACER
- ★ AMPLIFIER
- ★ SIGNAL INJECTOR
- ★ CODE OSCILLATOR
- ★ No Knowledge of Radio Necessary
- ★ No Additional Parts or Tools Needed
- ★ EXCELLENT BACKGROUND FOR TV
- ★ **SCHOOL INQUIRIES INVITED**
- ★ Sold In 79 Countries



Reg. U. S. Pat. Off.

Training Electronics Technicians Since 1946

YOU DON'T HAVE TO SPEND HUNDREDS OF DOLLARS FOR A RADIO COURSE

The "Edu-Kit" offers you an outstanding PRACTICAL HOME RADIO COURSE at a rock-bottom price. Our Kit is designed to train Radio & Electronics Technicians, making use of the most modern methods of home training. You will learn radio theory, construction practice and servicing. THIS IS A COMPLETE RADIO COURSE IN EVERY DETAIL. You will learn how to build radios, using regular schematics; how to wire and solder in a professional manner; how to service radios. You will work with the standard type of punched metal chassis as well as the latest development of Printed Circuit chassis. You will learn the basic principles of radio. You will construct, study and work with RF and AF amplifiers and oscillators, detectors, rectifiers, test equipment. You will learn and practice code, using the Progressive Code Oscillator. You will learn and practice trouble-shooting the Progressive Signal Tracer. Progress in a closely integrated progressive Dynamic Radio & Electronics Tester, Square Wave Generator and the accompanying instructional material.

You will receive training for the Novice, Technician and General Classes of F.C.C. Radio Amateur Licenses. You will build 20 Receiver, Transmitter, Square Wave Generator, Code Oscillator, Signal Tracer and Signal Injector circuits, and learn how to operate them. You will receive excellent background and Radio, worth many times the price of the kit.

Absolutely no previous knowledge of radio or science is required. The "Edu-Kit" is the product of many years of teaching and engineering experience. The "Edu-Kit" will provide you with a complete Radio & Electronics course, worth many times the price of the \$29.95. The Signal Tracer alone is worth more than the price of the entire Kit.

THE KIT FOR EVERYONE

You do not need the slightest background in radio or science. Whether you are interested in Radio & Electronics because you want an interesting hobby, a well paying business or a job with a future, you will find the "Edu-Kit" a worth-while investment. Many thousands of individuals of all

ages and backgrounds have successfully used the "Edu-Kit" in more than 79 countries of the world. The "Edu-Kit" has been carefully designed, step by step, so that you cannot make a mistake. The "Edu-Kit" allows you to teach yourself at your own rate. No instructor is necessary.

PROGRESSIVE TEACHING METHOD

The Progressive Radio "Edu-Kit" is the foremost educational radio kit in the world, and is universally accepted as the standard in the field of electronics training. The "Edu-Kit" uses the modern educational principle of "Learn by Doing." Therefore you construct, learn schematics, study theory, practice trouble shooting—all in a closely integrated program designed to provide an easily-learned, thorough and interesting background in radio.

You begin by examining the various radio parts of the "Edu-Kit." You then learn the function, theory and wiring of these parts. Then you build a simple radio. With this first set you will enjoy listening to regular broadcast stations, learn theory, practice testing and trouble-shooting. Then you build a more advanced radio, learn more advanced theory and techniques. Gradually, in a progressive manner, and at your own rate, you will find yourself constructing more advanced multi-tube radio circuits, and doing work like a professional Radio Technician.

Included in the "Edu-Kit" course are 20 Receiver, Transmitter, Code Oscillator, Signal Tracer, Square Wave Generator and Signal Injector Circuits. These are not unprofessional "breadboard" experiments, but genuine radio circuits, constructed by means of professional wiring and soldering on metal chassis, plus the new method of radio construction known as "Printed Circuitry." These circuits operate on your regular AC or DC house current.

THE "EDU-KIT" IS COMPLETE

You will receive all parts and instructions necessary to build 20 different radio and electronics circuits, each guaranteed to operate. Our Kits contain tubes, tube sockets, variable, electrolytic, mica, ceramic and paper dielectric condensers, resistors, tie strips, hardware, tubing, punched metal chassis, Instruction Manuals, hook-up wire, solder, selenium rectifiers, volume controls and switches, etc.

In addition, you receive Printed Circuit materials, including Printed Circuit chassis, special tube sockets, hardware and instructions. You also receive a useful set of tools, a professional electric soldering iron, and a self-powered Dynamic Radio and Electronics Tester. The "Edu-Kit" also includes Code Instructions and the Progressive Code Oscillator, in addition to F.C.C. type Questions and Answers for Radio Amateur license training. You will also receive lessons for servicing with the Progressive Signal Tracer and the Progressive Signal Injector, a High Fidelity Guide and a Quiz Book. You receive Membership in Radio-TV Club, Free Consultation Service, Certificate of Merit and Discount Privileges. You receive all parts, tools, instructions, etc. Everything is yours to keep.

FREE EXTRAS

- SET OF TOOLS
- SOLDERING IRON
- ELECTRONICS TESTER
- PLIERS-CUTTERS
- ALIGNMENT TOOL
- WRENCH SET
- VALUABLE DISCOUNT CARD
- CERTIFICATE OF MERIT
- TESTER INSTRUCTION MANUAL
- HIGH FIDELITY GUIDE • QUIZZES
- TELEVISION BOOK • RADIO TROUBLE-SHOOTING BOOK
- MEMBERSHIP IN RADIO-TV CLUB: CONSULTATION SERVICE • FCC AMATEUR LICENSE TRAINING
- PRINTED CIRCUITRY

SERVICING LESSONS

You will learn trouble-shooting and servicing in a progressive manner. You will practice repairs on the sets that you construct. You will learn symptoms and causes of trouble in home, portable and car radios. You will learn how to use the professional Signal Tracer, the unique Signal Injector and the dynamic Radio & Electronics Tester. While you are learning in this practical way, you will be able to do many a repair job for your friends and neighbors, and charge fees which will far exceed the price of the "Edu-Kit." Our Consultation Service will help you with any technical problems you may have.

FROM OUR MAIL BAG

J. Statatits, of 25 Poplar Pl., Waterbury, Conn., writes: "I have repaired several sets for my friends, and made money. The "Edu-Kit" paid for itself. I was ready to spend \$240 for a course, but I found your ad and sent for your Kit."

Ben Valerio, P. O. Box 21, Magna, Utah: "The Edu-Kits are wonderful. Here I am sending you the questions and also the answers for them. I have been in Radio for the last seven years, but like to work with Radio kits, and like to build Radio Testing Equipment. I enjoyed every minute I worked with the different kits; the Signal Tracer worked fine. Also like to let you know that I feel proud of becoming a member of your Radio-TV Club."

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

Edu-cate with Edu-Kit®

- ELECTRONICS COURSE
- VACUUM TUBE VOLTMETER
- TUBE TESTER
- RF SIGNAL GENERATOR
- FM TUNER
- HIGH FIDELITY AMPLIFIER

UNCONDITIONAL MONEY-BACK GUARANTEE

ORDER DIRECT FROM AD—RECEIVE FREE BONUS RESISTOR AND CONDENSER KITS WORTH \$7

- Send "Edu-Kit" postpaid. I enclose full payment of \$26.95.
- Send "Edu-Kit" C.O.D. I will pay \$26.95 plus postage.
- Rush me FREE "Edu-Kit" catalog.

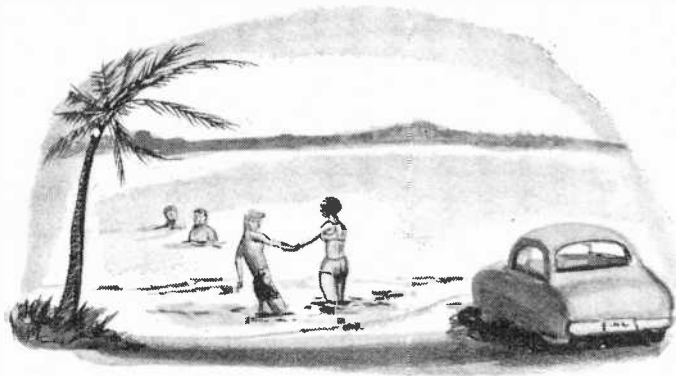
Name.....
Address.....

PROGRESSIVE "EDU-KITS" INC.

1186 Broadway, Dept. 596D, Hewlett, N. Y.

The CLINGING VINE

By
JOHN T. FRYE
W9EGV



a Carl and Jerry Adventure

CARL AND JERRY were driving down the road in their faithful 1954 Chevy. There was nothing unusual in this, but just about everything else in the scene was strange. Take the road itself. Instead of running between waving green banners of tall corn and harvested wheat and oat fields wearing their late-summer crew cuts, the road was bordered by cypress and live oak trees festooned with Spanish moss. Moreover, Carl and Jerry were not alone in the car. Seated in the front with Carl was dark-haired, lovely Jodi, whom the boys had first encountered in a tunnel beneath the campus of Parvoo University; and bouncing around on the back seat beside Jerry was a slender, vivacious, blue-eyed blonde with a dust of freckles across the bridge of her pert nose.

There was an explanation, of course. Taking a vacation trip before heading back to school, Carl and Jerry "just happened" to wind up in Panama City, Florida, where Jodi lived. As soon as she learned the boys were in town, she called her cousin, Mary, and organized this picnic at a small, secluded lake north of the city.

"Turn left onto that little sand road," she directed Carl.

"I declare, Jodi, I don't see how you

remember directions so well," Mary exclaimed in a rich southern drawl that matched Jodi's. "Daddy says the only two directions I know are up and down and he'd hate to have to depend on my not mixing those up. But you always were clever. You *had* to be to find these perfectly *dreamy* Yankee boys!"

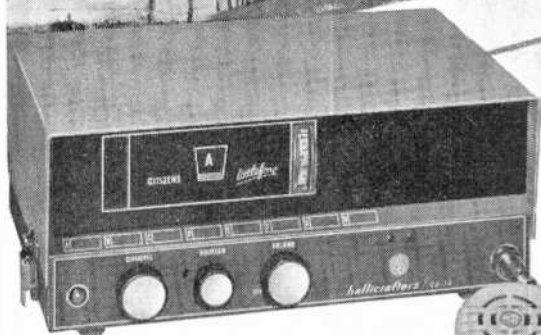
Jodi's fair skin turned pink, and she hastily changed the subject.

"What is this thing you and Jerry want to test today?" she asked Carl.

"Underwater communications equipment," he answered. "There was a fellow living in the H-3 building at school whose dad works for the Electro-Voice company in Buchanan, Michigan. Back in 1958 the company started experimenting with this sort of equipment and finally came up with a device they called 'Scubacom.' While it was decided not to put 'Scubacom' into production, several experimental units were built; and this fellow managed to get one of the speakers for us. Using that, and the information he could give us, Jerry and I built our own crude version.

"Essentially, it consists of two parts: a specially designed partial face mask that houses a microphone; and a speaker-amplifier unit that contains the power supply, amplifier, and the special speaker. The mask-microphone can be worn in

*Developed in the field
to pay off in performance
down the road*



only **\$159⁹⁵**
(S-meter optional extra)



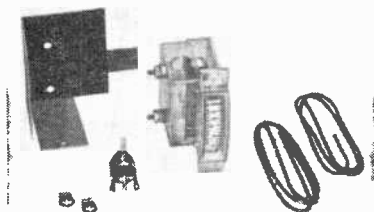
New
littlefone®

CB-3A

dual conversion
citizens band

TRANSMITTER/RECEIVER

New, improved version of Hallicrafters' high-performance CB-3 27-mc. transmitter/receiver—incomparable result of a 30,000-mile, continuous-operation field test under the most punishing conditions imaginable.



S-meter kit—easy to install as shown in photo above. \$8.95

Features:

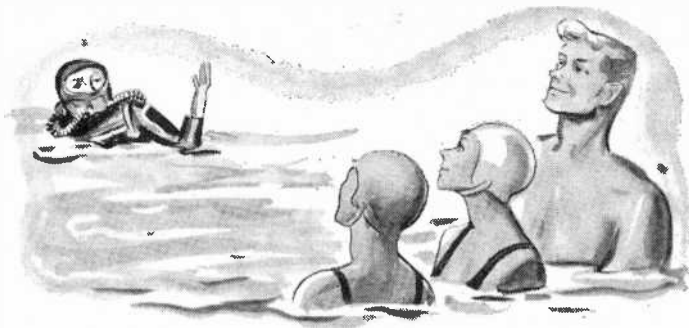
- 8-channel, crystal controlled convenience
- Dual conversion
- Improved electronic squelch
- Provision for S-meter
- Built-in jack for remote speaker and future accessories
- Audio output over 2 watts
- 6 kc. selectivity
- FCC type-accepted.

the new ideas
in communications
are born at . . .



hallicrafters

5th and Kostner Aves., Chicago 24, Illinois



conjunction with any standard eye-and-nose diving mask, after the standard scuba mouthpiece and barrel assembly is removed. A press-to-talk button on the bottom of the mask turns the thing on and off. The speaker-amplifier is designed for neutral buoyancy and is strapped to the air tank. The amplifier is transistorized.

"The speaker is the tricky item. You see, you have to maintain equal pressures on both sides of the diaphragm to get linear operation, and Electro-Voice accomplished this with a special design that features a circular bladder arrangement. The microphone connects to the amplifier through a special waterproof interconnect cable. Power is supplied by a couple of 6-volt 'Aqualite' pressurized batteries.

"We just finished it on the night before we were to leave on our trip," Jerry added; "so we threw it into the trunk and brought it along with the idea of trying it out somewhere along the way. In both the Electro-Voice unit and our homemade one, only a transmitter is used, and the sounds from the speaker are nondirectional—they can be heard by any underwater swimmer. I'll be content if a scuba diver can hear ours at a hundred feet.

"I just love that word 'scuba,'" Mary chimed in. "I think it sounds so romantic and exotic. I just know it comes from some South Seas dialect."

"I hate to spoil your illusion," Jerry said with a broad grin; "but the word is actually made up of the first letters of 'Self-Contained Underwater Breathing Apparatus.' Well, here we are."

THEY parked beneath some short-needed pine trees and looked out across the peaceful little lake. It was

about a half-mile in diameter, and the two couples had it all to themselves.

"Whew! It's hot in here when the car stops," Jodi exclaimed. "What say we take a swim before attacking the fried chicken and potato salad? You boys can change clothes in that little clump of bushes over by the point, and Mary and I will change here in the car."

A half hour later, refreshed by a dip in the cool waters of the deep little lake, they removed the scuba gear from the car trunk—including an impressive "frogman type" suit—and all took a hand in putting it on Jerry. As soon as everything was in place, he waded out into the lake and submerged. The other three, standing near the shore, placed their heads beneath the surface of the water and listened intently.

"Calling all mermaids! Calling all mermaids! This is Father Neptune calling all mermaids. Come to Daddy, girls!" Jerry's voice said clearly and distinctly.

"Hey, how about that! It works!" Carl exclaimed as he raised his head from the water.

"Isn't he cute, calling all mermaids?" Mary asked with an appreciative giggle.

"Could you hear me?" Jerry called from where he had surfaced and was treading water a short distance away.

"Roger; you were five by nine," Jodi answered in ham parlance.

"Great! I'll swim out a ways and call from the bottom. I want to find out how far the sound carries and whether or not increased pressure affects the transducer. Give me at least a couple of minutes and then start listening."

He disappeared from sight. There was enough of a breeze to roughen the surface of the lake and conceal any air bubbles rising from the exhaust of the scuba gear. Carl and Jodi both tried to

explain to Mary how Jerry was making the sound go through the water, but she just shook her head in pretty bewilderment. After a couple of minutes, they all ducked below the surface.

"I didn't hear a thing," Carl gasped as he came up for air several seconds later.

"Neither did I," the girls chorused.

They went under again and listened intently as long as they could. Carl and Jodi came up almost together.

"He must have swum beyond range of the transmitter, or else the pressure has clobbered the speaker," Carl hazarded; "but he should come up now and let us know where he is."

"Listen!" Mary said as she popped her head out of the water, gulped a breath of air, and immediately went back beneath the surface. Carl and Jodi joined her, and they heard Jerry's voice—much fainter than before but clearly understandable.

"If you can hear me, Carl, I'm in kind of a fix." Jerry was trying hard to seem casual, but there was a note of near-panic in his voice. "I swam into a roll of

old barbed wire down here on the bottom, and some of the coils are wrapped around my legs. The more I try to get loose, the tighter the coils wrap. I don't think I can make it without some sort of help. If you can hear me, try to make some sound to let me know."

Quick as a flash Mary scooped up a couple of stones from beneath her feet and struck them together in the water.

"Is that you? If so, make that sound twice." Jerry's voice was eager.

Mary struck the stones together twice. "Good. I'm going to rest a little and go easy on my air," Jerry said. "You know, Carl, the tank was pretty low to begin with."

ALL three of them surfaced at once. Carl's face looked white and drawn as the two girls stared questioningly at him. "It's true," he said. "We knew the air in the tank was low, but we only figured on testing the talking device for a few minutes. We've got to get him out of there, and quick."

"Do you have any of those wire-cutting scissors in the car?" Mary asked,

24 HOUR SHIPMENT On One Year Guaranteed RADIO & TV TUBES



CORNELL

33¢ PER TUBE

100 TUBES OR MORE:
30¢ PER TUBE

074	3B26	5BR8						12AV5	12SQ7
1AX2	3C86	5C88	6ARS	6BH8	6CF6	6DN7	6SQ7	12AV6	12V6
1B3/163	3CF6	5C88	6AS5	6BJ6	6CG7	6DQ6	6T8	12AV7	12W6
1J3	3CS6	5CL8	6AS8	6BK5	6CG8	6DR7	6U8	12AX4	12X4
1R5	3CY5	5CQ8	6AS8	6BK5	6CG8	6DR7	6U8	12AX7	13DE7
1S4	3OK6	5EM6	6AT6	6BK7	6CH8	6DT6	6V3	12A27	13DR7
1S5	3DT6	5J5	6AT8	6BL7	6CL6	6EAB	6V6	12B4	17AX4
174	3S4	5T8	6AU4	6BN4	6CL8	6EB8	6W4	12BA6	17D4
1U4	3V4	5U4	6AU5	6BN6	6CM6	6EM5	6W6	12B06	17D06
1U5	4AU6	5U8	6AU6	6BN8	6CM7	6EM7	6X4	12BE6	17GW6
1V2	4BC8	5V3	6AU8	6BQ5	6CN7	6E85	6X8	12BF6	19AU4
1X2	4BQ7	5X8	6AV5	6BQ6/6CU6	6CQ8	6E88	7AU7	12BH7	25AX4
2BN4	4BS8	5Y3	6AV6	6BQ7	6CS6	6EU8	8AW8	12BK5	25BQ6
2CY5	4BZ6	6AB4	6AW8	6BR8	6CS7	6EV5	8BQ5	12BQ6	25C06
2CW4	4BZ7	6AC7	6AX4	6BS8	6CU5	6EW6	8CG7	12BR7	25DN6
2FR5	4CB6	6AF3	6AX5	6BU8	6CU8	6G89	8CM7	12BT7	25L6
3A3	4CS6	6AF4	6AX8	6BX7	6CW4	6GM6	8CX8	12B77	25W4
3AL5	4EW6	6AG5	6AZ8	6BY5	6CX8	6J5	9AU7	12CA5	35B5
3AU6	5AM8	6AH4	6BA6	6BY6	6CY5	6J6	10DE7	12CU5/12CS	35C5
3AV6	5AN8	6AH6	6BA6	6BS8	6D7	6K6	10DR7	12CX6	35L6
3BC5	5AQ5	6AM5	6BC5	6BZ6	6E5	6L6	11C7	12D4	35W4
3BE6	5AS4	6AL5	6BC8	6BZ8	6D4	6S4	12A45	12DQ6	35Z5
3BN4	5AT8	6AM8	6BD6	6C4	6DE4	6SA7	12AT6	12L6	50B5
3BN6	5AV8	6AN8	6BE6	6CB6	6DE6	6SK7	12AT7	12SA7	50C5
3BU8	5BK7	6B06	6BE6	6CD6	6DG6	6SL7	12A06	12SK7	50L6
3BY6	5BQ7	6AQ7	6BH6	6CE5	6DK6	6SN7	12AN7	12SN7	5642

- HIGHEST QUALITY
- FASTEST SERVICE
- LOWEST PRICES

FREE BONUS OFFER

Genuine Leather • Hand Tooled Key Case • Yours Free with every order of 25 Tubes or more.

