How to Add a Mechanical Filter
What's Available in Police Receivers
What's New in CB Transceivers
Build Transistorized Ham Rig for Camping
Ham Equipment for the Newcomer
We Test Out the HRO-500
**Make $3 to $5 An Hour in Spare Time**

You don't have to wait until you get an NRI diploma to start earning. As many others have done, you can be making $3 to $5 an hour in your spare-time as you train, fixing radios and TV sets for friends and neighbors. You learn how to install, maintain and service stereo hi-fi, radios, TV sets (including color), even how to charge for service and how to set up your own spare-time or full-time business. Many students pay for their NRI training out of spare-time earnings long before they graduate.

**Skilled Technicians Are in Demand**

There has never been a time when ambitious men with specialized Electronics knowledge were as much in demand as they are today. From television service shops to launching pads, there's a profitable place for you as a skilled technician to help service, operate, install and supervise Electronically-controlled equipment. The NRI diploma is respected and recognized in business and industry. It can be your key to success in America's "glamor" industry.

**Achievement Kit Gets You Started Fast**

As soon as you enroll with NRI we deliver to your door everything you need to make a fast start in the Electronics training of your choice. This new Achievement Kit is an unparalleled example of the value of NRI home-study training. No other school has anything like it. Find out about the NRI Achievement Kit, about NRI training equipment, about NRI courses, about opportunities for success in Electronics. Send for the NRI catalog. There's no obligation. No salesman will call. NATIONAL RADIO INSTITUTE, Electronics Division, Washington, D.C. 20016.

**MAIL POSTAGE-FREE CARD NOW**

---

**PICK YOUR FIELD FROM NRI'S SPECIALIZED INSTRUCTION PLANS**

1. **TELEVISION-RADIO SERVICING**
   - Complete training from basic fundamentals of electricity to home entertainment equipment
   - You learn to fix radios, hi-fi and stereo sets, black-and-white and color TV, etc. A profitable field full or part time.

2. **INDUSTRIAL-MILITARY ELECTRONICS**
   - From basic principles to computers. A comprehensive training plan that teaches you the fundamentals, then takes you into such modern-day miracles as servos, telemetry, multiplexing, pulse circuitry, data processing, other important subjects.

3. **COMPLETE COMMUNICATIONS**
   - Designed to teach you and provide you with actual practice in operation, service and maintenance of AM, FM and TV broadcasting stations. Also covers marine, aviation, mobile radio, facsimile, microwave, radar.

4. **FCC LICENSE**
   - Specifically designed short course to prepare you for your First Class FCC Radiotelephone License examinations. You begin with a thorough background in fundamental Electronics principles, advance to required subjects covering equipment and procedures.

5. **MATH FOR ELECTRONICS**
   - A brief course for engineers and technicians who need a quick review of the essential mathematics used in industry, communications, government jobs. Basic arithmetic review, short cut formulas, modern digital number system much, much more.

6. **BASIC ELECTRONICS**
   - A concise course to teach modern Electronics terminology and components. A wealth of practical, useful information to help you better understand the field, to give you some technical knowledge. For anyone who wants the basic understanding of Radio-TV Electronics.

7. **ELECTRONICS FOR AUTOMATION**
   - This course is not for beginners. Offered for men with some fundamental knowledge of Electronics who want better understanding of Automation in present day use. Covers process control, ultrasonics, telemeterying, and remote control, electromechanical measurements, other subjects.

8. **AVIATION COMMUNICATIONS**
   - This course prepares you to install, maintain service aircraft communications equipment. Covers direction finders, ranges, markers, Loran, Sonar, Radar, landing systems. Earn your First Class FCC License with Radar Endorsement.

9. **MARINE COMMUNICATIONS**
   - Covers transmitters, direction finders, deep water equipment, direction indicators, radar, sonar, other equipment used on commercial ships and thousands of pleasure boats. Prepares you for a First Class FCC License with Radar Endorsement.

10. **MOBILE COMMUNICATIONS**
    - Learn to install and maintain mobile equipment and associated base stations. Covers transmitters and receivers used by police and fire departments, public utilities, construction projects, taxis, etc. Prepares you for a First Class FCC License.

*NOTE: You must pass your FCC License exam (an Electronics course) or NRI refunds in full the tuition you have paid.
"GOOD CB IS BETTER WHEN YOUR MICROPHONE IS THE BEST!"