We Ship Immediately!

ATTENTION QUANTITY BUYERS

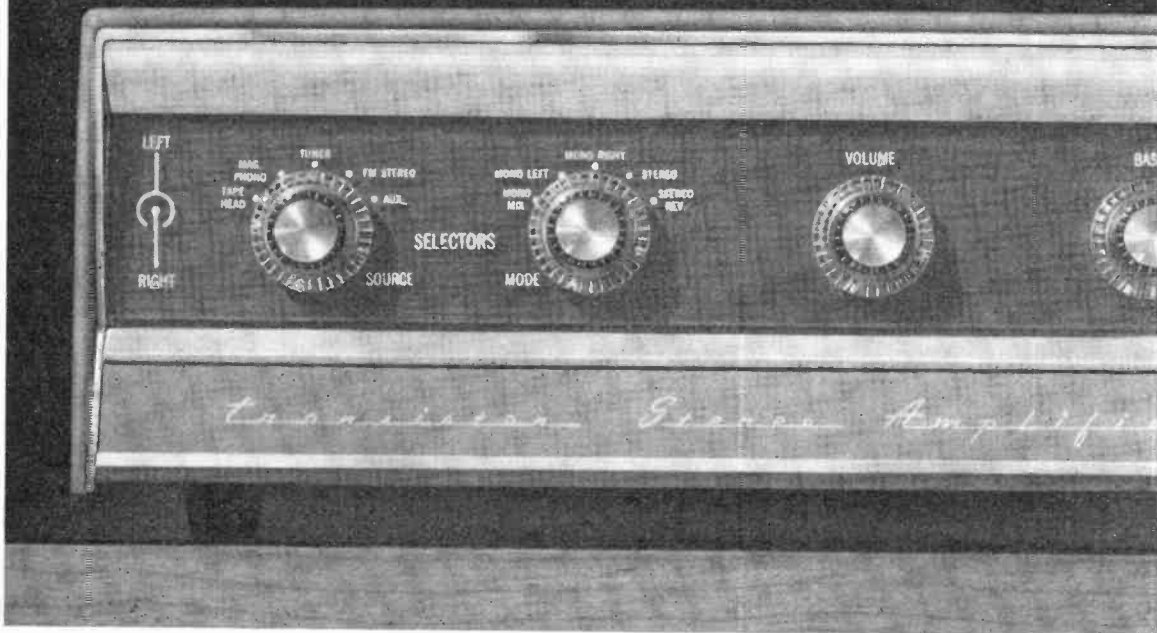
- Ask for Special Discounts
- Write for Private Brand Deal
- Submit your Tube needs for price quotation

Tubes are all guaranteed and field tested new factory seconds or used tubes and are so marked.

CORNELL ELECTRONICS CO.

Dept. PE9 4217 University Ave., San Diego 5, Calif. • Phone: AT 1-9792

HOW TO MAKE \$135



70 Watts, Heath Rating; 100 Watts IHFM Music Power

"Startling Realism . . . Superb Dynamic Range . . . Smooth, full power delivery . . . Fast, effortless transient response . . . Professional . . . Convenient . . . Takes full advantage of the state of transistor art . . . Simple assembly" . . . these are but a few of the enthusiastic comments of those who have heard and seen the new Heathkit AA-21 Transistor Stereo Amplifier.

Rated at 35 watts per channel by Heath standards or 50 watts per channel by IHFM music power standards, this Heathkit combination stereo preamplifier, power amplifier delivers full power over a range of 13 cycles to 25,000 cycles, ± 1 db! No compromise in dynamic range, no faltering power at the important high and low extremes of response . . . just the most satisfying solid sound you have ever heard. Its other specifications are equally impressive . . . completely factual and guaranteed!

Featuring 28 transistors and 10 diodes, the latest, most advanced in RCA semi-conductor technology, the Heathkit AA-21 not only offers record-setting performance, but also provides operational characteristics unique with transistors . . . cool operation with low power line requirements . . . steady performance under wide, external temperature variations . . . complete freedom from annoying microphonics . . . instant operation.

More than two years in development, this pace-setting unit features transformerless output circuitry plus multiple feed-back loops for flat response and finest fidelity. All controls are front-panel mounted for operating convenience, with a 5-position, dual concentric input selector which permits "mixing" inputs for

tape recording purposes, etc., a 5-position "mode" selector, plus dual concentric volume, bass and treble controls. A hinged lower front panel covers all input level controls, the tape-monitor input switch, a speaker phase reversal switch, and a loudness switch which converts the volume control to a loudness control for compensated low-volume levels. The right-hand section of the lower front panel is a unique On-Off switch . . . touch to turn on, touch to turn off. All input and output connections are conveniently located on the rear chassis panel. Circuit safety is assured through the use of 5 new, fast-acting, bi-metal circuit breakers . . . no more annoying fuse-fussing.

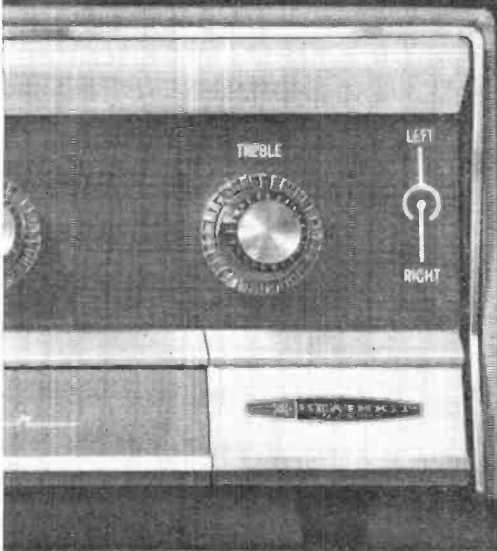
Kit assembly is fast and simple through the use of 5 circuit boards which eliminate most of the conventional, time-consuming point-to-point wiring. The preamplifier circuits are "capsuled" to reduce wiring . . . 6 epoxy-covered modules contain 70 resistors and capacitors, all factory wired and sealed, ready for easy mounting on the preamplifier circuit boards.

Styling is in the Heathkit deluxe motif of luggage-tan vinyl-clad steel with polished, anodized aluminum trim, plastic upper front panel, extruded aluminum lower panel with matching vinyl inset, and soft, refracted panel-lighting.

Designed to set a new standard of value, this finest of all stereo amplifiers carries a surprisingly low price tag . . . order yours now for early enjoyment.

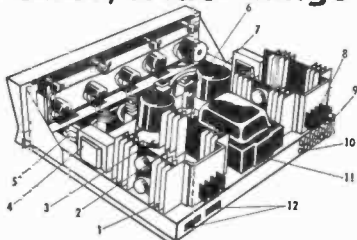
Kit AA-21, 28 lbs., no money down, \$13 mo. \$134.95
Assembled AAW-21, no money down, \$21 mo. \$219.95

SOUND LIKE A MILLION!



Build This New Heathkit Transistor Stereo Amplifier

Full Power, Wide-Range Sound As You Have Never Heard It



1. Eight germanium power output transistors mounted on four finned heat sinks. 2. Output circuit breakers. 3. Two power amplifier circuit boards containing four transistors and six diodes. 4. Two driver transformers. 5. Two preamplifier circuit boards containing six epoxy-sealed component modules and ten transistors. 6. Two germanium driver transistors plus four electronic filter transistors. 7. Two 3,000 mid filter condensers and four power supply diodes. 8. Two output terminal boards. 9. Stereo Input jacks. 10. Tape recorder output jacks. 11. Power transformer. 12. AC power outlets. All primary and secondary controls accessible at front panel area

SPECIFICATIONS—Power output per channel: (Heath rating), 35 watts/8 ohm load—26 watts/16 ohm load—18 watts/4 ohm load; (IHF-M music power output): 50 watts/8 ohm load—34 watts/16 ohm load—25 watts/4 ohm load @ 0.7% THD, 1% CL. **Power response:** ±1 db from 13 cps to 25 kc @ rated output; ±3 db from 8 cps to 40 kc @ rated output. **Harmonic distortion (at rated output):** Less than 1% @ 20 cps, 0.5% @ 1 kc, 2.0% @ 20 kc. **Intermodulation distortion (at rated output):** Less than 1% 60 & 6,000 cps signal mix—4:1. **Hum and noise:** Tapehead, 40 db below rated output; Mag phono, 25 db below rated output; Aux. inputs, 60 db below rated output; Tape monitor, 70 db below rated output. **Channel separation:** 10 db min. @ 20 kc, 55 db min. @ 1 kc, 50 db min. @ 21 cps. **Input sensitivity:** (For 35 watts output per channel, 8 ohm load) Tapehead: 2 mv; Mag. phono, 3 mw; Tuner, 25 v; FM Stereo, 75 v; Aux., 25 v; Tape Monitor, 90v. **Input impedance:** Tapehead, 60 K ohm; Mag. phono, 30 K ohm; Tuner, 100 K ohm; FM Stereo, 100 K ohm; Aux., 100 K ohm; Tape Monitor, 47 K ohm. **Outputs:** 4, 8, & 15 ohm and low impedance tape recorder outputs. **Controls:** 5-pos. Selector (dual-concentric), 5-pos. Mode switch, dual-concentric Volume, Bass & Treble controls, Tape monitor sw., Loudness sw., Phase sw., Input level controls (all inputs except Tape Head & Tape Monitor inputs), Push-Push on/off switch. **Semiconductor complement:** 28 Transistors, 10 diodes. **Power requirements:** 105-125 volts, 50-60 cycles AC, 35 watts idling, no signal; 200 watts, full power out, @ 120 volts with no load on AC receptacles. **Power outlets:** 2 AC receptacles, 1 switched, 1 unswitched. **Dimensions:** 15 1/2" W x 5" H x 14" D.

FREE 1963 HEATHKIT CATALOG

If you are not already on our mailing list, fill in and mail the coupon below right away to receive this new Fall & Winter edition of the world's biggest electronic kit catalog. More than 100 new electronic luxuries have been added since the last issue... more than 250 in all, completely described and illustrated. Send for your free copy today!



HEATH COMPANY
Benton Harbor 10, Michigan

Please send my FREE 1963 Heathkit Catalog

Name

Street

City Zone State

proving that she could speak rapidly and still retain her drawl.

"You mean diagonal cutters? Sure, I'll get them."

He was back in a few moments. Without a word, Mary took the tool from his hand and started for the middle of the lake with a professional overhand crawl stroke.

"Hey, wait! Hadn't I better—" Carl called.

"Let her go," Jodi advised. "Let's let him know we're trying to help."

Carl beat a sharp tattoo with a couple of stones, and immediately they heard Jerry's voice. "Okay, I hear you . . . and now I hear someone thrashing around in the water. There, I can see your shadow against the light. I'm over to your left. No, your left; the other way. That's right. Keep coming as you are. A little more to your right now. Okay, you're right above me."

Carl and Jodi came out of the water just in time to see Mary's slender green-clad figure arc in a bow as she started a dive. A few seconds later she came to the surface and raised a circled thumb and forefinger over her head to indicate the success of her mission.

Jerry was too busy cutting barbed wire to be playing with the push-to-talk button on his mask-microphone for the

next several minutes. Eventually he came to the surface, though, and he and Mary swam together to the shore.

"I don't know about the rest of you," Jerry said after they helped him off with the scuba gear and rubber suit and he was gingerly daubing Mercurochrome from the car's first-aid kit on the superficial scratches on his legs, "but personally I've had all the swimming I want for one day."

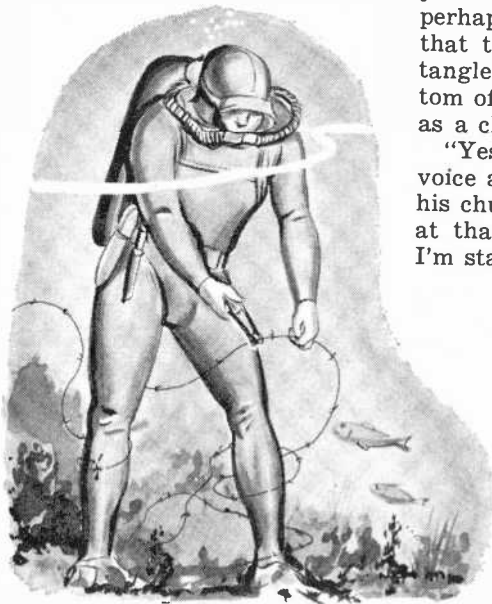
"So have we," Jodi said. "Let's all get dressed and see what we can find in that picnic basket."

I JUST don't get it," Jerry remarked to Carl as they were putting on their clothes. "That Mary is so slender and soft and helpless; yet she brought those diagonal cutters down to me like a professional diver. On the way here I had doubts she could even swim, and I was sort of hoping I'd have to teach her."

"You can give up that dream," Carl said with a grin. "While you were playing snip-snip with the barbed wire, Jodi told me Mary was the lifeguard at the municipal pool for two years. You mustn't let these Southern girls fool you. They're smart enough to make a man feel big and strong and protective—just as long as they possibly can. I'm thoroughly convinced the first clinging vine was a Southern honeysuckle. And since your father isn't here to warn you, perhaps I'd better explain right now that that roll of barbed wire you were tangled up with down there at the bottom of the lake is not half as dangerous as a clinging vine."

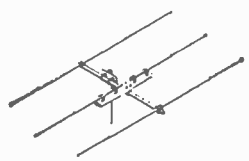
"Yes, Daddy!" Jerry said in a falsetto voice as he threw a handful of grass at his chum. "I'll remember. Now let's get at that fried chicken and potato salad. I'm starved!"

—30—



ATTENTION!

for CITIZENS BAND OPERATORS



MODEL A-311, Three Element Beam
for best point-to-point communication.
List, \$46.88



Whip-Klip - Universal clip for mobile whip antennas.
Model MWK. List, \$1.30

for SHORT WAVE LISTENERS

SEVEN BAND RECEIVING DIPOLE

A seven band receiving dipole that offers real 'DX-Ability' on 11, 13, 16, 19, 25, 31, and 49 meters. Kit complete to install.
Model SWL-7.....Net, \$14.75

for HAMS AND TECHNICIANS

WAVE TRAPS

Tunable wave traps to help "knock-out" TVI and BCI. High Q series resonant type may be used on any receiver input, 50 to 600 ohms, balanced or unbalanced. Solderless, easy to install, choose type whose range includes frequency of interfering stations.

- WT-7 -- 6.8 - 8.5 mcs.
- WT-14 -- 13.8 - 16 mcs.
- WT-21 -- 16 - 28 mcs.
- WT-41 -- 27 - 55 mcs.
- WT-78 -- 47 - 110 mcs.
- WT-165 -- 100 - 230 mcs.



List Price, \$5.06



THE Mosley CM-1

receiver is the first low priced receiver with double conversion and crystal controlled first oscillator. It is also the first receiver with 5 dual-purpose tubes of one type and 4 semi-conductor diodes which perform all functions usually requiring 12 or more tube sections. See this really new design concept in amateur receivers now on display at your dealer.

CM-1 Receiver Amateur Net \$ 182.70
CMS-1 Speaker Amateur Net \$ 16.95

NEW! CM-1 WILL RECEIVE CB WITH PROPER CRYSTAL NO OTHER ADJUSTMENTS

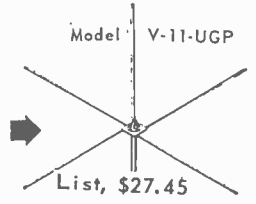
WRITE FOR PRICES-DETAILS



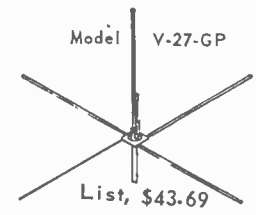
Electronics Inc.
4610 N. LINDBERGH BLVD.,
BRIDGETON, MISSOURI

OPERATORS

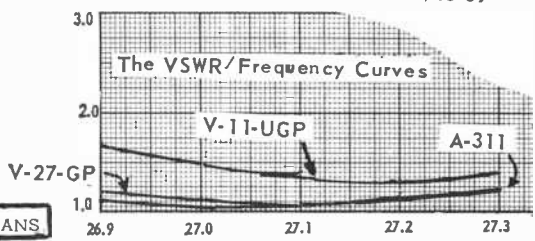
Both Ground Planes give 360 degree patterns and provide dependable base station communication over long distances. See SWR curves below.



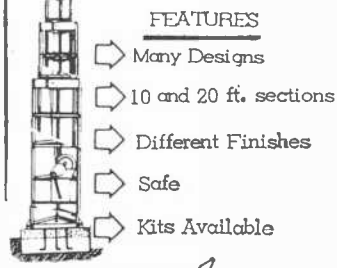
102 inch stainless steel Whip designed for high efficiency mobile operation. Whip may be mounted on bumper or rear fender. Base fits any standard mount.



Model V-102-SS..List, \$8.55



NEW! MOSLEY TOWERMASTER LINE



- ### FEATURES
- Many Designs
 - 10 and 20 ft. sections
 - Different Finishes
 - Safe
 - Kits Available

Send for Free Literature,

To: MOSLEY Electronics, Inc.
4610 N. Lindbergh Blvd.,
Bridgeton, Missouri

A-311 V-102-SS
 SWL-7 MWK V-11-UGP
 Wave T CM-1 V-27-GP
 Towers

I am CB Swl Tech Ham

Print Tech Ham

NAME _____

ADDRESS _____

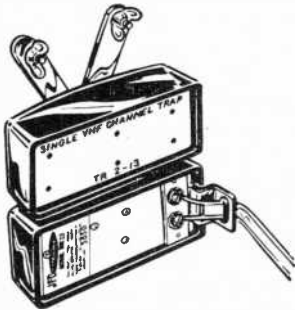
New Products

TV WAVE TRAPS

Produced by JFD Electronics Corp., a new series of wave traps provides "clear-channel" TV reception by eliminating interfering

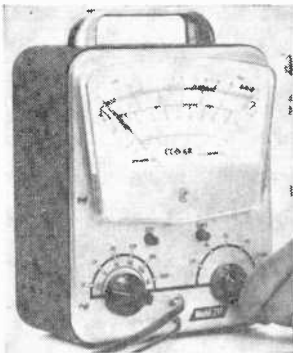
TV or FM stations. They are intended for use in conjunction with the JFD "Transistenna" (as shown in the photo) or with any other TV preamplifier. The antenna output feeds directly into

the trap, where the troublesome signal is attenuated before it is boosted by the amplifier. Wave traps TR2 to TR13 "screen out" TV channels 2 through 13, respectively; TRFM eliminates interference from FM stations. Priced at \$6.95 each, these traps give approximately 35 db attenuation of the frequencies they are designed to restrict. (JFD Electronics Corp., 6101 16th Ave., Brooklyn 4, N. Y.)



VTVM KIT

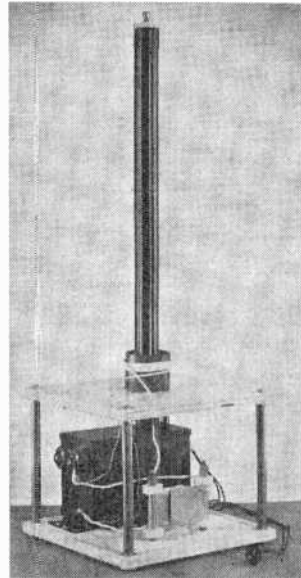
Conar Instruments (a division of National Radio Institute) is producing a VTVM kit with 24 overlapping ranges for a.c. or d.c. volts, a.c. peak-to-peak readings, and ohms. The Model 211 VTVM has a 6" meter with jeweled D'Arsonval movement; a special circuit protects the movement from overload and vibration damage. Ranges are 0-1200 d.c. volts, 0-1200 r.m.s. a.c. volts, 0-1200 a.c. peak-to-peak, and 0-1000 megohms (10 megohm center scale). An optional "TV



probe" extends the d.c. range to 30,000 volts. Calibration is simple and there's no need to make readjustments when switching from one range to another. Price: \$31.95 in kit form; \$44.95 factory-assembled. The TV probe sells for \$5.50. (Conar Instruments, 3939 Wisconsin Ave., Washington 16, D.C.)

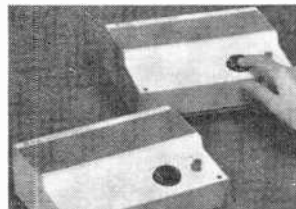
TESLA COIL KIT

Morris & Lee, manufacturer of science equipment for amateur or professional experimenters, has developed a "spark-gap" type Tesla coil kit. Said to be more spectacular in operation than conventional vacuum-tube types, the coil delivers r.f. power in short bursts of 10 kw. or more. Discharges up to 12" in length can be obtained. Since the kit can be constructed "in a dangerous manner," orders will not be filled until the prospective purchaser has proven that he understands M&L's explanatory material by successfully completing a questionnaire. The price of the kit is \$75.00. Send \$1.00 to the manufacturer for literature, plans, experiments, and questionnaire. (Morris & Lee, 294 Elm St., Buffalo, N.Y.)



WIRELESS INTERCOM KIT

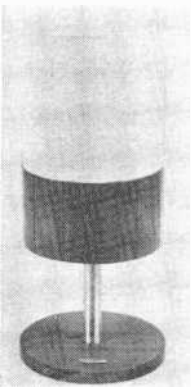
A completely transistorized wireless intercom in kit form has been introduced by Allied Radio. There are no interconnecting cables to install, since the two-station "Knight - Kit" system operates by simply plugging into any a.c. or d.c. power source. Each station is a "master," and has a press-to-talk button which can be locked in the "talk" position. No on-off switch is required, since each station draws no more power than an



Hi-Fi Showcase

*A quick look at new products
in the stereo/hi-fi field**

A LOW, "SCULPTURED" silhouette and a special, silver-blue luster to blend with darker wood hues are two features of the new Model UA16 automatic record changer from **BSR (USA) Ltd.** Designed by Raymond Loewy/William Snaith, Inc., the UA16 incorporates a precision-built, dynamically balanced motor with self-lubricating, lifetime bearings. The motor is suspended in rubber for vibration-free performance, and the changer's tone arm is a one-piece aluminum die-casting. The unit plays all four speeds, and you can intermix 7", 10", or 12" records of any one speed to your heart's content. Weighing less than seven pounds, the UA16 changer plays either mono or stereo discs and it can be operated either manually or automatically. . . . A valuable accessory to any stereo console is the "Satellite" speaker system developed by **Electrohome of Canada.** Although



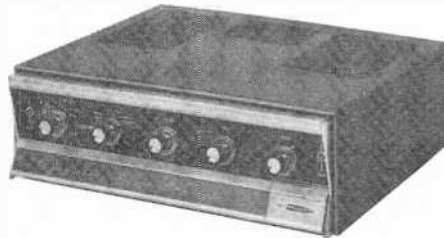
Electrohome's satellite speaker system

it looks much like a small table lamp, this compact unit contains a 6" mid-range speaker and a horn-type tweeter. Placed at either side of your console, the "Satellite" radiates high frequencies upward and outward throughout the room; low-frequency sounds, on the other hand, basically non-directional, continue to emanate from the console's "woofers." Since both speakers in the "Satellite" face upwards and there is a diffusing cone above each one, they effectively

radiate a "fountain of sound" in a 360° circle; and a treble-level control permits adjusting the output to meet room acoustical requirements. The "lamp" model (illustrated) lists for \$49.95; another model, housed in a smart-looking perforated metal canister, sells for \$27.95. . . . Buy **Ferro-**

dynamics' color-coded "signal" reels for your tape recorder, and you'll never again wonder which side is "up." Available in both 3" and 7" sizes, the reels are supplied in packs of six—one red and five green. Tape is wound on a green reel, then transferred to the red reel as it is being played on your recorder. Thus, whenever you see tape on the red reel, you know that it must be rewound or turned over before being played again. Prices are \$8.95 for the 3" reels and \$13.95 for the 7" variety.

One of the most advanced amplifiers in the hi-fi field (its completely solid state), **Heath's** new AA-21 contains 28 transistors and 10 diodes for smooth response (within 1 db) from 13 to 25,000 cycles at 35 watts per channel (IHF_M rating is 50 watts per channel). Available both as a kit



Heath AA-21 Stereo Amplifier

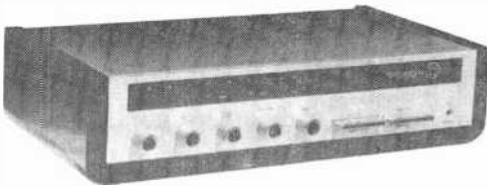
and factory-wired (AAW-21), this superbly engineered unit features a transformerless output circuit and multiple feedback loops for finest fidelity. All controls are front-panel-mounted, and five fast-acting "bi-metal" circuit breakers mean that you'll never have to replace a fuse. Controls include a 5-position dual concentric input selector, a 5-position mode selector, and dual concentric volume, bass, and treble controls. Concealed behind a hinged lower front panel are a tape monitor switch, a loudness switch (to convert the volume control to a loudness control for compensated low-level listening), a speaker phase reversal switch, and all input level controls. If you decide to build the AA-21, you'll find that its five circuit boards eliminate most of the conventional point-to-point wiring. In addition, the preamplifier circuits themselves are "capsulated" in six epoxy-covered modules, all factory-wired and sealed, ready for installation on the circuit board. The AA-21 kit sells for \$134.95 and the fully wired unit (AAW-21) is priced at \$219.95 (both prices f.o.b. Benton Harbor, Mich.) . . . The AD-22 stereo tape recorder kit, another new item from Heath, can be used as part of your stereo/hi-fi system or as a portable recorder, and for recording and playing back 4-track stereo tapes or for playing mono tapes. Its heavy, die-cast frame is extremely rigid, and a test tape is included for head

*Write to the manufacturers listed at the end of this column for more data on products mentioned

alignment to insure optimum frequency response. A digital counter guarantees easy tape cueing, and two VU-type meters enable you to set record and playback levels with test instrument accuracy. Its four-pole motor provides either 7½ or 3¾ ips speeds at the push (or pull) of a knob, and there are individual bias-adjust and meter-calibrate controls for final circuit adjustments. The complete recorder kit (the AD-22) sells for \$179.95, while the tape deck only (no electronics) is available as the AD-12 for \$124.95; a sturdy luggage-tan carrying case for the AD-22 is priced at \$37.50.

The "Citation A" all-transistor professional stereo control center from *Harman-Kardon* provides features and performance to satisfy even the most demanding audio perfectionist. Flat from 1 cycle to the megacycle region, it is said to produce unmeasurable harmonic distortion at 2 volts output between 20 and 20,000 cycles. There are two power switches rather than the usual single switch—one controls the power for the basic amplifier, while the second governs the preamp and associated equipment. Other controls include function, mode, equalization, tone, balance, channel reverse, low-cut, high-cut, and tape monitor. Among the special features are a push-button selector switch, a stereo headphone receptacle, and a "tape head" control to "trim" equalization for any tape head regardless of age or make. A 33-transistor unit, the Citation A is priced at \$249.95 in kit form, \$349.95 factory-wired and tested.

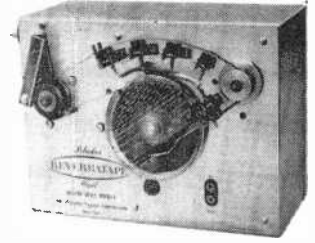
Omega's Model 1650 all-transistor FM/stereo tuner is a perfect match for the company's all-transistor 60-watt stereo



Omega 1650 FM/Stereo Tuner

amplifier; tubes have disappeared even from the tuning eye. The tuner is housed in sleek modern cabinetry: ebony, oiled walnut, and mahogany cabinets are available, along with mounting rings for custom installations. Price, \$249.00. . . . Splicing 4-track stereo tape can be a mighty critical operation, but *Robins Industries'* latest addition to the Gibson Girl line—the TS-8D "Stereo 4" tape splicer—makes it as easy as 1, 2, 3. The TS-8D's blades are preset at the factory to minimize contact with "live" tape surfaces, and an adjustment mechanism enables you to keep the blades in perfect alignment. Ideal for use with any standard

¼" tape, the TS-8D lists at \$11.50. . . . Here's a reverberation device that can be installed in any electronic organ, regardless of brand or size. Designed to make even the smallest electronic organ sound like a pipe instrument, *Schober's* "Reverbatape" contains no springs. Instead, it makes use of a small tape-recorder mechanism with a continuous loop of tape and multiple playback heads. The result, thanks to some special circuitry, is a series of carefully spaced repetitions of sound which blend to give the characteristic gradual decay. A control enables you to vary reverberation to suit any type of music in virtually any room or auditorium. And installation should present no problem: you simply place the unit in the organ



Schober "Reverbatape"

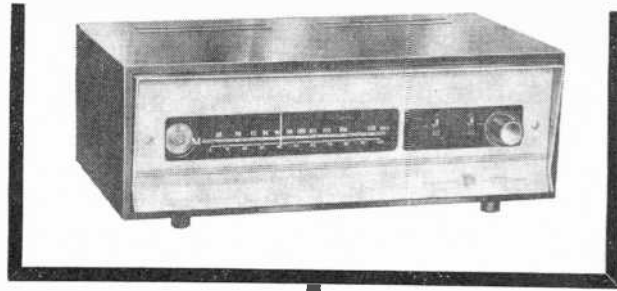
console, connect it with a tube socket adapter, and the sound will continue to come from the organ's own speakers. Price, \$299.95. . . . *H. H. Scott's* new FM/stereo tuner has just about everything—even an "electronic brain." Tune in an FM/stereo broadcast, and the 4310 automatically adapts itself for multiplex reception. But if you're receiving in a "fringe" area, the tuner will switch itself to monophonic FM reception whenever the signal falls below a predetermined "interference threshold"—which you set by means of a unique "threshold control." When the interference clears up, the tuner instantly switches itself back to FM/stereo. Ten separate front-panel controls, including separate level controls (and separate vu meters) for each channel, cover almost every conceivable function. An automatic noise suppressor cuts inter-channel "hish," and a sensitivity meter simplifies antenna orientation and makes for perfect tuning. Equipped with a silver-plated cascade front end, the 4310 employs 22 tubes and is available in a rack-mounted model for broadcast-station use. Price of the new tuner, \$475.00.

BSE (USA) Ltd., College Point 56, N.Y.
Electrohome of Canada Ltd., Kitchener, Ont., Canada
Ferrodynamics Corp., Gregg St. & Rte. 17, Lodi, N.J.
Harman-Kardon Inc., Plainview, L.I., N.Y.
Heath Co., Benton Harbor, Mich.
Omega Electronics Corp., 10017 North 19 Ave., Phoenix 21, Ariz.
Robins Industries Corp., 36-27 Prince St., Flushing, N.Y.
Schober Organ Corp., 43 W. 61st St., New York 23, N.Y.
H. H. Scott Inc., 111 Powder Mill Rd., Maynard, Mass.



**Hi-Fi LAB
CHECK**

*(Continued
from page 45)*



PACO ST-26 FM Tuner/Amplifier Kit

Manufactured by Paco Electronics Co., 70-31 84th St., Glendale 27, N. Y.

Prices: \$54.95 (kit); \$69.95 (factory-wired); plus \$14.95 (walnut case), or \$4.95 (black and gold metal case); kit sold without power stage as Model ST-25.

THE ST-26 is also something quite new in hi-fi kits. An economical FM tuner/amplifier, it is meant for use with an external speaker. The choice of speaker system is pretty much up to you—and depends on whether you are building the kit as a “second” FM receiver or as a low-cost music system.

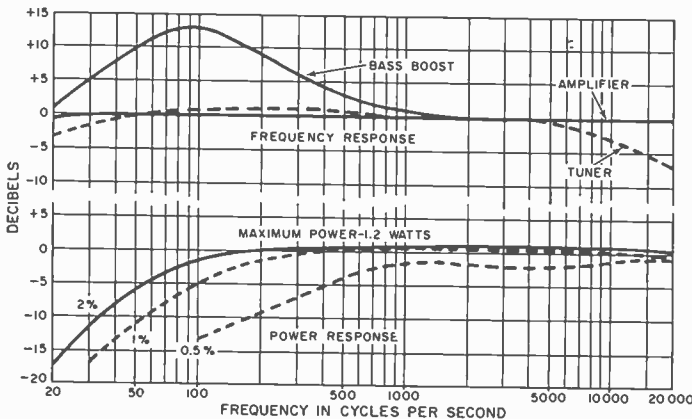
This is a “you do practically everything” kit—including the mounting of sockets, tie points, jacks, etc. Assembly and wiring are not difficult, and the instruction manual is clear. But we do suggest that you pay close attention to the manufacturer’s “addenda” sheets to eliminate all possible confusion.

Alignment of the FM tuner section (any tuner kit, regardless of brand, should be aligned after completion) can be accomplished solely with the aid of the set’s “magic eye” tuning indicator. No complicated instruments are re-

quired to achieve satisfactory performance with good limiting. Instrument alignment will add a bit more sensitivity.

Two identical ST-26’s were built in the P.E. labs—one by an experienced constructor, the other by a neophyte. Construction time for the experienced man was about 13 hours; that for the neophyte was a bit longer. Both units worked as soon as they were plugged in.

CIRCUIT REPORT: The ST-26 is sold with a factory-wired, prealigned and sealed front end. A dual triode (ECC85/6AQ8) is used in this sealed unit as a low noise r.f. stage and self-oscillating mixer. A.f.c. voltage is fed to a voltage-variable solid-state capacitor for drift correction. There are two 10.7-mc. i.f. stages with partial limiting in the second stage and full limiting in a separate stage. The first i.f. stage uses a 6BA6, the second a



Response of the amplifier alone is shown in top half of this graph (solid line); bass boost involves special wiring connection and is not adjustable from front panel. (Dashed line indicates response of entire unit.) Lower part of graph shows power response curves for three harmonic distortion figures.

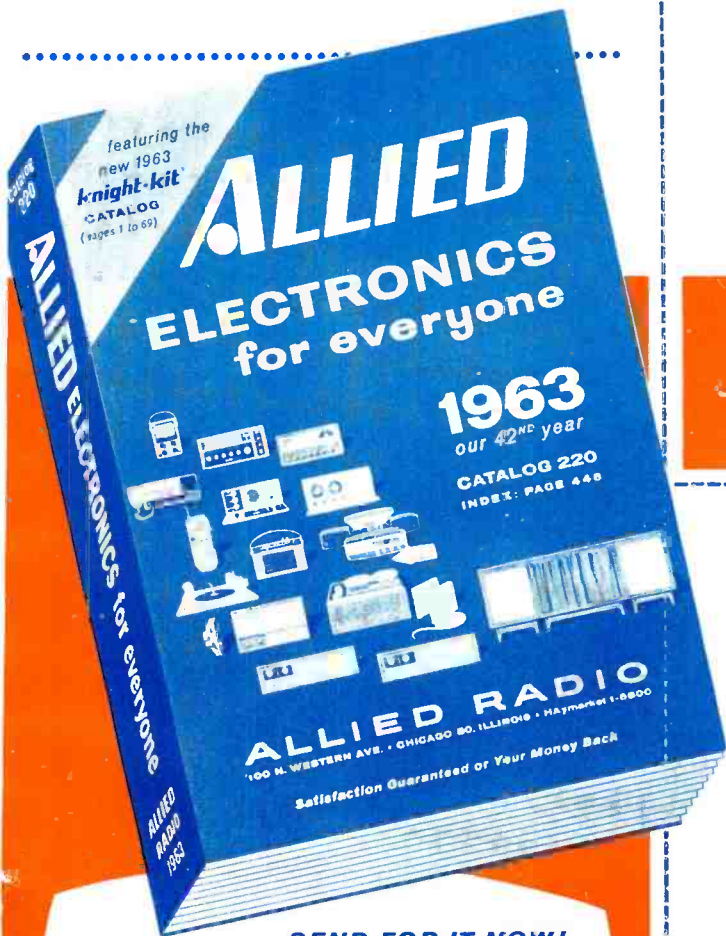
Free

SEND TODAY FOR
MONEY-SAVING
464-PAGE

mail
now

ALLIED

1963 CATALOG



SEND FOR IT NOW!

WORLD'S LARGEST ELECTRONICS CATALOG
BIGGEST SELECTION • BIGGEST SAVINGS!

satisfaction guaranteed or your money back

NO MONEY DOWN: OVER 50% MORE BUYING POWER
WITH YOUR ALLIED CREDIT FUND PLAN

SEE
OTHER
SIDE

For your FREE 1963 ALLIED Catalog, fill in card, detach and mail. (Please give second card to an interested friend.)

SEND
CARD
TODAY

mail
now

Name
PLEASE PRINT

Address

City

State

Zone

131J



YOUR Free
ALLIED
1963 CATALOG

Name
PLEASE PRINT

Address

City

State

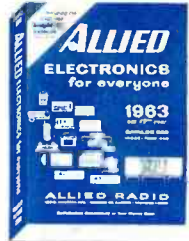
Zone

131J



YOUR Free
ALLIED
1963 CATALOG

Free SEND CARD TODAY FOR YOUR 464-PAGE



mail now

ALLIED
1963 CATALOG

WORLD'S LARGEST • BIGGEST SELECTION • BIGGEST SAVINGS!

TO:
ALLIED RADIO
100 N. WESTERN AVE.
CHICAGO 80, ILL.

PLACE
STAMP
HERE

TO:
ALLIED RADIO
100 N. WESTERN AVE.
CHICAGO 80, ILL.

PLACE
STAMP
HERE

NEW

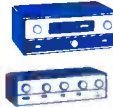
1963 Knight-Kits®



Over 100 great do-it-yourself kits: Hi-Fi, Hobby, intercom, Amateur, Citizens Band, Instrument—savings up to 50%.