Don Serovy, Communications Engineering Company, with Turner SR-90.

... AND TURNER IS THE BEST THERE IS!

Turner microphones are the most-used microphones in CB. The six Turner microphones shown above, with variations, will meet your every CB requirement. Features like electronic switching, noise cancelling, and single sideband response all contribute to Turner leadership. The full line of Turner CB microphones, the only complete line for CB, all feature high output and rugged, built-to-last construction.


MODEL 350C—More 350C microphones are used as original CB equipment than any other. Response: 80-7000 cps. Level: -54 db. List Price: $12.50.


CHECK THE READER SERVICE CARD FOR A FREE TURNER CATALOG

THE TURNER MICROPHONE COMPANY
946 17th Street N.E.
Cedar Rapids, Iowa

In Canada: Tri-Tel Associates, Ltd.; 81 Sheppard Ave. West, Willowdale, Ont.
Export: Ad Auriera, Inc., 85 Broad St., New York 4, N.Y.

CIRCLE NO. 42 ON READER SERVICE PAGE

August, 1965
Special Features

Annual Report on CB Equipment .......................................................... J. D. Gillespie 67
   Inside information on what's new in Citizens Band gear and what's
   coming up on the CB transceiver market in the next few months
Ham Gear for the Newcomer .............................................................. Herbert S. Brier, W9EQQ 57
   Planning to get your ham license soon? This report by our Amateur
   Radio Editor "sketches" some of the equipment you will be looking at

Electronic Construction Projects

Camper's Special ................................................................. Hartland B. Smith, W8VVD 48
Super Selectivity for Your Receiver ................................................. Charles Caringella, W6NJV 53
Plug-In Modules to Simplify Your Projects ......................................... Charles Green, W3IKH 66
Simple Go No-Go Diode Testers ....................................................... 88

Amateur, CB, and SWL

OTCB Calendar ................................................................. 20
Is the HRO-500 the Greatest Receiver Ever Made? .............................. John D. Drummond 45
Across the Ham Bands: Learning the Code and Increasing Speed
   Herbert S. Brier, W9EQQ 79
Short-Wave Report: Radio New York Worldwide ................................. Hank Bennett, W2PNA 81
English-Language Newscasts to North America .................................... 82
DX States Awards Presented ............................................................ 110

Electronic Features and New Developments

Hats Off to VHF ................................................................. Christopher Sheridan 41
Clean Layout Technique .............................................................. E. G. Louis 56
NEWS ......................................................................................... 65
Transistor Topics ............................................................................ Lou Garner 76
Diode Function Quiz ........................................................................ Robert P. Balin 78
When It's 6 AM in Tokyo ............................................................... Howard S. Pyle 90

Departments

Letters from Our Readers ..................................................................... 6
Reader Service Page ............................................................................. 15
New Products ..................................................................................... 22
POP'tronics Bookshelf ......................................................................... 26
Breakthroughs .................................................................................... 32
Tips and Techniques ........................................................................... 92
Operation Assist .................................................................................. 96
August, 1965

5,000 FIRMS HAVE EMPLOYED DEVRY TECH ELECTRONICS GRADUATES...

There Must be a Reason!

Let Us Prepare You at Home or In One of Our Two Big Resident Schools for a Profitable Career in ELECTRONICS

Across the continent, leading employers of personnel trained in electronics tell us that DeVry training is "Tops." Get the full story of DeVry Tech and the advantages it offers, by filling in the coupon below. The two free booklets pictured below tell of many fine opportunities for trained men in electronics: the great variety of jobs, from research, production, operation, maintenance and servicing of electronic equipment — to a neighborhood TV-radio sales and service business of your own. They'll tell you too, how DeVry has prepared men for good jobs with outstanding firms: on practical, "brass-tacks" problems with actual electronic equipment.

Here's good news: you don't need advanced education or previous technical experience to get started. If you can follow simple directions, you should be able to prepare with DeVry's help for real money in a field that may offer the opportunity of your lifetime.

Employment Service: With many employers so enthusiastic about DeVry Tech graduates, it's no wonder our Employment Service can help our graduates get started in electronics, or can assist them toward promotions later.