NEW

Stereo Hi-Fi



Complete selection of components and systems; latest all-transistor equipment and Stereo Multiplex FM.

NEW

Tape Recorders



Complete recorders, tape decks, recording and pre-recorded tapes at big savings.

NEW

Citizens Band Radios



Latest 2-way radio—no exam required—a complete selection of top-value CB equipment, including Walkie-Talkies.

NEW

Transistor, FM-AM Radios



Best buys in all types of compact transistor radios, including quality FM-AM portables.

NEW

Phonographs & Records



Big values in phonographs; latest stereo portables; famous-brand records at amazing discounts.

NEW

Test Equipment



Save on every type of instrument for home or professional use—all leading makes available.

NEW

Ham Station Equipment



Largest selection of receivers, transmitters, antennas—everything in Ham station gear.

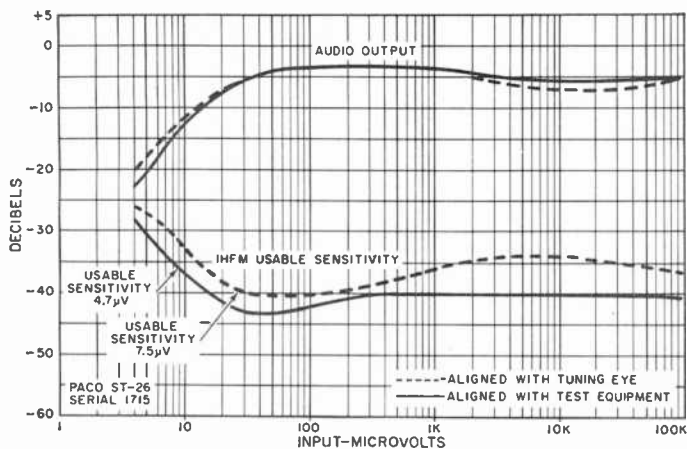
- PA Systems & Intercoms • Power Tools, Soldering Guns, Hardware
- TV Tubes, Antennas; Parts, Tubes, Transistors, Books

satisfaction guaranteed or your money back

NO MONEY DOWN: Over 50% More Buying Power with Your Allied Credit Fund Plan

mail now

FREE MAIL CARD TODAY
for your 1963 Allied Catalog
AND GIVE THIS CARD TO A FRIEND



Sensitivity figures were obtained by the Hirsch-Houck Laboratories using the standards established for FM tuners by the Institute of High Fidelity Manufacturers (IHFM). Maximum output for the ST-26 was found to be 1.65 volts.

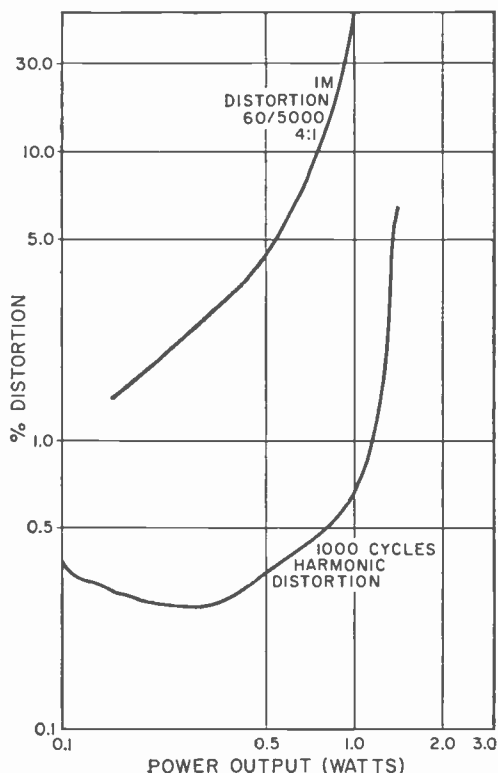
The single-tube audio stage of the ST-26 is not a powerhouse, but it does provide more than enough power (0.3-0.5 watt) at low distortion to drive a high-efficiency speaker system.

6BC5, and the full limiter is a 6AU6. Ratio detection using a 6BN8 follows the limiter; the triode section of the 6BN8 serves as an audio voltage amplifier. The Model ST-26 has an ECL86/6GW8 audio power amplifier with 4-8 ohm speaker output—a feedback loop around this stage provides optional bass boost. Provisions are made to permit multiplex take-off from the detector, to feed a high-output phono cartridge through the audio stages, and to use the FM tuner section with an external amplifier.

HIRSCH-HOUCK LAB CHECK: Sensitivity of the ST-26 is quite close to the manufacturer's advertised claim of $4.0 \mu\text{v}$., showing it can be achieved by using simple test equipment to align the tuner. Maximum output reached 1.2 watts (better than manufacturer's claim of at least 1 watt—see graph). The output voltage is reasonably constant (regardless of whether instrument or tuning-eye alignment is used) from $25 \mu\text{v}$. through 100,000 μv .

The manufacturer obviously does not intend the audio amplifier in this tuner/amplifier combination to produce powerhouse audio. Nevertheless, the response is flat, and if it is used with a high-efficiency speaker, where more than enough volume results from $\frac{1}{4}$ to $\frac{1}{2}$ watt drive, the ST-26 has very reasonable IM and harmonic distortion figures.

IN CLOSING: Successful use of the ST-26 depends entirely on a clean, high-efficiency speaker system. Fitting this cate-



gory are dozens of so-called "bookshelf" speakers employing the ducted-port or bass-reflex principle. Bass boost may or may not be needed (or desirable), and the constructor should try the tuner/amplifier both ways.

Considering the price and ease of assembly, the ST-26 makes a good "second" FM receiver. Or you can use its audio section with a record player as a good low-cost music system.

On the Citizens Band

(Continued from page 82)

nect up the squelch unit. For best results, a 50-ohm, ganged potentiometer should be used, but since these are difficult to obtain, you can make do with two 50- or 25-ohm units, put knobs on them, and set each to approximately the same position. The proper setting of the potentiometer is where almost all background hiss will be eliminated (squelch "open").

Club Notes. The Cereal City Citizens Band Club (Battle Creek, Mich.) avoided possible chaos by providing communications for the city's annual "Parade of Parades" recently. More than 50,000 persons saw the 140 marching units in

Potentiometer Quiz Answers

(Quiz on page 86)

Many experimenters can intuitively come up with the correct answers to this quiz by examining each circuit, visually moving the potentiometer wiper arm, and estimating the output voltage. "E." In a sense, they plot the curves. You can do the same thing either by setting up the circuit on your workbench and measuring the voltage out as the wiper arm is rotated, or by mathematically computing the output voltage.

The computations and plotting of the curve for each problem can be easily done by drawing equivalent circuits for different positions of the potentiometer's wiper arm. In most cases, only five positions are needed. They are for wiper arm settings of zero (at point "1"), $\frac{1}{4}$ turn, $\frac{1}{2}$ turn, $\frac{3}{4}$ turn and a full turn (at point "2"). Remember that all of the resistors and linear potentiometers have equal resistance value, and that a potentiometer set at $\frac{1}{4}$ turn will have one-quarter of its resistance between terminal 1 and the wiper arm and the remainder between the wiper arm and terminal 2. Potentiometers with center taps are just like the others except that the center tap permits connection to the mid-point of the potentiometer's resistance, which occurs at $\frac{1}{2}$ turn of the wiper arm.

If you have a good sixth sense, or your computations are correct, you will agree with the answers given below.

1-D	3-B	5-F	7-E
2-G	4-C	6-H	8-A

the parade. A tip 'o the hat to the breakfast-food boys! (Contact Richard J. Kline, 27 Richards Place, Battle Creek, if you'd like more information about this club.) . . . The Southern California Citizens Band Assn. (P. O. Box 17296, San Diego 17, Calif.) plans to name a "Mr. CB'er." He (or if it turns out to be a she—"Miss" or "Mrs." CB'er) will have to be, in general, a courteous person on and off the air in addition to having good operating skills. This is an excellent kind of promotion for any club to have. . . . A new club is the North Area Emergency Radio Team (NAERT), 4507 N. Charlotte, Kansas City, Mo. This group maintains a continuous "watch" on channel 21, and guarantees to help motorists stranded in the area—even at 3:30 a.m.! . . . Ever think about starting a club for walkie-talkie owners? They've done just that down in Cumberland, Md. Although walkie-talkies are unlicensed, and communications between them and regular CB'ers is forbidden, there are a lot of them around. The Cumberland "Walkie Talkie" Club boasts 34 members and has received good local press coverage. Wonder how many members will fill out "505" once the radio bug bites them. . . . "Coffee breaks" (informal club gatherings at a neighborhood eatery) seem to be an important activity for members of the Greater Dallas Citizens Band Club. Perhaps that is one of the reasons why its members seem to work together so smoothly; these informal get-togethers can turn a "guy with a call sign" into a good friend.

-50-

Computers Can Think

(Continued from page 72)

throw (4-p.d.t.) relays can be used with the coils of both relays connected in parallel.

There's Much More. You have just read how a problem in logic can be converted from a written thought into a schematic diagram; and if you care to build the simple computer, you will have converted thoughts into "hardware." Naturally, there are many more basic logical operations that cannot be covered here. Your

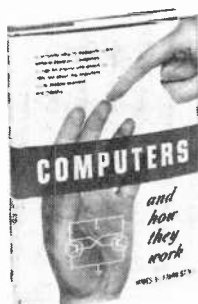
The most informative books for the experimenter and electronic hobbyist



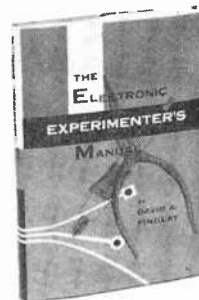
VACUUM-TUBE CIRCUITS FOR THE ELECTRONIC EXPERIMENTER by Julian M. Sienkiewicz. At last in one book—all the basic diagrams, schematics, and other vital information on vacuum-tubes and their circuits. 192 pgs. 100 illus. **\$4.95**



CLASS D CITIZENS RADIO by *Leo G. Sands*
The first complete book on the two-way radiotelephone. Its history, rules, how it works, applications, equipment, receiver circuits, transmitters, antennas, installations, illus. **\$4.95**



COMPUTERS AND HOW THEY WORK by *James D. Fahnestock*
A fact-filled guidebook to electronic computers. More than 110 illus. easy-to-follow tables in nine sections will help you understand all major types of computing mechanisms. **\$4.95**



THE ELECTRONIC EXPERIMENTER'S MANUAL by *David A. Findlay*
With this guide you can put theory into practice. Learn about every component used in experimentation, every tool, its function and why it is used. A perfect guide to professional know-how. **\$4.95**

USE THIS HANDY ORDER FORM

ELECTRONICS BOOK SERVICE—A. S. Barnes & Co. Inc.
151-51 Seventh Avenue, Whitestone 57, N.Y. PE 61A

Please send me the books I have checked below:

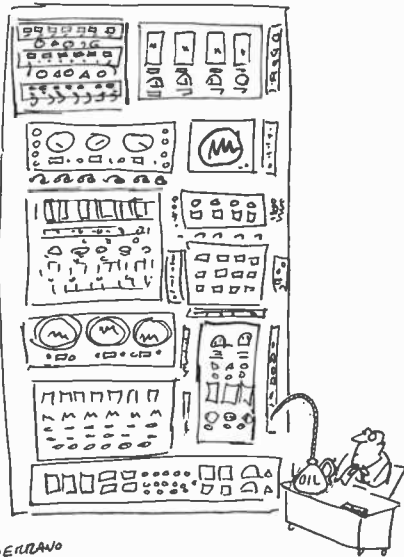
I enclose \$ _____ (You pay all postal charges.) Send C.O.D. (I pay charges)

- ___ copy (ies) VACUUM-TUBE CIRCUITS FOR THE ELECTRONIC EXPERIMENTER \$4.95
 ___ copy (ies) CLASS D CITIZENS RADIO \$4.95
 ___ copy (ies) COMPUTERS AND HOW THEY WORK \$4.95
 ___ copy (ies) THE ELECTRONIC EXPERIMENTER'S MANUAL \$4.95

NAME _____

ADDRESS _____ CITY _____ ZONE _____ STATE _____

If I am not fully satisfied I can return these books in seven days for a full and prompt refund.



SERIANO

local public library or book store can be the source of a wealth of information which will open the growing new world of computers to you.

If you want to program a computer while you are learning, you may be interested in a "training" computer—the Minivac 601—a unique digital device made by the Scientific Development Corporation, 370 Main Street, Watertown, Mass. Designed to be programmed by the user, the Minivac 601 can be employed to set up the circuit in Fig. 5. Six instruction books supplied with the 601 are undoubtedly the finest beginner's guide to understanding computers.

-30-

Transistor Topics

(Continued from page 80)

exact) we described in this column two portable transistorized oscilloscopes which were being manufactured by Tektronix, Inc. (P. O. Box 500, Beaverton, Ore.) and EI Labs (1165 Morena Blvd., San Diego, Calif.) respectively. During the intervening months, a number of other firms have developed and introduced transistorized 'scopes of their own design. Here's a quick review of the new units.

What is claimed to be the "world's first solid-state automatic digital oscilloscope" is now being offered by California Instruments Corp. (3511 Midway Dr., San Diego 10, Calif.). Identified as

the Model 5000 automatic oscilloscope, it uses a 5" CRT and features a vertical amplifier with a bandwidth of 0 to 10 mc. and a maximum sensitivity of 50 mv./cm. Other features include automatic sweep speed, automatic d.c. positioning, automatic vertical sensitivity, and a digital readout on Nixie indicators. Measuring 14" x 8 $\frac{3}{4}$ " x 22" and weighing approximately 20 lb., the Model 5000 sells for a "whopping" \$1975.00.

Galaxy Laboratories, Inc. (3606 Midway Dr., San Diego 10, Calif.) is producing a portable transistorized oscilloscope with a vertical bandwidth of 0 to 15 mc. and a maximum sensitivity of 10 mv./division. Model 3015, measuring 7" x 8" x 14" overall and weighing 16 lb., is designed for operation on 105-125 volts, 60-400 cycles a.c., and draws about 15 watts. It sells for \$950.00.

A husky, "militarized" transistorized oscilloscope is being offered by the Electronic Tube & Instrument Division of General Atronics Corp. (1200 E. Mermaid Lane, Philadelphia 18, Pa.). Featuring a vertical bandwidth of 0 to 6 mc. and a maximum sensitivity of 0.01 volt/division, the Model K-106 measures 8 $\frac{3}{4}$ " x 6 $\frac{1}{2}$ " x 14" overall and weighs 23 pounds. It is equipped with a special snap-on front cover which protects the controls and CRT, and also provides space for such accessories as probes, connectors, and cables.

Allen B. DuMont Laboratories (750 Bloomfield Ave., Clifton, N. J.), a long-established name in the oscilloscope field, has introduced a "family" of solid-state 'scopes. They are available in rack-mounted, bench, and portable versions, and feature plug-in vertical amplifiers and time base (sweep) generators. Both single- and dual-channel vertical amplifier units are offered, along with a full range of accessories such as probes, cables, camera, and so on.

The DuMont instruments are somewhat larger than the other solid-state 'scopes now on the market, measuring (in the portable version) 8 $\frac{1}{8}$ " x 17 $\frac{3}{4}$ " x 24" overall and weighing 27 pounds. Prices naturally vary with the plug-in amplifiers and generators you select. As an example, the basic portable oscilloscope, Model 765, sells for \$645.00. A single-channel vertical amplifier, Model 7601, adds \$385.00 to the basic price,

while the addition of a Model 7403 time base generator costs you \$345.00 more.

Generally speaking, then, transistorized 'scopes meet a definite need, but they are still priced well beyond the reach of service technicians, hobbyists, and experimenters—except for those few individuals who have oil wells in their backyards!

Product News. A new series of 1-watt zener diodes is in production at International Rectifier Corp. (233 Kansas St., El Segundo, Calif.). Designated as Types 1N3016 to 1N3051, the diodes have voltage ratings from 6.8 to 200 volts, maximum current ranges from 3 to 100 ma., and are available in 5%, 10%, and 20% voltage tolerances.

Electrosolids Corp. (12740 San Fernando Rd. N., Sylmar, Calif.) is merchandising a unique transistorized device dubbed the Model 4000 "Son-r-lure." When the unit is placed in the water near a fishing boat, it generates a buzzing signal which attracts game fish. It sells for \$8.95.

Once more, we must close. But as the "Bums" used to say, "Wait 'til next year"—or rather, next month!

—Lou

The 440 Fork

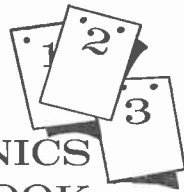
(Continued from page 65)

which should continue for as long as the power remains on. If the signal isn't sustained, move the two coils closer to the tuning fork. Also, recheck the hook-up of these coils for proper phasing; if necessary, try reversing the leads to one coil or the other—not both!

Once you've obtained a continuous signal, turn the power off for a few seconds and then switch it back on. Note the length of time it takes before the signal builds up to full strength again, then adjust the position of the coils for the fastest start-up time.

With a sustained vibration of the tuning fork and a continuous 440-cycle sine-wave signal at its output jack, your tuning fork oscillator is now ready for use in any one of many possible applications.

—30—



ELECTRONICS DATEBOOK

- AUG. 31-SEPT. 9**
World's Fair of Music and Sound
McCormick Place, Chicago, Ill.
- SEPT. 1-3**
National ARRL Convention
Memorial Coliseum,
Portland, Oregon
- SEPT. 11-13**
EIA Fall Conference
Biltmore Hotel, New York, N.Y.
- SEPT. 13-14**
Engineering Management
Conference
Hotel Roosevelt, New Orleans, La.
- SEPT. 13-14**
Engineering Writing and
Speech Symposium
Mayflower Hotel, Washington, D.C.
- SEPT. 19-20**
Industrial Electronics Symposium
Hotel Sheraton, Chicago, Ill.
- SEPT. 28-29**
Broadcast Symposium (IRE)
Willard Hotel, Washington, D.C.
- OCT. 2-4**
National Symposium on Space
Electronics & Telemetry
Fontainebleau Hotel,
Miami Beach, Fla.
- OCT. 2-6**
New York High Fidelity Music Show
Trade Show Bldg., New York, N.Y.
- OCT. 7-12**
American Institute of Electrical
Engineers Fall General Meeting
Pick-Congress Hotel, Chicago, Ill.
- OCT. 8-10**
National Electronics Conference
and Exhibition (NEC)
McCormick Place, Chicago, Ill.
- OCT. 15-19**
Audio Engineering Society Fall
Convention & Exhibit
Barbizon-Plaza Hotel,
New York, N.Y.
- NOV. 28-DEC. 2**
International Communications Fair
New York Coliseum, New York, N.Y.

The Master Magnet

(Continued from page 52)

available, copper best meets that requirement.

Electrical Hookup. If the a.c. line is connected between terminals 1 and 2 of the magnet coil (see Schematic "A"), current consumption will be in the neighborhood of 20 amperes—a bit excessive for use around the house. Connecting terminals 1 and 3 (Schematic "B") results in a current flow of about 4.25 amperes, but the strength of the magnet is reduced proportionately. In both cases, however, the current performs little useful work because, in this inductive circuit, it lags about 90° behind the voltage.