FREE!
SEND COUPON FOR BOOKLETS ON ELECTRONICS AS A CAREER

DeVry Technical Institute
4341 Belmont Ave., Chicago, Ill. 60641, Dept. PE-B-V

1. I AM INTERESTED IN ELECTRONICS. Please give me your two free booklets, "Pocket Guide to Real Earnings" and "Electronics in Space Travel"! Also include details on how to prepare for a career in this field. The following opportunity fields (check one or more) interest me:
   - Space & Missile Electronics
   - Television & Radio
   - Microwave
   - Automation Electronics
   - Radar

2. I AM INTERESTED IN AUTOMOTIVE AND MAINTENANCE ELECTRICITY. Please supply further information.

NAME ____________________________ AGE ____________
ADDRESS __________________________
CITY __________________ STATE ______ ZIP ___________

Check here if you are under 16 years of age.

Canadian residents: Write DeVry Tech of Canada, Ltd.,
2055A 970 Lawrence Avenue West, Toronto 19, Ontario

DeVry Technical Institute
ACCREDITED MEMBER OF NATIONAL HOME STUDY COUNCIL
Chicago * Toronto

AmericanRadioHistory.Com
ALLIANCE Tenna-Rotor® for Single Bay CB beam antennas

Tenna-Rotor stands up under severe conditions. Tests prove it is the strongest, most durable antenna rotator available for Citizens Band use on all single bay vertically polarized antennas up to six elements.

This latest Alliance Tenna-Rotor will turn heavy antennas and is designed to withstand wind velocities to 50 m.p.h. in accordance with E.I.A. wind loading standards. The patented rigid offset design distributes the load resulting in superior strength to weight ratio for greater ease of installation.

Features anti-weathering, steering, and brake system to maintain positive positioning and eliminate overtravel. Unit, enclosed in a sturdy, ribbed die-cast zinc housing, is lightweight and simple to set up. If you can lift your antenna and put it on the Tenna-Rotor...it will support it, hold it and turn it.

- New Precision Machined Steel Drive Gear
- Greatest Positioning Accuracy Possible
- The new Alliance transistorized automatic C-225 features a patented phase-sensing bridge similar to laboratory test equipment and is now available exclusively from Alliance for CB users. Affords automatic, stepless, synchronous pinpointing accuracy throughout 360° of rotation that reduces or eliminates interference.
- All this with noiseless control.

CHRISTOPHER SHERIDAN Technical Editor
ANDRE DUZANT Technical Illustrator
MARGARET MAGNA Associate Editor
CHRISTOPHER SHERIDAN Associate Editor
OLIVER P. FERRELL Editor
WILLIAM GALBREATH Art Editor
PHILIP T. HEFFERAN Publisher
ROBERT CORNELL, WA2HDQ Managing Editor
WILLIAM G. DRUMMOND Technical Editor
H. S. KOSIN, W9EGQ Amateur Radio Editor
L. E. GARNER, Jr. Semiconductor Editor
H. BENNETT, W3PNA Short-Wave Editor
PATTI MORGAN Editorial Assistant
M. P. SPINELLO, KHC2060 CB Editor
STANLEY LEINWOLL Radio Propagation Editor
WA2HDQ ShortWave Editor
LAWRENCE SPORN Advertising Sales Manager
ZIFF-DAVIS PUBLISHING COMPANY
DAVID T. ZIFF, W9WOK Publisher
MARTIN L. ZIFF, V.P. General Manager
THOMAS A. WRIGHT, JFN Vice President, Marketing
J. W. BUTZOW, Vice President, Production
T. W. BUTZOW, Vice President, Production
RICHARD J. HALFERN Eastern Advertising Manager
FRANK R. MORGAN, Jr., Western Advertising Manager
JAMES WEAKLEY Circulation Manager
W. H. MILLER Circulation Manager

ALLIANCE Mfg. Co., Inc.
(Headquarters of Consolidated Electronics Industries Incorporated)
Alliance, Ohio

CIRCLE NO. 1 ON READER SERVICE PAGE
“Sure, you work hard, but that’s not enough...

...you need more education to get ahead in electronics”

No matter how hard you work, you can’t really succeed in electronics without advanced, specialized technical knowledge.

Going back to school isn’t easy for a man with a full-time job and family obligations. But CREI Home Study Programs make it possible for you to get the additional education you need without attending classes. You study at home, at your own pace, on your own schedule.

CREI Programs cover all important areas of electronics including communications, servomechanisms, even spacecraft tracking and control. You’re sure to find a program that fits your career objectives.