The lag can be partially offset by adding an 80- μ f. phase-shifting capacitance as shown in the modified parallel-resonant circuit of Schematic "C." The current drawn from the line is then about 4 amperes, while the currents flowing between terminals 1 and 2 and terminals 2 and 3, respectively, are 18.5 amperes and 9 amperes. This hookup results in a more powerful magnetic field than that of either Schematic "A" or Schematic "B."

Maximum magnetic pull is obtained with the series-resonant circuit illustrated in Schematic "D." In this case, 17 amperes flows through the whole coil; and the magnet will hold six or more half-dollar coins, or an equivalent weight of any other non-ferrous metal, at one time.

The 80- μ f. capacitance specified in Schematics "C" and "D" is built up by paralleling several smaller capacitors. These must be of the non-electrolytic type, with ratings of at least 250 volts if connected as in Schematic "C" or 600 volts if connected as in Schematic "D." Such capacitors are available for the least money in surplus stores—where they are usually easy to find. Units totaling less than 80 μ f. could be employed, provided that they have the proper voltage ratings, but the current flowing through the magnet winding would be reduced.

Since high voltages appear across the

capacitors, and since they are apt to retain their charge after being disconnected from the line, it's best to enclose them in a wooden or metal box. As an added precaution, the capacitors should always be discharged with a tool having an insulated handle before any work is done on the circuit.

Because of the peculiarities of the magnetic field around the copper washers, the magnet will not attract pieces of non-ferrous metals narrower than the inside diameter of the washers or wider than their outside diameter. Designing an electromagnet to attract pieces of metal narrower or wider than the range covered by this unit might be an interesting project for you experimenters.

A final word of caution: since the washers carry considerable current, they get quite hot under prolonged use. Heating can be kept to a minimum if the magnet is connected to the line only when necessary.

-50-

The Lodestar

(Continued from page 42)

Masonite cross-member, and the sensing coil is ready for "prospecting!"

Trying It Out. No tricky adjustments are necessary to put the unit into operation. Set the tuning capacitor at about half-capacity, then adjust the tuning slug in coil L_2 until the "zero beat" is heard in the phones. Disregard any minor beats or whistles you may hear—the main beat-note signal will be very pronounced. If you have any doubt about the oscillators functioning, a quick excursion through the 1000-kc. region on an ordinary AM receiver will serve as an easy check.

Incidentally, capacitor C_5 , which couples the signal from the search oscillator to the mixer input, actually doesn't appear in the author's model—the proximity of this oscillator to the mixer induced enough coupling. Should additional coupling be necessary in your layout, simply install a "gimmick" capacitor for C_5 . The gimmick can consist of two 1" lengths of hookup wire which are twisted together.

-50-

Short-Wave Report

(Continued from page 62)

Current Station Reports

The following is a resume of current reports. At time of compilation all reports are as accurate as possible, but stations may change frequency and/or schedule with little or no advance notice. All times shown are Eastern Standard and the 24-hour system is used. Reports should be sent to P. O. Box 254, Haddonfield, N. J., in time to reach your Short-Wave Editor by the eighth of each month; be sure to include your call letters and the make and model number of your receiver.

Afghanistan—According to the latest information, *R. Afghanistan* is scheduled as follows: in Eng. to the Far East on 15,225 kc. at 0530-0600, and to S. E. Asia and Indonesia on 15,135 kc. at 0600-0630, with the Third Program on 4040 kc. at 0900-0930; in Urdu on 4040 kc. at 0830-0900; in Russian on 9705 kc. at 1230-1300; in Arabic on 15,225 kc. at 1300-1330; and in French to Europe on 15,225 kc. at 1330-1400.

Andorra—*R. Andorra* is noted on 6195 kc. from 1640 to 1800 s/off with music and ID's in Eng., French and German. Reports go to: *R. Andorra*, Post Box #1, Principality of Andorra.

Australia—Melbourne is being heard in French at 0030-0130 on 15,180 kc., in Eng. on 17,820 kc. at 2329-0045. *R. Australia* is heard well at 0600-0915 on 9570 and 11,710 kc.

Austria—OEI64, Vienna, has been noted on 15,305 kc. with Eng. anmt, then native language; music to 2027; followed by weekly report. The schedule reads: to N.A. on 6155 kc. at 1800-2300; on 9770 kc. at 2000-2300; and on 15,305 kc. at 1800-2100.

Belgium—Brussels operates to N.A. at 1100-1145 on 11,850 kc., at 1615-1800 on 11,805 kc., and at 1815-2000 on 9705 kc. There is an Eng. mailbag on Saturdays at 1900.

Bolivia—One of the few Bolivians currently active is *R. Nacional*, La Paz, 5860 kc., heard in S. America from 2110 with a Spanish request program and some time checks. There is an ID at 2134.

Brazil—The following listing represents changes in Japanese language programming from Brazil: *R. Clube de Marilia*, 3255 kc., at 1800-1900; *Bauru R. Clube*, 3275 kc., at 1800-1915; *R. Presidente Prudente*, 3335 kc., at 0700-

NRNC Dinner

The Annual Dinner of the Newark News Radio Club will be held on Saturday, October 13, at "The Cabin In The Sky," Atlantic Highlands, N. J. You do not have to be a club member to attend. Tickets (at \$5.00 each) may be obtained from your Short-Wave Editor.

POWERFUL NEW CIRCUIT

JUST 3" HIGH



First Miniaturized
TWO-WAY RADIO!

\$ 24.88

each postpaid with batteries
Two for \$44.88

SPACEPHONE—FITS IN POCKET! Latest two-way American made Walkie-Talkie sending and receiving set. Completely wireless. Each unit contains microphone — loud-speaker, 9-volt transistor radio battery, 48" collapsible antenna. Latest transistorized transmitting and receiving circuits. Range 1/2 mile. Citizen's band — NO LICENSE, NO EXAM, ANY AGE.

IN DO-IT-YOURSELF KIT FORM \$11.88 ea. Two for \$24.88. All parts, components, photograph, identification sheet, manual, circuit board, case, antenna all complete.

Produced by leading space satellite company. Spacephone does same job as equipment costing from \$89 to \$195 per pair. TO ORDER: Enclose check, cash or M.O. for postpaid shipment. \$5 deposit per unit for C.O.D. 10-day money-back guar. Dealers inquire. Calif. reg. add 4% state tax.

730 San Fernando Road
San Fernando 108, California

B. S. DEGREE IN 36 MOS.

INDUSTRY AND GOVERNMENT NEED 50,000 NEW ENGINEERS EACH YEAR! Accelerated year-round program puts you in the job-market a whole year early! Accredited. Aeronautical, Chemical, Civil, Electrical, Mechanical, Electronics, Math, Chemistry, Physics. Also diploma in Engineering in 27 months. Quality instruction; widely recognized. Graduates employed from coast to coast. Self-help program. Moderate rate. Start Sept. Jan., March, June. Catalog: 1614 E. Washington Blvd., Fort Wayne 2, Indiana.

INDIANA TECHNICAL COLLEGE



ARTISAN ORGAN "King of Kits"

- The ultimate in organ tone & styling
- Skip dealer profits and factory labor
- Pay as you build & play as you build
- No previous technical skill required
- The original build-it-yourself organ
- Choice of models from \$1750 to \$5500

Write today for details

4949-P York Blvd., Los Angeles 42, Calif.

GET INTO ELECTRONICS

V.T.I. training leads to success as technicians, field engineers, specialists in communications, guided missiles, computers, radar, automation. Basic & advanced courses. Electronic Engineering Technology an ECPD accredited Technical Institute curriculum. Assoc. degree in 29 mos. B.S. obtainable. G.I. approved. Start Sept., Feb. Dorms, campus. H.S. graduate or equivalent. Catalog.

VALPARAISO TECHNICAL INSTITUTE
Dept. PE VALPARAISO, INDIANA



\$3 TO \$5 AN HOUR REPAIRING ELECTRIC APPLIANCES

FREE BOOK tells about profitable spare-time or full-time business. 400 MILLION Appliances now in use. People need them fixed. YOU make good money doing it — right at home! Easy course trains you for top earnings. At no extra charge you get Appliance Tester. Get FREE Book, FREE Sample Lesson! make good money doing it — Mail coupon now.

FREE BOOK

FREE LESSON

NATIONAL RADIO INSTITUTE, Appliance Division
Dept. D4JZ, Washington 16, D. C.

Send Free Book, Free Appliance Repair Course Lesson.

Name.....

Address.....

City.....Zone...State.....

0730; *R. Brasil*, 4755 kc., at 0400-0500 and 1515-1545; *R. Emissora de Piratininga*, 6025 kc., at 0330-0500 and 1800-1900; *R. Emissora de Paranaense*, 9545 kc., at 0550-0700; and *R. 9th of July*, 9620 kc., at 0415-0500, 1000-1100, and 1700-1730.

Bulgaria—Sofia broadcasts Eng. to Africa at 1130-1155 on 15,330 and 17,800 kc. and at 1505-1530 on 11,850 and 15,330 kc.; to the United Kingdom at 1630-1700 on 9700 and 6070 kc. and at 1430-1500 on 9700 kc.; to N.A. at 2000-2030 and 2300-2330 on 9700 kc. There is a daily concert to N.A. and the United Kingdom at 1835-1900 on 9700 kc.

Chile—When conditions prevent reception of *R. Australia* on 11,740 kc. around 1100, a



Bruce Alan Coleman, WPE2GNX, of Westfield, N. J., tells us that he does his DX'ing with a Hallicrafters S-38EB and "great patience." Now 13, Bruce became interested in short-wave radio about a year and a half ago. His QSL card total is up to 29.

check of the frequency may turn up *R. Nuevo Mundo*, Santiago. It has been heard only once in the mid-west with opening in Spanish at 0100.

Colombia—HJFN, *R. Neiva*. Neiva, has moved from 4855 to 4869 kc., where it is noted from 2253 to 2357 s/off with Latin American music. Reception on the new channel suffers from severe teletype QRM.

Cuba—Havana has been noted broadcasting to N.A. at 2200-0100 on 11,840 kc., a new channel which replaces 5990 kc., and is dual to 11,875 kc. Also noted on 11,962 kc. at 1245 with music, 1253 with ID and address. Another possible new channel is 11,920 kc., noted from 0130 with talks in Spanish.

Czechoslovakia—Prague has changed the times of the N.A. xmsn to 2000-2055 and 2330-0030 on 7345, 9550, 9795, 11,990, and 15,285 kc. (15,285 kc. being replaced by 11,745 kc. at 2330). The Eng. xmsn to New Zealand, Australia, Japan, and the Far East has been changed to 0300-0355 on 21,450, 15,285, 15,245, and 11,725 kc.

Finland—The new schedule from Pori reads as follows: Eng. to N.A. at 1000-1130 on Mondays and Fridays on 9555, 11,805, 15,190 kc.

Germany (East)—*R. Berlin International*,

9560 kc., has changed the Eng. xmsn times to N.A. from 1930 and 2100 to 2000 and 2130. A German program follows the 2000 Eng. newscast.

Ghana—The latest Eng. schedule from Accra reads: 6070 kc. at 1630-1715 and 9545 kc. at 1000-1045, 1200-1245, 1500-1545, and 1630-1715 to W. Africa; 11,800 kc. at 1330-1415 to Sudan and Ethiopia, and at 1550-1635 to Europe; 15,287 kc. at 1500-1545 and 17,740 kc. at 1000-1045 to S. Africa; and 21,545 kc. at 0915-1045 to E. Africa.

Israel—A reader in Jerusalem sent in this new schedule: Tel Aviv, on 9009 kc., operates to South America at 2315-2330 in Yiddish; to S. Africa at 1100-1130 in Yiddish and at 1130-1200 in English; to Europe at 1315-1345 in Persian, at 1345-1400 in Ladino, at 1400-1415 in Rumanian, at 1415-1430 in Hungarian, at 1430-1445 in Hebrew, at 1445-1515 in French, at 1515-1545 in Eng.; to W. Africa at 1600-1630 in Eng., and at 1630-1645 in French. Tel Aviv also operates on 7189 kc. (with 20 kw.) and 9725 kc. (with 7500 watts) in Arabic at 0030-0115, 0615-0715, and 1030-1615. The 9009-kc. outlet is rated at 50 kw.

Japan—The new schedule for the General Services of *R. Japan* has been adjusted to: 1000-1030 and 1100-1130 on 11,815, 11,855, and 11,725 kc.; 2000-2030, 2100-2130, 2200-2230, 2300-2330, and 0000-0030 on 15,105, 15,195, and 17,755 kc.; 0100-0130, 0200-0230, 0300-0330, 0400-0430, and 0500-0530 on 11,725, 11,855, and 15,195 kc.; 0600-0630, 0700-0730, 0800-0830, and 0900-0930 on 11,725, 11,815, and 11,855 kc.

Liberia—The current operating schedule from ELWA, Monrovia, reads as follows: Tuesdays only to N.A. at 1956-2230 on 11,825 and 9660 kc. and to S. America at 1657-1945 on 15,155 kc. Other xmsns, all reportedly in Eng. (but this has not been confirmed by your Short-Wave Editor): to Nigeria at 2345-0300 and 0555-0830 on 11,975 kc. and at 0842-1330 on 11,790 kc.; to local areas at 0112-0430 on 4770 kc.; to the Congo at 1027-1300 on 15,155 kc.; to W. Africa at 0112-0430 on 3225 kc. and at 1357-1730 on 4770 kc.; to the Near East at 1309-1430 on 15,155 kc.; to Liberia at 0742-1745 on 3225 kc.; and to N. Africa at 1433-1630 on 15,155 kc. They are all listed as being on the air Monday through Saturday.

Malaya—ZLH10, *R. Malaya* (Blue Network), Singapore, 7200 kc., is noted in Western Canada in Eng. from 0030 on Mondays and Thursdays only.

Netherlands—Hilversum now beams Eng. to N.A. and Europe at 1630-1720 on 9715 kc. (new), dual to 11,730 kc. (also dual to 6020 kc. to Europe).

Norway—*Norsk Rikskringkasting*, Oslo, sends this new schedule: to S. America, Mid and S. Atlantic areas at 1800-1930 on 17,825, 15,175, 11,850, and 6130 kc.; to N.A., N. Atlantic, and Caribbean areas at 2000-2130 and to N. Atlantic, Western N.A., Pacific areas, and E. Africa at 2300-0030 on 15,175, 11,850, 9610, and 6130 kc. "Norway This Week" is broadcast in Eng. during the last half hour on Sunday in each of the xmsns listed. *R. Norway* also suggests that listeners who are troubled by jamming try for the medium-wave outlet on 1578 kc.; the broadcast-band fellows report hearing it at times.

Peru—A new station is OAX7Z, *R. Juliaca*, Juliaca, 5780 kc. It has been noted at 1830-1907 with music and time checks but no commercials, all-Spanish. Other rarely reported stations heard (in Brazil) are: OAX8V, *R. Eco*, Iquitos, 5010 kc., also new and testing irregularly from about 2332 to 0000 s/off; OAX6B, *R. Landa*, Arequipa, 6038 kc., at 2341-0006; OAX1A, *R. Delcar*, Chiclayo, 6700 kc., at 2254 with music and many ads. All of these stations were noted using Spanish only.

Poland—While not beamed to N.A., Eng-language xmsns from Warsaw can be found at 1530-1600 on 7285 and 9675 kc. and at 1630-1700 on 7125, 9540, and 11,865 kc.

Portugal—Eng-language xmsns from Lisbon are beamed to N.A. at 2100 and 2245 on 6025 and 6185 kc.; to Europe at 1315 on 6025 kc.; to Africa at 1315 on 17,895 kc.; and to S. E. Asia at 0815 on 21,495 kc.

Singapore—The British Far Eastern Broadcast Station, Singapore, 15,455 kc., has been noted from 0640 with a discussion program relay from London. An ID is given at 0644.

South Africa—According to a recent radio bulletin, Paradys operates for Africa on 21,690 kc. at 0600-1045; on 15,085 kc. at 1045-1400; on 11,900 kc. at 1230-1500; on 11,865 kc. at 0600-1230; and on 9660 kc. at 1400-1500. English is broadcast on Tuesdays, Thursdays, and Saturdays; on other days Afrikaans is used. There is a French news bulletin at 1305-1310 daily, Monday through Friday. DX'ers needing this country might also try 6095 kc. on Sunday evening around 2335-2358. All reports

SHORT-WAVE ABBREVIATIONS

anmt—Announcement	N.A.—North America
Eng.—English	ORM—Station interference
ID—Identification	R.—Radio
kc.—Kilocycles	s/off—Sign-off
kw.—Kilowatts	xmsr—Transmission

go to: Chief Engineer, South Africa Broadcasting Corp., Box 8606, Johannesburg.

Sweden—*R. Sweden*, Stockholm, is operating to N.A. as follows: to Eastern N.A. on 11,805 kc. at 2000-2045 in Swedish and at 2045-2145 in Eng., and on 17,840 kc. at 0900-0930 in Eng.; to Western N.A. on 11,805 kc. at 2130-2215 in Swedish, at 2215-2245 in Eng.; to Mexico and Central America on 11,805 kc. in Spanish. The National Program is also broadcast at 0000-0400 on 6065 kc. (Program I), at 0400-0715 on 11,880 kc. (Program I), and at 1200-1630 on 6065 kc. (Program II). These xmsns are non-directional; they can be heard best in Europe, and in certain areas of the Mid-Atlantic and Africa.

Switzerland—The latest Berne schedule reads: to United Kingdom and Ireland at 1345-1500 on 9545 and 7210 kc.; to N.A. at 2030-2145 and 2315-0000 on 6165, 9535, and 11,865 kc.; to Australia, New Zealand, and the Far East at 0400-0515 on 11,865, 15,315, and 21,520 kc.; to S. E. Asia and Japan at 0745-0900 on 9665, 15,315, and 21,520 kc.; to India and Pakistan at 0945-1100 on 11,865, 15,315, and 17,795

FIRST ON CB



THE TURNER 350C

Microphones always come first with us—we're a one line company of microphone specialists. This has helped make the Turner Model 350C the microphone most used as standard equipment on CB.

THE TURNER MICROPHONE COMPANY
946 17th Street NE
Cedar Rapids, Iowa

EXTRA QUALITY & VALUE!

Sonar CITIZENS BAND RADIO

No where else but at Sonar can you get such performance and quality at this low price! Check these features: Dual conversion • RF output meter • Signal strength meter • Crystal spotting switch • Illuminated panel • 8 channels, crystal-controlled • Receiver tunes 23 channels • Class "B" modulation • 1-year guarantee

SONAR RADIO CORPORATION, 73 Wortman Ave., B'klyn 7, N. Y. Please send me complete information on Model "G" CB Radio.

NAME _____
ADDRESS _____
CITY _____ STATE _____



Complete with 1 pair of crystals and microphone

\$229⁵⁰

Switzerland Calling



Official opening of SBC's new studios, in Bern, Switzerland.

SPECIAL VERIFICATION CARD

kc.; and to the Middle East at 1145-1300 on 9665 and 11,865 kc. All of the above xmsns are in English.

Surinam—AVROS, R. Surinam, Paramaribo, 15,462 kc., is noted with music and commercials at 2003-2105, news at 2100, all-Dutch. An Eng. xmsn is listed for 2030 daily, dual to 4852 kc.