You’re eligible for a CREI Program if you have a high school education and work in electronics. Our FREE book gives all the facts. Mail coupon or write: CREI, Dept.1208C 3224 Sixteenth Street, N.W., Washington, D.C. 20010

SEND FOR FREE BOOK

The Capital Radio Engineering Institute Dept.1208C 3224 Sixteenth Street, N. W. Washington, D.C. 20010

Please send me FREE book describing CREI Programs in Electronics and Nuclear Engineering Technology. I am employed in electronics and have a high school education.

Name__________________________________________
Address________________________________________
City________________________________State_________Zip Code________
Employed by_____________________________________
Type of Present Work____________________________

Acredled Member of the National Home Study Council

CREI
Founded 1927

August, 1965
You've never seen an American made transceiver like this. Pacer not only comes fully assembled, it now includes a solid state 12-volt power supply... to increase its efficiency in mobile operation. And to eliminate both vibrator hash and mechanical vibrator noise. Completely.

Pacer also includes eight crystal-controlled channels and a 23-channel, tunable, superhet receiver and plenty of other important features like positive squelch control, illuminated “S” meter, spotting switch, ANL, and a quick-change external crystal socket.

Put away that soldering gun. Put your money in a Pacer. Complete with AC and 12-volt DC power cords, mobile mounting bracket, PTT mike... $99.95

NOW... GET STARTED IN CB FOR JUST $74.95

Here's everything you need to get on the air in one low-priced package. Our Mustang features six-channel crystal-controlled transmit, and a 23-channel tunable receiver. Other features include: PTT mike, positive squelch control, ANL, built-in speech clipping. Complete, ready to operate, AC cord... $74.95

METROTEK ELECTRONICS, INC., a subsidiary of Regency Electronics, Inc.
7900 Pendleton Pike • Dept. PBM • Indianapolis, Indiana
CIRCLE NO. 48 ON READER SERVICE PAGE

Letters from our Readers

Address correspondence for this department to:
Letters Editor, POPULAR ELECTRONICS
One Park Avenue, New York, N.Y. 10016

Hobby Frequencies Proposed For CB


FRANK T. BOW, M.C.
Washington, D.C.

Our readers will be interested to know that in his bill Rep. Frank T. Bow (R-Ohio) proposed assignment to the Citizens Radio Service of all or part of the 28-mc. band now assigned to the Amateur Radio Service. He also asked for an investigation of the recent FCC order which restricts CB operations. In his press release Bow said that thousands of persons throughout the country have obtained CB licenses primarily for hobby operation, and that FCC failure to explain or enforce limitations on hobby operation encouraged its development. He wants to find a means of continuing to permit CB hobby-type operation.

"Re-Broadcaster" Gets Blue Ribbon

I thought you might be interested in hearing about an unusual use for the “Wireless Re-Broadcaster” (January, 1965). I am the assistant leader of a Cub Scout Pack and we used the unit as the heart of a broadcast station in our exhibit at a Scout Cavalcade Exhibition For Nassau County.

Re-Broadcaster with microphone and console.
Choose Your Tailor-Made Course in N.T.S. "PROJECT METHOD" ELECTRONICS!

Now! N.T.S. — one of America's oldest leading home-study and resident technical schools — offers you GREATER CAREER OPPORTUNITIES IN ELECTRONICS. N.T.S. "Project Method" home training lessons are shop-tested in the Resident School in Los Angeles. You work on practical job projects, learn to use shop manuals and schematics. Your N.T.S. training is individual. You proceed at your own pace. The Schools' practical methods, plus more than 60 years of experience, have helped thousands of students all over the world to successful careers. Prepare now for a secure future in one of 8 N.T.S. Electronics Courses designed to fit your own particular needs.