Turkey—English from Ankara is broadcast at 0845-0915 on 17,820 kc. (to Asia), at 1645-1730 on 7285 kc. (to Europe), and at 1815-1900 on 9515 kc. (to N.A.). Foreign-language xmsns from Ankara are scheduled as follows: on 17,820 kc. at 0800-0830 in Peshtu, at 0830-0845

and 1000-1030 in Persian, at 0915-0945 in Urdu, at 1030-1100 in Arabic; on 9745 kc. at 2330-0000 in Arabic; on 9515 kc. at 0600-0700 and 1100-1115 in Turkish, at 1230-1245 in Arabic, and at 1745-1800 in Spanish (to S. America); on 7285 kc. at 1115-1130 in Greek, at 1130-1145 in Serbo-Croatian, at 1145-1200 in Rumanian, at 1200-1215 in Bulgarian, at 1345-1400 in Hungarian, at 1400-1415 in Polish, at 1415-1445 in German, at 1445-1515 in Italian, at 1515-1545 in French, and at 1545-1615 in Turkish.

Windward Islands—A letter from the Windward Islands Broadcasting Service, St. Georges, gives this new schedule: 1030-1230 on 6080, 9520, and 5010 kc. (15,085 kc. has been temporarily discontinued); 1500-1740 on 5010 and 15,085 kc.; and 1745-2115 on 9815 and 3280 kc. There is a special program to the British Isles on 15,240 kc., but no times were listed. Broadcasts are beamed to Jamaica and/or the Eastern Caribbean. Reports go to Mr. R. A. Smith, Technical Director, WIBS, Broadcasting House, St. Georges, Grenada, The West Indies.

Utility—Two coastal stations which may be of interest to our readers are *Hollandia Radio*, Hollandia, Netherlands New Guinea, on 8776 kc., and *Nuku'alofa Radio*, Tonga Islands, on 2182 kc. The former is heard at times in the non-broadcast phone service and is scheduled weekdays only at 1900-2100. The latter maintains radio-phone service with ships at various times between 1240 and 0440 daily and may be quite difficult to log. -30-

SHORT-WAVE CONTRIBUTORS

Paul Gough (WPE1ASX), W. Newton, Mass.
 Paul Burns (WPE1DRB), Montpelier, Vt.
 Robert Kokko (WPE1DSI), Needham, Mass.
 Richard DiLalla (WPE1DTW), Trumbull, Conn.
 Ronald Grzelak (WPE1DWA), Williamsett, Mass.
 Gene Molter (WPE1IW), Needham, Mass.
 Robert Biglands (WPE2CTS), Angola, N.Y.
 Edward Light (WPE2FBT), New York, N.Y.
 Dave Listort (WPE2FGX), Elmont, N.Y.
 Henry Marbach (WPE2FHU), White Plains, N.Y.
 Jeffrey Newbro (WPE2FVZ), Great Neck, N.Y.
 Dennis Austin (WPE2FZU), Olean, N.Y.
 Martin Rosenzweig (WPE2GOO), Levittown, N.Y.
 George Fank (WPE2GOD), N. Valley Stream, N.Y.
 Frank Diehl (WPE2GUJ), Buffalo, N.Y.
 George Derringer (WPE2GYZ), Newburgh, N.Y.
 Nicholas Nicastro (WPE2HHS), Hoboken, N.J.
 John Linzmayer (WPE2HNT), S. Amboy, N.J.
 Harvey Stern (WPE2HSS), New York, N.Y.
 Bill Dickerman (WPE3BEB), Williamsport, Pa.
 Frank Raftovich, Jr. (WPE3BOG), Chester, Pa.
 J. L. Ekblom (WPE3BPJ), Williamsport, Pa.
 Alfred Ioppolo (WPE3CUG), Philadelphia, Pa.
 Jack Cunningham (WPE3DOV), Silver Spring, Md.
 Gene Pearson (WPE4AIX), Birmingham, Ala.
 Grady Ferguson (WPE4BC), Charlotte, N.C.
 S/Sgt. R. C. Watts (WPE4CMR), APO New York, N.Y.
 Theodore Lawson, Jr. (WPE4CXV), Nashville, Tenn.
 Edward Odum (WPE4EDO), Mobile, Ala.
 James W. Phillips (WPE4EDV), Waverly, Va.
 Ernest Childs (WPE4EMV), Charleston, S. C.
 Robert Stack (WPE4ESP), Columbia, Tenn.
 Billy Akin (WPE4EUW), Columbia, Tenn.
 Bruce Churchill (WPE4EVD), Pensacola, Fla.
 Delmar Ihle, Jr. (WPE4EWT), Memphis, Tenn.
 Pat Griffin (WPE4EXS), Tuscaloosa, Ala.
 Pat Dyer (WPE5ABW), San Antonio, Texas
 William Bing (WPE5AG), New Orleans, La.
 John Frazier (WPE5AUV), Tyler, Texas
 James Coston (WPE5CFP), Winfield, Texas
 Larry Altman (WPE5CGR), Hedley, Texas
 William Kraus (WPE5CGT), Albuquerque, N.M.
 Ted Drew (WPE6CMS), Arcadia, Calif.

Greg Kordes (WPE6DDT), Anaheim, Calif.
 Charles Mattered (WPE6DGA), San Leandro, Calif.
 Steve Coombes (WPE6DIE), Arcadia, Calif.
 David Ryan (WPE6DKU), El Segundo, Calif.
 John Langdell (WPE6DLH), San Francisco, Calif.
 Robert Kipp (WPE6BBL), Detroit, Mich.
 Gary Cook (WPE6DJW), Lansing, Mich.
 Thomas Ebeling (WPE6DOA), Wheeling, W.Va.
 John Udvari (WPE6EDM), Akron, Ohio
 Dennis Marquart (WPE6ELK), Sandusky, Ohio
 Mike Kander (WPE6MS), Dayton, Ohio
 Robin Fisher (WPE6OG), Beach City, Ohio
 Richard Powers (WPE6WH), Detroit, Mich.
 Stanley Head, Jr. (WPE6YC), Huntington, W.Va.
 Don Griffith (WPE6CGF), Evansville, Ind.
 Jan Jackson (WPE6CVB), Spring Green, Wis.
 Dan Hillyer (WPE6DBN), Stretator, Ill.
 Kenneth Shafer (WPE6DCK), Whitestown, Ind.
 Dennis Strevler (WPE6DFJ), Hammond, Ind.
 Lawrence Baron (WPE6DKF), Skokie, Ill.
 Daniel Lyon (WPE6DMJ), Lincolnwood, Ill.
 J. P. Arendt (WPE6DN), Aurora, Ill.
 Daniel Weinstein (WPE6DST), Madison, Wis.
 Franklin Bayuk (WPE6DUJ), Greenwood, Wis.
 Michael Peters (WPE6EEC), Burnett, Wis.
 Eddie Coven (WPE6EJ), Hammond, Ind.
 William Foley (WPE6EKH), Depauw, Ind.
 Robert Frey (WPE6IP), Niles, Ill.
 John Beaver, Sr. (WPE6AE), Pueblo, Colo.
 Bill Holscher (WPE6ATE), Webster Grove, Mo.
 Ron Moore (WPE6CCV), El Dorado, Kansas
 Jack Perolo (WPE6EJC), Sao Paulo, Brazil
 Gregg Calkin (WPE6E3L), Saint John, N.B.
 Brad Watson (WPE6E1H), Port Credit, Ont.
 Halid Carim (WPE6E1A), Ottawa, Ont.
 Richard Laviolette (WPE6EM), Richmond, B.C.
 Eddie Burchfield, Mississippi City, Miss.
 Stanley Cohen, Philadelphia, Pa.
 S. G. Kellerman, San Pedro, Calif.
 Bentley La Montagne, N. Babylon, N.Y.
 John McDermott, Franklin Lakes, N.J.
 Daniel Roseenn, Jerusalem, Israel
 Nils Young, Dayton, Ohio

Across the Ham Bands

(Continued from page 77)

The length of the stub can be calculated from the formula: $L = 2420/F$, where L is the length in inches, and F is the interfering frequency in megacycles. For an interfering frequency of 50 mc., for example, the length would be 48.4 inches.

For best results, cut the stub slightly "long," connect it to the TV set, and trim off $\frac{1}{4}$ " pieces from the end until you reach a point of minimum interference. A word of caution, though. Don't trim a six-meter stub too short, or you may spoil reception on Channel 2.

News and Views

Greg Rolfe, WNØBNX, 1859 Flandrau, St. Paul 9, Minn., has been tickling the 40-meter ionosphere for a month with his Heathkit DX-40 transmitter. The DX-40 feeds a 40-meter dipole 20" high, which, in turn, feeds most of its power into a nearby rain gutter;

nevertheless, Greg has worked 15 states. A Hallicrafters S-38E receiver processes incoming signals. . . . **Don Ward, WN4AAL**, 206 Linden St., Arden, N.C., uses a Globe Scout 680-A transmitter, a doublet antenna, and a National NC-57 receiver on the 80-, 40-, and 15-meter Novice bands. Don will sked anyone who needs a North Carolina contact or who wants to be nominated for the RCC (Ragchewer's Club)—he QSL's 100%, incidentally. And, if you have the August, 1960, issue of P. E. available, Don recommends the transmit-receive switch we described in that issue—at least six of his friends also use it. . . . **Bob Tucker, KN1VWN**, 80 Fairbanks Ave., Wellesley Hills, Mass., keeps the 2-meter Novice phone band hot in his area with a Heathkit "Twoer" transceiver, and a 7-element beam on an Alliance "Tenna Rotor." In three months he made over 200 contacts in three states. By the time you read this, Bob will also be operating CW on the other Novice bands.

Richard Nadelson, WA2MJF, 688 Longacre Ave., Woodmere, N.Y., has exchanged the "N" in his call letters for an "A," but he wants the world to know that he worked 40 states and 25 countries as a Novice. The scene of the battle was 15 meters; the weapons, an EICO 720 transmitter, a 3-element, 15-meter beam, and a Hallicrafters SX-111 receiver. . . . Just as **Chip, K9IGR**, was about to give **Frank Cantwell**, 622 Monroe St., River Forest, Ill., his Novice code test, the code oscillator gurgled off into silence. Un-

ALL TYPES
30¢

NATION-WIDE TUBE COMPANY
NATION-WIDE BLDG., HARRISON, N.J.

1-YEAR GUARANTEE
ON ALL TUBES!

\$27.00 Per Hundred • Brand New • Factory Seconds • Used Tubes

6 GOOD REASONS TO BUY FROM NATION WIDE:

- All Tubes Guaranteed 1-Year
- Free Postage On All Orders
- 5-Day Money Back Guarantee
- Free Surprise Bonus On Order Of \$5 Or More
- Immediate Delivery On Any Size Order
- Free Trouble-Shooter Guide With Every Order

80Q8TA/B	8SQ7	12AT7	14A7
8R47/A	8T4	12AU7	14B6
6BU8	6T8/A	12AX7	14C7
6BY6	6U6/6G5	12AZ7	17AX4GT
6RZ7	6U8/A	12AV6	17C5
6C4	6V3A	12AX4GT/A/B	19A4UGTA
6C8B/A	6V6GT	12B4	19B6G6/A
6C8C	6W4GT/A	12BA6	19T8
6CD6/A	6W6GT	12BE6	25C06
6CG7	6X4	12BH7/A	25CD6A/B
6C17	6X6GT	12BL6	25CU6
6CQ8	6X8/A	12BQ6	25L6GT
6CU8	7A4/XXL	12BY7/A	25V4GT
6C18	7A7	12CA5	25W4GT
6DE4	7A8	12CU5/12C5	25Y6
6D08/A/B	7AR	12CU6	35L6GT
6DT6	7AU7	12D4/A	35L6GT
6EA8	7B5	12E6	35V4
6E8B	7B7	12DQ6/A/B	35Y4
6F9GT	7C6	12DT8	35Z5GT
6G8	7F5	12K7GT	50A5
6H6	7N7	12L6GT	50B5
6J5	8A W8/A	12Q7GT	50E5
86A	8C7	12S4T	50H5
86GT	8C17	12SK7	50L6GT
8K7	8CX8	12SN7GT	70L7GT
8L6G/A/B/C	9A7	12T6GT	75
8SA7	8A8	10D6T	75
8SA7	12A8GT	12W6GT	78
8SK7	12AB6	12X4	80
8SL7GT	12AD6	12E7	112Z3
8SN7GT/A/B	12AT6	13DR7	11726GT

Individually boxed:	Code dated:	Branded
OZ4	5AT8	6AF4/A
3BU8	5AT8	6A5GA
1A7GT	5BK7A	6AV8
1B7GT	5BR	6AW8/A
1HG7	5C8	6AX4GT/A/B
1L5	5C86	6AK5
1AN8	5D1A	6AX6GT
1AN8	5D7E	6AL5
1RG	5Q4GT	6B5
1R6	5T6	6AM8/A
1T4	5V1	6AN8/A
1U4	5V1	6AQ5/A
1U5	4BQ1A	6AS3
1X2	4B88	6AT6
2AF4	4B78	6AT8
2BN4	4C86	6AT8/A
2C7E	5A38	6A1E
3AD8	5AN8	6AGT/A
3BC5	5AQ6	6AUGT
3BC5	5AR4	6AU6/A
3BN6	5AS8	6AU8

FREE POSTAGE On All Orders. 25c Handling Charge On Orders Under \$5.00. Deposit Of 25c On C.O.D.'s. Canadian and Foreign, please send approximate postage. **REMEMBER**, if you're not completely satisfied with any merchandise, Nation-Wide will refund your money within five (5) days! • Immediate shipment on all orders! • All tubes guaranteed for one full year!

Before shipping, each order of tubes is scientifically tested by Nation-Wide's own quality-control department! All shorted and low-emission tubes are immediately destroyed! You receive only top quality, long-life, Hickok and set tested tubes!

"Do-It-Yourself" TUBE CHECKERS
At 1/5 The Original Cost!
Shipped Railway Express, F.O.B. **\$36.95**
Express P.B.
Pays for itself in one month or less! Ideal for supermarkets & drug stores. Completely reconditioned, these machines have up-to-date charts, heated back & locked compartment that stores up to 300 tubes.

TV CONSOLES
Complete from knobs to back cover! No burned out picture tubes or transformers! Satisfaction guaranteed or your money back!
10" 12" 14" 16" 17" 19" 20" 21"
\$7.95 (as is) \$15.95 (as is)

ONE YEAR GUARANTEED TV PICTURE TUBES
Priced As Low As 49c Per Inch!
Here are just a few spectacular sample prices!
10BP4 \$ 4.90 17BZ4 \$19.95
12P14 \$ 7.19 19AF4 \$15.75
14BP4 \$ 8.25 21BP4 \$16.95
16P14 \$ 9.95 21AMP4 \$28.95
17BP4 \$ 9.95 21CP4 \$28.95
NOTE: No Tube Required On Any Of The Above Tube Types.
ATTENTION! All picture tubes sold by Nation-Wide contain only new parts! The glass envelope which is reused has been closely inspected prior to manufacture to insure clear and perfect pictures!

All picture tubes shipped F.O.B. **SEND FOR NATION-WIDE'S COMPLETE PICTURE TUBE LIST Dept. CL**

QUE HABLE ESPANOL
A Special Message From Nation-Wide To Our South-Of-The-Border Friends: Over the years, we have served thousands of customers in Mexico, Central and South America! Right Now, We Are Looking For Centralized Distributors in Each Country! If You Qualify, You Can Turn Over 10,000 to 100,000 Tubes Annually! Write Nation-Wide Immediately! Our overseas agent will call on you, or we will pay your expenses to New York to give you our special distributors discounts!

NATION-WIDE TUBE CO. NATION-WIDE BLDG. HARRISON, N. J. Humboldt 4-9848

POPULAR ELECTRONICS

September 1962

Ad Index

ADVERTISER	PAGE
Allied Radio	15, 101, 102
Artisan Organ	109
B & K Manufacturing	10
Capitol Radio Engineering Institute, The	29
Cleveland Institute of Electronics	13
Columbia Stereo Tape Club	5
Cornell Electronics Co.	91
Coyne Electrical School	97
DeVry Technical Institute	7
E.C.I. Electronics Communication, Inc.	31
EICO (Electronic Instr. Co. Inc.)	36
Electronics Book Service—A. S. Barnes & Co., Inc.	105
Fisher Radio Corporation	35
Grantham School of Electronics	11
Grove Electronic Supply Company	12
Hallcrafters	89
Heath Company	92, 93
Holt, Rinehart and Winston, Inc.	30
Indiana Technical College	109
Johnson Company, E. F.	8
Key Electronics Company	26
Kuhn Electronics, Inc.	12
Lafayette Radio	THIRD & FOURTH COVER
Metrotek Electronics, Inc.	25
Milwaukee School of Engineering	32
Mission House	109
Mosley Electronics, Inc.	95
Moss Electronic, Inc.	14
Multicore Sales Corp.	114
Nation-Wide Tube Co.	113
National Radio Institute	SECOND COVER, 1, 109
National Technical Schools	83, 84
North American Philips Company, Inc.	27
PACO Electronics Co., Inc.	85
Poly Paks	34
Progressive "Edu-Kits" Inc.	87
RCA Institutes, Inc.	16, 17, 18, 19
RTS Electronics Division	9
Rad-Tel Tube Co.	118
Sams & Co., Inc., Howard W.	20
Sarkes Tarzian, Inc.	23
Scientific Development Corporation	21
Scott Inc., H. H.	3
Sonar Radio Corporation	111
Sonotone Corp.	4
Sony Corp. of America	33
Transvision Electronics, Inc.	24
Turner Microphone Company, The	111
Utica Communications Corp.	8
Valparaiso Technical Institute	109
Watsco Inc.	34

ERSIN
Multicore
5-CORE SOLDER
WETS FASTER—MELTS FASTER
SOLDERS BETTER!

MULTICORE SALES CORP. • PORT WASHINGTON, N. Y.

daunted, Chip went over to the grand piano and gave the test on it. Frank's new call letters are **WN9CTP**—who says piano lessons are a waste of time? . . . **George M. Churpek, K8VPX**, RD #1, Huron, Ohio, is another General who started his radio career as a POPULAR ELECTRONICS registered SWL (WPE8BUQ), then got his Novice license, and finally his General ticket. As a General, George still uses his Heathkit DX-40 transmitter and Hallicrafters S-108. He works some phone but still prefers CW; a 20-wpm ARRL code-proficiency certificate proves that he can copy it. Check with George for a sked or if you need help with either code or theory.

David Johnson, KN7RMV, 2715 S.E. Kelly St., Portland, Ore., can give lessons to many more-experienced hams in the art of getting out. In 4½ months, he has worked 46 states—all confirmed—16 contacts in Japan, two in Okinawa, one in Puerto Rico, two on Midway Island, and one in New Zealand! Puerto Rico, Midway, and one of the Japan stations were worked on 40 meters—the rest on 15 meters. A Globe Scout Deluxe running 75 watts, a 40-meter dipole, and a 15-meter vertical antenna, plus a Hammarlund HQ-145XC receiver and good operating are the secret ingredients Dave uses. . . . **Ted Leonberger, KN3RCI**, Rt. #2, Rockwood, Pa., was a railroad telegrapher for 15 years, which probably didn't hurt when he took the Novice code test. Ted prefers 80 meters and has worked 28 states and two Canadians on this band. He transmits on a Hallicrafters HT-40K transmitter, assembled from a kit, feeding a 5-band "trap" antenna about 45' high. A National NC-109 does his receiving.

If you know something about basic electricity and electronics, and would like to try your hand at writing a column for fun and experience, contact **Richard D. Roll, WPE2ALE**, President, North American Shortwave Association, 265 Stillwell, Hamburg, N.Y. You'll probably end up as a contributing editor of the "NASA" bulletin. . . . **Bobby Webb, WN5CAC**, 2003 W. Capitol St., Jackson, Miss., uses the Hallicrafters twins—an HT-40 transmitter and an SX-140 receiver—tied to a dipole antenna 30' high. Bob didn't tell us which bands he operates on, but he has worked 19 states, 16 confirmed.

Ronnie Long, K7NUQ, 2835 E. Lincoln St., Idaho Falls, Idaho, worked five countries with a home-brew 35-watter. He now works all bands (6 through 80 meters), and will sked anyone needing an Idaho contact. . . . **Tony Anderson, WV6YDX**, 210 South Montague Ave., Fullerton, Calif., likes to rag-chew on 40 meters with his Heathkit DX-40 transmitter exciting a 40-meter dipole. Tony receives on a Heathkit AR-3 aided by a QF-1 Q-multiplier. Although he prefers a good chat to DX-chasing, Tony has worked 14 states in two months on the air.

Would you like to be represented in "News and Views?" If so, write and tell us about your ham activities. Send your letters to: Herb S. Brier, W9EGQ, Amateur Radio Editor, POPULAR ELECTRONICS, P.O. Box 678, Gary, Indiana. Until next month, 73,

Herb, W9EGQ

ELECTRONICS MARKET PLACE

RATE 60¢ per word. Minimum 10 words prepaid. October issue closes August 6th. Send order and remittance to Martin Lincoln, POPULAR ELECTRONICS, 1 Park Ave., New York 16, N. Y.

FOR SALE

TV Tuners—Rebuilt or Exchanged \$9.95 complete—all types—fast, guaranteed service. Send tuner with all parts to: L.A. Tuner Exchange, 4611 West Jefferson Blvd., Los Angeles 16, California.

GOVERNMENT Surplus Receivers, Transmitters, Snoposcopes, Parabolic Reflectors, Picture Catalog 10¢. Meshna, Malden 48, Mass.

DIAGRAMS for repairing Radios \$1.00, Television \$2.00. Give make, model. Diagram Service, Box 672-PE, Hartford 1, Conn.

BEFORE You Buy Receiving Tubes or Hi-Fi Components send now for your giant Free Zalytron current catalog—featuring nationally known Zalytron First Quality TV-Radio Tubes, Hi-Fi Stereo Systems, Kits, Parts, etc. All priced to Save You Plenty—Why Pay More? Zalytron Tube Corp., 220 W. 42nd St., NYC.

"SPECIAL! WPE-SWL-CB-QSL cards, 3 colors, \$2.50 per 100—Free Samples, Garth, Jutland, New Jersey."

SAVE dollars on radio, TV-tubes, parts at less than manufacturer's cost. 100% guaranteed! No rebrands, pulls. Request Bargain Bulletin. United Radio, 1000-E, Newark, N. J.

FREE list. Do-it-yourself circuits for building many economical miniaturized shop equipment items. Voice relays, signal generators, etc. Send stamped addressed envelope. Dept.-2K, 11500 NW 7th Ave., Miami 50, Florida.

TRANSFIRE Transistor electronic ignition. Saves gas, tune-ups. Points, plugs last to 100,000 miles. Top performance, improved starting. Parts, Complete systems, Kits, from \$34.95. Literature. Palmer Electronics, 40E, Carlisle, Massachusetts.

FREE—R.C.A., G.E., etc. tube catalog. Discount to 75% from list. Picture tubes at 75¢ inch up. Parts, parts kits at 1/10 original cost. Needles, tube testers, silicones, seleniums, 7" TV bench test tube. \$6.99—and more. Arcurus Electronics Corp., P.E. 402—22nd Street, Union City, New Jersey.

WPE-CB-QSL cards—Brownie-W3CJ1—3110A Lehigh, Allentown, Pa. Catalogue with samples 25¢.

CB WPE QSL Cards, Finest Quality, Multicolor, 10¢ For Samples. Radio Press, Box 24, Pittstown, New Jersey.

INVESTIGATORS, write for free brochure on latest subminiature electronic listening devices. Dept. 9A, Ace Electronics 11500 NW 7th Ave., Miami 50, Fla.

CONVERT any television to sensitive, big-screen oscilloscope. Only minor changes required. No electronic experience necessary. Illustrated plans, \$2.00. Relco Industries, Box 19563, Houston 18, Texas.

SUPERSENSITIVE directional microphone picks up faint sounds at 300 feet. Detects sound through ordinary walls. Easily built for \$7.00. No electronic Experience necessary. Plans, \$2.00. Dee Company, Box 7263-F, Houston 8, Texas.

CB-QSL-SWL cards. Samples 10c. Include your personal picture on cards. No extra Cost. Signal, Adams County, Manchester, Ohio.

CITIZENS Band Lafayette HE15B, HE15, HE15A, TR800/910. Plug-in crystal receiver converter. No wiring. Always tuned to your channel. Switches from tune to crystal receive, 3 positions. \$10.95 with one crystal, specify channel and model. F. Abate, P.O. Box 206, Pompton Lakes, N. J.

1/4 TRACK Stereo recording amplifier, direct connection to speakers, trouble free one tube circuitry, dual V.U. meters, pre-adjusted for most heads. \$69.50. Write Ri-Deen Electronics, 400 30th St., Bakersfield, Calif., for brochure.

10 DISTANCE crystal set plans—25c; 20 different—50c, including Transistor experiments, catalog. Laboratories, 1131-L Valota, Redwood City, California.

TRANSISTOR Ignition Coil and construction manual. Special \$8.50. Anderson Engineering, Wrentham, Mass.

TV Tuners rebuilt \$9.95—Ninety Day Guarantee. Western Tuner Rebuilders, 4130 El Cajon Blvd., San Diego 5, California.

TREASURE finder locates deep buried, sunken metals. Build your own. Inexpensive. No electronics experience necessary. Illustrated plans, \$2.00, Dee Designs, Box 7263-D, Houston 8, Texas.

COMMUNICATIONS, Teletype, Unusual Surplus. Free Flyer MDC, 923 W. Schiller St., Phila. 40.

BUYERS' Guide of name brand home furnishings. \$1.00 Refundable. COE, Box 472, Bloomington, Indiana.

CBers'—Enjoy better selectivity, greater sensitivity, and hear only the channel you tune. Install Dual Conversion adapter in easy-do kit form. All parts, schematic, pictorial complete. HE-15A; TR-800, 910; etc. \$14.95, with tubes \$16.95. HE-20A,B; Mark VII; 770, 1,2; \$15.50, with tubes \$17.50. GW-10; HE-15B; 910B; \$15.75, with tubes \$17.75, or \$5.00 deposit plus C.O.D. Bainbridge Radio, 2649 Bainbridge Ave, New York 58, N. Y.

POWERFUL Transistorized Inter Com—includes one master (3 transformer coupled) batteries, one slave unit, 50' wire—\$12.88 prepaid. Extra Slaves \$5.49 each. Lifetime Value Crystal Radio with earphone. Safe for children \$1.49. Western World Electronics, Box 401, La Mirada, California

SURVEILLANCE, investigate equipment, bugging devices. Information guide lists wholesale and retail sources. Save half on some items. \$3.95. Dee, Box 7263-F, Houston 8, Texas.

TV camera. Build for less than \$50. Construction details \$4.75. DB Enterprises, 8959 Wonderland Ave., Hollywood 46, Calif.

EYELET tool for punched or printed circuit boards. Free information. \$1.00 including eyelets. RFE Lab, Box 535, Berkeley 1, Calif.

POLICE and Fire Dept. Receiver Low and Hi-Band \$5.00 Up. Transmitter \$2.50 Up. Motorola, General Electric, Link. Catalog \$1.00. Communication Service Company, 121 1st S.E., Paris, Texas.

QSL Cards—Low Prices—Free Samples. Debbeler Printing, 1309-A North 38th Street, Milwaukee 8, Wis.

MORSE code by sleep teaching. Guaranteed. 4 taped lessons to 18 WPM; \$12.95 each. Electro-Sleep, 8959 Wonderland Ave., Hollywood 46, Calif.

"LISTEN-In-Coil" picks up any telephone conversation in vicinity. No connection to telephone necessary. Easily concealed. \$2.98 complete. Acoustical Research, 512A E. 80 St., NYC.

SK-3-RF Preselector fits GW-10, GW-11, GW-12, boosts sensitivity 3+ "S" units. Complete kit, \$8.99, wired \$11.99; postpaid. Holstrom Associates, Box 8640, Sacramento 22, California.

HAMS, SWL'S. Tunable 3.5-30 megacycle SK-20-RF Pre-selector boosts receivers 20+ DB without modification. Complete kit, built-in power supply, \$18.98 postpaid. Holstrom Associates, Box 8640, Sacramento 22, California.

CBERS'! Only one mobile antenna serves both CB and broadcast radios simultaneously with our DP-2 coupler-duplexer. Improved performance! Complete kit, \$4.49 postpaid. Holstrom, Box 8640, Sacramento 22, California.

JUNK your distributor and voltage regulator. Improve automobile mileage and performance. Construction details for transistorized distributor and voltage regulator \$4.75. No moving parts. DB Enterprises, 8959 Wonderland Ave., Hollywood 46, Calif.

EAVESDROP with a pack of cigarettes. Miniature transistorized FM radio transmitter. Complete diagrams and instructions \$2.00. C. Carrier Co., 5880 Hollywood Blvd., Hollywood 28, Calif.

BE a spy. Correspondence course on wire tapping, bugging, telescopic sound pickup, recording techniques, microphotography, and invisible photography. Lessons in surveillance, taping, and use of equipment. Complete course \$22.50. C. Carrier Co., 5880 Hollywood Blvd., Hollywood 28, Calif.

TV tape recorder. Build your own video recorder. Complete correspondence course and construction details. \$22.50. C. Carrier Co., 5880 Hollywood Blvd., Hollywood 28, Calif.

TELEPHONE Extension In Your Car. Answer your home telephone by radio from your car. Complete diagrams and instructions \$2.00. C. Carrier Co., 5880 Hollywood Blvd., Hollywood 28, Calif.

TELEPHONE voice switch (LS-500). Actuates automatically and unattended any tape or wire recorder. Pictorial installation instructions included. \$23.75. Post Paid U.S. WJS Electronics, 1130 N. Highlands Ave., Los Angeles 38, Calif.

INVESTIGATORS. Do your own sound work. Send \$1.00 for brochure of latest electronic equipment. WJS Electronics, 1130 N. Highland Ave., Los Angeles 38, Calif.

POLICE Radar Detector, and Legal Jammer. Stop before those radar speed traps. Easy to build for less than \$10; used with your car radio. Complete construction details \$3.00. C. Carrier Co., 5880 Hollywood Blvd., Hollywood 28, Calif.

SURPLUS—Outside Telephone Bells \$4.95. Voltage regulating Transformers 115V 60 Cy.; 1.2 KVA \$45.00; 2.4 KVA \$85.00. Remote Controlled training tractors \$22.50. Seaway Electronics, 5880 Hollywood Blvd., Hollywood 28, Calif.

RUBBER Stamps—101 uses. Free list. Dennis Beckley, R.D.3—Cold Spring Road, Baldwinville, New York.

DIAGRAMS: Radio \$1.75, Television \$1.75. Baker, 129 Cooper, Santa Ana, Calif.

RADIO Builders Handbook \$1 ppd. Baker, 129 Cooper, Santa Ana, Calif.

BUILD A Stereo Speaker System. Book Shelf Size. Console Sound. Speakers and Complete Plans For Matched Enclosures. \$25.00. L.E. Sound Company Box 1082, Magnolia Station, Burbank, California.

BARGAINS! Used CB, Amateur, Test equipment! List 10c. Brands, Sycamore, Illinois.

BOOK 200 Electric Stunts \$1.00. Cuttziif, 875 Arastradero, Palo Alto, Calif.

GOVERNMENT Sells Surplus: Electronics; Oscilloscopes; Transceivers; Test Equipment; Radar; Sonar; Walkie-Talkies; Boats; Jeeps; Aircrafts; Misc.—Send for "U.S. Depot Directory & Procedures"—\$1.00—Brody, Box 425(PE), Nanuet, New York.

CONVERTERS: Monitor police, fire, amateur, citizens band signals. Adapt to any car radio with no internal connections. Write for brochure. Box 438, Jacksonville, Texas.

TV Camera—Low Cost—Schematics, instructions 50¢. Denson Electronics, Rockville, Conn.

WANTED

TRIGGER—W9IVJ. We Buy Shortwave Equipment For Cash. 7361 North, River Forest, Ill., Phone PR 1-8616.

QUICKSILVER, Platinum, Silver, Gold. Ores Analyzed. Free Circular. Mercury Terminal, Norwood, Mass.

PLATINUM electronic scrap bought. Noble Metals Co., Box 90001, Los Angeles 9, Calif.

REPAIRS AND SERVICING

TRANSISTOR Radios Repaired \$2.95 plus parts and postage. Gulf Freeway Radio & TV, 1807 Evergreen, Houston 17, Texas.

ELECTRONIC Kits Constructed By Experienced Laboratory Technicians. Work Guaranteed;—Martin Electronic Laboratories, Box 41, Brookfield, Illinois.

HIGH-FIDELITY

PRICES? The Best! Factory-Sealed Hi-Fi Components? Yes! Send for free catalog. Audion, 25P Oxford Road, Massapequa, N. Y.

DISGUSTED with "Hi" Hi-Fi Prices? Unusual discounts on your High Fidelity Requirements. Write Key Electronics, 120 Liberty St., New York 6, N. Y. Cloverdale 8-4288.

RECORDERS, Components. Free wholesale catalogue. Carston, 125-P East 88, N. Y. C. 28.

WRITE for quotation on components, recorders. Free catalog. Hi-Fidelity Supply, 2817-YC Third, N.Y.C. 55.

DON'T buy Hi-Fi components or Electronic Equipment until you get our return mail quotation. "We guarantee not to be undersold." Send 10¢ for Catalog. Hi-Fidelity Center, 220 PC East 23rd St., N.Y. 10, N.Y.

INTRODUCING—Pennwood's all transistor auto FM receiver. Supersensitive, quiet, has AFC, highest quality. \$59.95. Transistor High Fidelity FM tuner with AFC, Multiplex provision \$39.95. Satisfaction guaranteed. Pennwood Communications Box 164, Camden, N.J.

"**LOW,** Low quotes: all components and recorders. HiFi, Roslyn 9, Penna."

HiFi AMPLIFIERS, tuners, speakers, radios, telescopes, microscopes, cameras. Free Catalog. GM PhotoElectronics, 623 Gay, Knoxville 2, Tennessee.

TAPE AND RECORDERS

TAPE Recorders, Hi-Fi, components, Sleep Learning Equipment, tapes. Unusual Values. Free Catalog. Dressner, 1523PE, Jericho Turnpike, New Hyde Park, N. Y.

SAVE 30% Stereo music on tape. Free bargain catalog/blank tape/recorders/noreloc speakers. Saxitone, 1776 Columbia Road, Washington, D.C.

RENT Stereo Tapes—over 2,500 different—all major labels—free catalog. Stereo—Parti, 811-G Centinela Ave., Inglewood 3, California.

4/TR Stereo Tapes—bought, sold, rented, traded! Free Catalog/Bargain closeouts. Columbia, 9651 Foxbury, Rivera, California.

SELF-Hypnosis may help you many ways. New tape or LP-record teaches you quickly, easily! Free literature. McKinley Company, Box 3038, San Bernardino, California.

RENT Stereo Tapes. Visit Store or Write For Catalog. National Cinema Tapes, 71 Dey Street, N.Y.C.

GOVERNMENT SURPLUS

U.S. Government Surplus—Jeeps, \$264.00, Radios, \$2.53, Guns, Typewriters, Cameras, Tools, Thousands of Items. Fabulously Low Surplus Prices. Complete Information Sent Immediately. Send \$1.00 to:—Surplus, P.O. Box 50512, Dept. R, New Orleans 50, Louisiana.

JEEPS \$278, Airplanes \$159, Boats \$7.88, Generators \$2.68, Typewriters \$8.79 are typical government surplus prices. Buy 10,001 items wholesale, direct. Full details, 627 locations and procedure only \$1.00. Surplus, Box 177-C34, Abbottstown, Penna.

PATENTS

PATENT Searches, \$6.00. For free Information Record, and "Information Inventor's Need, write: Miss Heyward, 1029 Vermont Avenue NW, Washington 5, D. C.

PLASTICS

NEW Liquid Casting Plastic, clear, colors. Embed real flowers, butterflies, photos, coins. Send 25c for two handbooks, "How to Cast Liquid Plastics" and "How to Make Extra Money at Home". Castolite, Dept. K-108, Woodstock, Illinois.

INVENTIONS WANTED

INVENTIONS wanted. Patented; unpatented. Global Marketing Service, 2420-P 77th, Oakland 5, Calif.

INSTRUCTION

NEW Trade? Electronic, Mechanical Drafting pay \$150 week. Send \$2 first lesson, complete home study course \$25. Prior Inc., 23-09 169th St., Whitestone 57, New York.

LEARN While Asleep, hypnotize with your recorder, phonograph. Astonishing details, sensational catalog free! Sleep-Learning Association, Box 24-ZD, Olympia, Washington.

PHOTOGRAPHY for pleasure or profit. Learn at home. Practical basic training. Long established school. Free Booklet. American School of Photography, 835 Diversey Parkway, Dept. 2536, Chicago 14, Illinois.

PHOTOGRAPHY-FILM, EQUIPMENT, SERVICES

SCIENCE Bargains—Request Free Giant Catalog "CJ"—144 pages—Astronomical Telescopes, Microscopes, Lenses, Binoculars, Kits, Parts. War surplus bargains. Edmund Scientific Co., Barrington, New Jersey.

STAMPS AND COINS

ALBUM! Hundreds of Spaces! Only 25c Postpaid. Stampmart, Andover, Conn.

TERRIFIC Stamp Bargain! Israel—Iceland—San Marino—plus triangle set—Plus Antigua—Borneo—Virgin—Scouts—Congo—Russia—Plus large stamp book—all four offers free—Send 10¢ for mailing cost. Empire Stamp Corporation, Dept. Z2, Toronto, Canada.

SELLING entire personal stamp collection. All foreign. Good condition. Assorted packets of 50—25¢ and self-addressed, stamped envelope. Popular Electronics, Box 107, One Park Avenue, New York 16, New York.

COINS & Stamps—U.S.A., Canada, Newfoundland. Buying and Selling. For the best deal, and fee price lists write, William F. Seamore, 584 Barrington St., Halifax, Nova Scotia, Canada.

OLD Stamps! Before 1899! 5 only 10¢. Stampmart, Andover, Conn.

100 DIFFERENT stamps only (10) ten cents. Write Dave Posey, Route #1, Charleston, Tennessee.

START Approval Business—details 20¢. Steele, Box 553-HB, Pacific Grove, Calif.

NEW Approval Service—300 world-wide stamps only 35¢ to serious collectors with request for approvals. Special selections for beginners. Martin Stamp Co., 2662 West 2nd Street, Brooklyn 23, N. Y.

LEATHERCRAFT

FREE "Do-It-Yourself" Leathercraft Catalog. Tandy Leather Company, Box 791—D46, Fort Worth, Texas.