**CHOOSE YOUR FIELD — INSURE YOUR FUTURE!**

1 **ELECTRONICS-TV-RADIO-SERVICING & COMMUNICATIONS** A basic course thoroughly covering fundamentals of electronics, radio, TV servicing and communications.
2 **MASTER COURSE IN ELECTRONICS-TV-RADIO, PLUS ADVANCED TV & INDUSTRIAL ELECTRONICS** This course covers everything included in Course No. 1 plus Automation and every phase of the Electronics industry.
3 **FCC LICENSE** Preparation for this government license essential for interesting jobs in radar, radio, television, communications, guided missiles, many others. Upon completion of this course, if you do not pass the FCC exam for a 1st Class Commercial Radiotelephone License your tuition will be refunded.
4 **RADIO SERVICING (AM-FM-Transistors)** Train for radio sales and service with dealer or distributor.
5 **TELEVISION SERVICING** (Including Color) Covers installation, adjustment, repair and servicing of black and white and color television ... prepares you for your own sales and service business.
6 **STEREO, HI-FI AND SOUND SYSTEMS** A growing field. Prepares you to build, install and service modern sound equipment for home or industry.
7 **BASIC ELECTRONICS** Gives you the fundamentals you must know to build on for a future Electronics career. Also offers an excellent background for Salesmen, Purchasing Agents, and others in Electronics.
8 **ELECTRONICS MATH** Simple, easy-to-follow instructions in the specialized math you need in many electronics jobs.

**CLASSROOM TRAINING AT LOS ANGELES**
You can take classroom training in our famous Resident School at Los Angeles In Sunny Southern California, N.T.S. is the oldest and largest school of its kind. Associate in Science Degree also offered in our Resident Program. Check Resident School box in coupon for full details.

**MAIL COUPON TODAY FOR FREE BOOK AND SAMPLE LESSON** In Field of Your Choice, You enroll by Mail — and Save Money. No Salesmen. This means lower tuition for you. Accredited Member N.H.S.C.

**HIGH SCHOOL AT HOME**
Learn easily. New modern method. N.T.S. also offers accredited high school programs for men and women. Take only subjects you need. Study at your own pace. Latest approved textbooks — yours to keep — everything included at one low tuition. Check High School box in coupon for information.

**NATIONAL SCHOOLS**
4000 S. Figueroa St., Los Angeles, California 90037

Please Rush FREE Electronics "Opportunity Book" and sample lesson on course checked below:

- Electronics-TV-Radio Servicing & Communications
- Master Course in Electronics-TV-RADIO
- Advanced TV & Industrial Electronics
- FCC License
- Radio Servicing (AM-FM-Transistors)
- Television Servicing (Including Color)
- Stereo, Hi-Fi and Sound Systems
- Basic Electronics
- Electronics Math

Dept. 205-85

Check here if interested ONLY in Classroom Training at L.A.

Check here for High School Department Catalog only.

City_________________________ State_________ Zip_________

Name________________________ Age_________

Address_______________________

Mail coupon at once to:

NATIONAL SCHOOLS
4000 S. Figueroa St., Los Angeles, California 90037

August, 1965
Letters

(Continued from page 8)

hams. I enjoy building and experimenting as much as the next guy, but I also have other hobby interests (photography, astronomy, hi-fi, to name a few) and would enjoy discussing them with others who share them with me. But where do I meet such people on the ham bands? Must I continue calling CQ with the hope that maybe one out of a hundred will provide an enjoyable and profitable contact for me? Why can't P.E. act as a "clearinghouse" for hams like myself and help us get together on the air? I'll bet there are a great many hams who would make their other interests known, and increase their on-the-air activity, if such a "clearinghouse" were provided. What do you say?

Art Taylor, WØEYC
Lincoln, Nebr.

Art, we couldn't agree with you more. Too much time is being spent in some circles worrying about ham radio two or three years from now, while activity today gradually declines. The idea of a "clearinghouse" is a good one and Popular Electronics would be honored to serve in such a capacity. So how about it, hams? Drop us a postcard itemizing your favorite "second" or "third" hobby, what bands you operate, what mode, when you are on the air, and what you would be willing to join a net or discussion group. We will make your response known and publish calls, bands, and interests starting in our November issue.

"Slim Twosome" Boosts Hi-Fi

I enjoyed building the "Slim Twosome" (December, 1964). I installed Norelco AD-3800 8" speakers in the cabinets and have received many compliments on the setup. The speakers have been used outdoors and as part of my regular hi-fi system indoors.

SSgt. Don K. Maxon
Cherry Point, N.C.

Slipped Tweeter Control

I have just finished reading the article entitled "Bantam Hi-Fi Speaker Systems Ride On Air Cushion," May, 1965. I realize the job it is to put

NEW Hy-Gain DX ROOF TOPPER

...Guaranteed to out-perform ANY CB mobile antenna or your money back!