EDUCATIONAL OPPORTUNITIES

ENGINEERING Education for the Space Age. Northrop Institute of Technology is a privately endowed, nonprofit college of engineering offering a complete Bachelor of Science Degree Program and Two-Year accredited technical institute curricula. Students from 50 states, many foreign countries. Outstandingly successful graduates employed in aeronautics, electronics, and space technology. Write today for catalog—no obligation. Northrop Institute of Technology, 1179 West Arbor Vitae Street, Inglewood 1, California.

DETECTIVE Profession. Home Study. Lapel pin, Certificate, Future. Box 41197-AG, Los Angeles 41, Calif.

BUSINESS OPPORTUNITIES

BUY Direct from factories. Appliances, cameras, watches! Free details! Cam Co., 436 PE Bloomfield Ave., Verona, N. J.

VENDING Machines—No Selling. Operate a route of coin machines and earn amazing profits. 32-page catalog free. Parkway Machine Corporation, Dept. 12, 715 Ensor St., Baltimore 2, Md.

ELECTROPLATING equipment and supplies. All types for home work shops. Free Catalog. HBS Equipment Division, 3445 Union Pacific, Los Angeles 23, Calif.

SECOND Income From Oil Can End Your Toil! Free Book And Oilfield Maps! National Petroleum, Panamerican Bldg.—ZD, Miami 32, Florida.

I MADE \$40,000.00 Year by Mailorder! Helped others make money! Start with \$10.00—Free Proof. Torrey, Box 3566-N, Oklahoma City 6, Oklahoma.

FREE Franchise Profit Letter tells how unique NFR service is helping thousands seeking profitable businesses. Write today. National Franchise Reports, PE-528, 222 North Michigan, Chicago 1.

ASSEMBLE artificial lures at home for stores. Materials supplied free. Profitable! Write: Lures, Ft. Walton Beach 1, Florida.

MAKE Durable Building Plastic Easily. Waterproof, fireproof, economical. Bays Laboratory, Cedaredge 10, Colorado.

MAKE \$25-\$50 week clipping newspaper items for publishers. Some clippings worth \$5.00 each. Particulars free. National, 81, Knickerbocker Station, New York City.

PIANO Tuning learned quickly at home. Tremendous field! Musical knowledge unnecessary. Information Free. Empire School of Piano Tuning—PE, Champaign, Ill. (Founded 1935).

INVESTIGATE Accidents—Earn \$750 to \$1,000 monthly. Men urgently needed. Car furnished. Business expenses paid. No selling. No college education necessary. Pick own job location. Investigate full time. Or earn \$6.44 hour spare time. Write for Free Literature. No obligation. Universal, CZ-8, 6801 Hillcrest, Dallas 5, Texas.

WANT to buy good equipment and accessories? Place a low-cost classified ad in this space. For information, write: Martin Lincoln, Popular Electronics, One Park Avenue, New York 16, N. Y.

EMPLOYMENT INFORMATION

ELECTRONIC Positions in the N. Y. Area. Also all trades. Skilled, Unskilled and Trainees. Classified adds \$1.00. Cole, Box 191, N. Y. 16, N. Y.

MECHANICAL Assemblers \$4.00 Hr. Electronic Assemblers \$200.00 Week. Electronics Technicians To \$5.50 Hr. Tech Writers to \$8.00 Hr. Designers & draftsmen to \$6.50 Hr. Engineers to \$12.00 Hr. Overtime, Per diem, travel pay, Local & out of town. These are bona fide rates of pay by a thousand firms coast to coast, border to border & Canada. Who they are and where they are with hundred pages of vital technical data in the Job Shoppers Manual for only \$2.00, Cash, check, Money order. Electro-Press, Box 315, Pasadena, California.

JOBS In Electronics: Opportunities in Long Island's booming electronics industry. Send \$1.00 for latest information. Job Lists, P.O. Box 8, Levittown, N. Y.

WOULD you like to work at Cape Canaveral? Skilled and unskilled help needed. For the names and addresses of over twenty of the major employers send \$1.00 to Employment Services, P.O. Box 311, Palm Bay, Florida.

AIRCRAFT Radio Technician. Excellent opportunity with well-known Midwestern aviation firm for man of higher than average intelligence. Must have heavy background in aircraft radio installation and maintenance. Pleasant and stable personality. Highest salary offered. All inquiries held in confidence. Box 110, Popular Electronics, One Park Avenue, New York 16, New York.

AIRCRAFT Maintenance Supervisor, to run high-quality operation for well-known Midwestern aviation firm. Must be thoroughly experienced in general aircraft field. Must be a leader and be able to make the right decisions. This is an outstanding opportunity with high salary. All inquiries held in confidence. Box 111, Popular Electronics, One Park Avenue, New York 16, New York.

MISCELLANEOUS

INDEPENDENT Thinkers—investigate Humanism! Write American Humanist Association, Dept. PE, Yellow Springs, Ohio.

INVESTIGATORS, free brochure, latest subminiature electronic listening devices. Dept-7K, 11500 NW 7th Ave., Miami 50, Fla.

AUTHORS! Learn how to have your book published, promoted, distributed. FREE booklet "ZD," Vantage, 120 West 31 St., New York 1.

"HOME Brewing! Beers, Wines." Complete instructions \$1. (Guaranteed.) Crystal's, 28-BPE9, Millburn, New Jersey.

NEW Vortex theory for elementary particles and forces. 30 pages. 25 cents ppd. C. F. Krafft, 4809 Columbia Road, Annandale, Virginia.

WRITERS Send Your books, articles, stories, plays, for free evaluation, screening and sale. Write today! Literary Agent Mead, 916 Broadway, N. Y. C. 10.

"HOMEBREW Guide" Complete Illustrated Instruction Manual, \$1.00. Supply Catalog Included. CalBrew Supplies, Box 1005-B3, Seaside, California.

PUBLISH your book! Join our successful authors: publicity, advertising, promotion, beautiful books. All subjects invited. Send for free appraisal and detailed booklet. Carlton Press, Dept. ZDI, 84 Fifth Avenue, N.Y.C. 11.

MISSILE Photos Actual Color Reproductions, 15 Cards—\$1.00. Missile Book—\$1.00. Carlo Company, Box X 616, Winter Park, Florida.

MEDICAL Film—Adults Only—"Childbirth"—1 reel 8mm. \$7.50—16mm \$14.95. International, Greenvale, L. I., New York.

PARTY Record With Catalog \$1.00. Pioneer, Box #38-P, Station F, Toledo 10, Ohio.

SEXTANTS aircraft fairchild jaguar watch powered shoots stars, astronauts \$37.50. VHF-FM transceiver 144-174MC including mike, speaker, control, antenna \$150. Other surplus aircraft parts applicable to marine. Write O'Keefe Surplus Aircraft, Box 284, Stanhope, N. J.

"GIANT Arms." Dr. Young's, D.C. Revolutionary discovery. \$2. Satisfaction or refund. Gaucho, Box 9309-E8, Chicago 90.

"HYPNOTIZE . . . One word . . . One Fingersnap," on stage. Satisfaction—or refund. \$2. Hypnomaster, Box 9309-E8, Chicago 90.

"HOMEBREW Recipes!" . . . Beer, Wines, Brandy, others! \$1.00. Research Enterprises, 29-D Samoset Road, Woburn, Massachusetts.

RAD-TEL SAVES YOU MONEY WHY PAY MORE!

**RAD-TEL'S QUALITY
BRAND NEW TUBES
FOR TV, RADIO, AND HI-FI
1 YEAR GUARANTEE**

UP TO 75% OFF*

1-DAY SERVICE • Over 500 Types in Stock



**SERVICEMEN:
RAD-TEL HAS THE
LATEST TUBE TYPES.**

THE SIGN OF RAD-TEL'S
RELIABILITY FOR
OVER 15 YEARS

*Manufacturers Suggested List Price

FREE! Send For New Tube & Parts Catalog
& Trouble Shooting Guide

POWER TRANSISTORS PNP Replacements*

To-3. AF Power amplifier, auto
radio. 2N155, 2N156, 2N157,
2N176, 2N234, 2N235, etc.
No. 140 79c ea.

To-36. Hi Power stud Type.
2N173, 2N174, 2N441, 2N442,
2N443, DS501, DS503, DS504.
No. 141 \$1.39 ea.

50% OFF on Nos. 140 & 141
in lots of 25 assorted.
*Each Diode and Transistor Performance tested on
an American TV set.

500 Ma. Silicon Diode Epoxy Construction

- Replaces top-Hat type directly.
 - PIV 450 Volts max. I.3 ma.
 - AC — RMS input, 130V.
- No. #147 45c ea.
Lots of 10..35c ea.
Lots of 20..30c ea.

RAD-TEL TUBE CO. TV, RADIO AND HI-FI

DEPT. PE-9 55 CHAMBERS STREET, NEWARK 5, NEW JERSEY

TERMS: 25% deposit must accompany all orders, balance C.O.D. Orders under \$5 add \$1 handling charge plus postage. Orders over \$5: plus postage. Approx. 8 tubes per 1 lb. Subject to prior sale. No C.O.D.'s outside continental U.S.A.

EACH TUBE INDIVIDUALLY & ATTRACTIVELY BOXED & BRANDED RAD-TEL

Qty.	Type	Price	Qty.	Type	Price	Qty.	Type	Price	Qty.	Type	Price
—	024	.79	6AU6	.52	6J5GT	.51	12CR6	.67			
—	1AX2	.62	6AU7	.73	6J6	.71	12CU5	.58			
—	1B3	.79	6AU8	.87	6K6	.63	12CU6	1.06			
—	1DN5	.55	6AV6	.41	6L6	1.06	12CX6	.54			
—	1G3	.79	6AW8	.90	6N7	.98	12D4	.69			
—	1J3	.79	6AX4	.66	6S4	.52	12DB5	.69			
—	1K3	.79	6AX5	.74	6SA7GT	.99	12DE8	.83			
—	1R5	.77	6AX7	.64	6SG7GT	.41	12DL8	.88			
—	1S4	.59	6BA6	.50	6SH7GT	1.02	12DQ6	1.04			
—	1S5	.75	6BA8	.92	6SJ7	.88	12DS7	.84			
—	1T4	.72	6BC5	.61	6SK7GT	.95	12DT7	.79			
—	1U4	.72	6BC7	.95	6SN7GT	.84	12DT8	.78			
—	1U5	.65	6BC9	1.04	6SQ7	.84	12DW8	.89			
—	1X2B	.82	6BD5	1.25	6SQT	.99	12Z6	.62			
—	2AF4	.96	6BE6	.55	6T4	.99	12Z6	.62			
—	2BN4	.64	6BF5	.90	6T8	.85	12ZD5	.62			
—	3AL5	.46	6BF6	.44	6U8	.83	12EG6	.62			
—	3AU6	.54	6BG6	1.70	6V6GT	.54	12EK6	.62			
—	3AV6	.42	6BH6	.68	6W4	.61	12EL6	.50			
—	3BA6	.51	6BH8	.98	6W6	.71	12EZ6	.57			
—	3BC5	.63	6BJ6	.65	6X4	.41	12F8	.66			
—	3BE6	.56	6BJ7	.79	6X5GT	.53	12FA6	.79			
—	3BN6	.75	6BK7	.85	6X8	.80	12FM6	.50			
—	3BU8	.78	6BL7	1.09	7A8	.68	12FR8	.97			
—	3BY6	.58	6BN4	.62	7AU7	.65	12FX8	.90			
—	3BZ6	.56	6BN6	.74	7B6	.69	12GC6	1.06			
—	3CB6	.56	6BQ6	1.12	7EY6	.75	12J8	.84			
—	3C6	.58	6BQ7	1.00	7F8	.90	12K5	.75			
—	3DG4	.85	6BS8	.95	7N7	.90	12L6	.73			
—	3DK6	.60	6BU8	.70	7S7	1.00	12SA7	.99			
—	3DT6	.54	6BX7	1.11	7Y4	.69	12SF7	.69			
—	3GK5	.99	6BY6	.62	8AU8	.90	12SH7	1.00			

RAD-TEL TUBE CO. NOT AFFILIATED WITH ANY OTHER MAIL ORDER TUBE COMPANY

3Q4	.63	6BZ6	.55	8AW8	.93	12SJ7	.67
3Q5	.80	6BZ7	1.03	8BQ5	.60	12SK7	.95
3S4	.75	6BZ8	1.09	8C7	.63	12SL7	.80
3V4	.63	6C4	.45	8CM7	.70	12SN7	.67
4BQ7	1.01	6CB6	.55	8CN7	.97	12SQ7	.91
4BZ7	1.04	6CD6	1.51	8C57	.74	12T7	.62
4CS6	.61	6CE5	.57	8EB8	.94	12V6	.63
4DT6	.55	6CF6	.64	8FQ7	.56	12W6	.71
4GM6	.60	6CG7	.61	9CL8	.79	12X4	.47
5AM8	.79	6CG8	.80	11CY7	.75	17AX4	.67
5AN8	.90	6CK4	.70	12A4	.60	17BQ6	1.16
5AQ5	.54	6CL8	.79	12AB5	.60	17DQ6	1.06
5AT8	.83	6CM7	.69	12AC6	.55	17W6	.70
5BC8	.79	6CN7	.70	12AD6	.57	18FW6	.49
5BE8	.83	6CQ8	.92	12AE6	.50	18FX6	.53
5BK7	.86	6CR6	.60	12AE7	.94	18FY6	.50
5BQ7	1.01	6CS6	.57	12AF3	.73	19AU4	.87
5BR8	.83	6CS7	.69	12AF6	.67	19BG6	1.39
5CG8	.81	6CU5	.58	12AJ6	.62	19C8	1.14
5CL8	.76	6CU6	1.08	12AL5	.47	19EA8	.79
5CQ8	.84	6CY5	.70	12AL8	.95	19T8	.85
5CZ5	.72	6CY7	.71	12AQ5	.60	21EX6	1.49
5EA8	.60	6DA4	.68	12AT6	.50	25AX4	.70
5EU8	.80	6DB5	.69	12AT7	.76	25BQ6	1.17
5J6	.72	6DE6	.61	12AU6	.51	25C5	.53
5T8	.86	6DG6	.62	12AU7	.61	25CA5	.59
5U4	.60	6DJ8	1.21	12AV6	.41	25CD6	1.52
5U8	.84	6DK6	.59	12AV7	.82	25CU6	1.11
5V3	.90	6DN6	1.55	12AX4	.67	25DN6	1.42
5V6	.56	6DQ6	1.10	12AX7	.63	25EH5	.55
5X8	.82	6DT5	.81	12AY7	1.44	25L6	.57
5Y3	.46	6DTS	.53	12AZ7	.86	25W4	.68
6A8G	1.20	6DTR	.94	12B4	.68	32ET5	.55
6AB4	.46	6EAB	.79	12BA7	.84	32L7	.90
6AC7	.96	6EB5	.73	12BD6	.50	35C5	.51
6AF3	.73	6EB8	.94	12BE6	.53	35L6	.60
6AF4	1.01	6EM5	.77	12BF6	.60	35W4	.42
6AG5	.70	6EM7	.82	12BH7	.77	35Z5	.60
6AH4	.81	6EUB	.79	12BK5	1.00	36AM3	.36
6AH6	1.10	6EV6	.75	12BL6	.56	50B5	.69
6AK5	.95	6EW6	.57	12BQ6	1.16	50C5	.53
6AL5	.47	6EY6	.75	12BR7	.74	50EH5	.55
6AM8	.78	6FSGT	.39	12BV7	.76	50L6	.61
6AQ5	.53	6FG7	.69	12BY7	.77	70L7	.97
6AR5	.55	6FV8	.79	12BZ7	.86	11Z73	.85
6AS5	.60	6GH8	.80	12C5	.58	807	.75
6AS6	.80	6GK5	.61	12CN5	.56	70Z5	.69
6AT6	.49	6GK6	.79				
6AT8	.86	6GN8	.94				
6AU4	.85	6H6	.58				

ORDER TYPES NOT LISTED
SAME DISCOUNT AS ABOVE

PRINTED IN U.S.A.

LAFAYETTE

RADIO ELECTRONICS

1963 CATALOG No. 630



FR

FOR

'63

IT'S NEW
IT'S BIGGER
IT'S BETTER THAN EVER

IT'S from the
"WORLD'S HI-FI & ELECTRONICS SHOPPING CENTER"

Here it is . . . the exciting, all-new 1963 Lafayette Catalog. 388 giant-sized pages (the largest in our 42-year history) . . . over 50,000 different items for the audiophile, experimenter, technician, hobbyist, engineer, student, serviceman . . . fully illustrated . . . hundreds of different manufacturers. It's the "World's Hi-Fi and Electronics Shopping Center" right in a catalog.

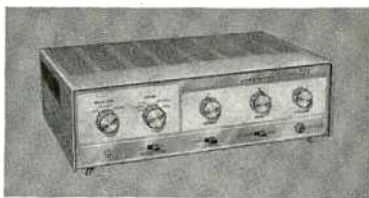
CHECK THESE OUTSTANDING LAFAYETTE BENEFITS

- ✓ **SATISFACTION GUARANTEED OR MONEY REFUNDED.** Lafayette's 30-day Free Home Trial lets you try-what-you-buy at home. If you're not completely satisfied, the full purchase price will be refunded.
- ✓ **LARGEST STOCK SELECTION.** If it's in Electronics or Hi-Fi it's in the Lafayette catalog — Citizens Band; Tape Recorders; Ham and Amateur Equipment; Test Instruments; P.A. Equipment; Radio & TV Tubes, Parts, Antennas; and much more.
- ✓ **EXCLUSIVE LAFAYETTE KITS.** Easy-to-assemble kits designed by Lafayette engineers for at-home construction. Dollar for dollar the best value for your money today.
- ✓ **SPECIAL HI-FI SYSTEM PRICES.** Select a hi-fi music system and get Lafayette's special money-saving price.
- ✓ **24 HOUR SERVICE.** Most orders fully processed within 24 hours after receipt.
- ✓ **LOWEST PRICES.** You always save more with Lafayette's low, low prices.
- ✓ **3-IN-1 EASY PAY PLAN.** Choose the plan that suits you best. No money down, up to 24 months to pay.



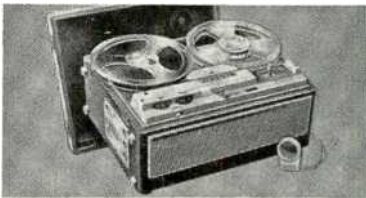
Detach and Mail the Attached Card for Your **FREE CATALOG**

1



LA-224 24-Watt Integrated Stereo Amplifier — 49.95

2



RK-137 2-Speed Tape Recorder with 4-Track Stereo Playback — 89.50

3



HE-20C Deluxe Citizens Band Transceiver Approved for Use in Canada — 109.50

4



KT-220 Multiplex Adapter Kit — 19.50

5



KT-390 Starflite 90-Watt Phone and CW Transmitter Kit — 82.75

NEW MEMBERS OF THE LAFAYETTE FAMILY

What's new at Lafayette? Plenty!

A 24-Watt Integrated Stereo Amplifier, a 4-Track Stereo Playback Tape Recorder, a Citizens Band Transceiver, a Multiplex Adapter Kit, a 90-Watt Amateur Transmitter Kit . . . to name five of the latest in the Lafayette Family. Conceived, designed and created in the 42-year old Lafayette tradition of always offering you the finest in everything in hi-fi and electronics . . . from the World's Hi-Fi and Electronics Shopping Center.

"The Symbol of Quality"



111 Jericho Turnpike
Syosset, L. I., New York