Delivers up to 3 times the "Talk Power" of base loaded mobile whips

Hy-Gain's new DX Roof Topper...the CB mobile antenna that delivers such outstanding performance it's backed by the most daring guarantee in antenna history. Exclusive solid state, moisture-proof Hy-Q loading coil—"no cut" lifetime adjustable tuning rod—durable stainless steel whip section—rugged chrome plated spring—unique "can't leak" base mount—50" overall height...totally designed for simple mounting either as a new installation or as a replacement (special adapter plate furnished) for any existing roof mounted antenna. Buy it...install it...if it doesn't out-perform any mobile antenna you've ever had, return it to your Hy-Gain distributor and get your money back.

Ask for it by name—Hy-Gain DX Roof Topper—or, by Model Number TQRDX—or, just ask for the world's highest performance mobile antenna for Citizens Band....$16.95 Net.

Available now from your Hy-Gain distributor

HY-GAIN ELECTRONICS CORPORATION
8500 N.E. Highway 6—Lincoln, Nebraska 68501

CIRCLE NO. 16 ON READER SERVICE PAGE

CIRCLE NO. 31 ON READER SERVICE PAGE
New from RCA!

ALL SOLID-STATE CB 2-WAY RADIO
WITH ALL SILICON TRANSISTORS

Here's the latest, and the finest, in a long line of exceptional 2-way radios from RCA. The new all transistor RCA MARK 10 with the operating features you have been asking for...engineered to provide the most dependable communications possible. Check this partial list of RCA MARK 10 advantages:

- All silicon transistors assure dependable communications at temperatures ranging from -23° to +130°F.
- 12 crystal-controlled transmit and receive channels with illuminated channel selector
- Combination "S" meter and relative RF output meter
- Operates from 12-volts DC power source (positive or negative ground)
- 3-watt public address system with volume level fully controllable by receiver volume control
- Provision for selective call, tunable receive, and AC operation
- Crystal-controlled double conversion, superheterodyne receiver provides frequency accuracies greater than 0.004%
- Separate AGC amplifier eliminates blasting and overloading minimizes fading
- Six-stage IF bandpass filter for maximum selectivity without ringing
- Low distortion, series type noise limiter with automatic threshold adjustment
- Receiver power regulated for maximum stability
- Acoustically designed cabinet with audio characteristics shaped for maximum intelligibility
- External speaker jack (de-activates internal speaker)
- Compact, lightweight. Only 3½” high, 5¾” deep, 8½” wide, weighs less than 4½ pounds

See it at your Authorized RCA Citizens' Band Radio Distributor. To find him, look for stores displaying this symbol. It's your assurance of top-quality RCA CB equipment.

*Optional distributor resale price

RCA ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

The Most Trusted Name in Electronics
now there are 3 time & tool-saving double duty sets

New PS88 all-screwdriver set rounds out Xcelite’s popular, compact convertible tool set line. Handy midgets do double duty when slipped into remarkable hollow “piggyback” torque amplifier handle which provides the grip, reach and power of standard drivers. Each set in a slim, trim, see-thru plastic pocket case, also usable as bench stand.

PS88
5 slot tip, 3 Phillips screwdrivers

PS7
2 slot tip, 2 Phillips screwdrivers, 2 nutdrivers

PS120
10 color coded nutdrivers

Letters

(Continued from page 10)

Slips don’t count, Roland, but tweeter controls do. The tweeter control can be adjusted to cover a wide range, from completely eliminating the high-frequency speaker’s output to boosting frequencies above 5000 cycles by 10 db. The control should be adjusted by the listener to obtain the most pleasing sound.

We Said It Was a Giant Size

In your May, 1965, issue, page 49, you featured a new color TV antenna, “Colormagic,” made by GC Electronics. Your specifications for this antenna were 190 feet by 110 feet. If I purchase one of these signal-grabbing monsters, what shall I use to support it, Washington Monument?

Ted Osborn
Danville, Ill.

Yes . . . if you can get the monument moved to Danville. However, Ted, you should be able to use a regular mast as the antenna actually measures 190 inches by 110 inches.

Video Tape Too Big For Texan

I have followed enthusiastically your running reports concerning the up-and-coming Home Video Tape Recorders, and have been awaiting the day when prices would become low enough for me to afford one. Now it appears that all my waiting may have been in vain. You see, I live in a Mobile Home, and with space at a premium, I just don’t have room for a 6½-foot by 9-foot piece of equipment as described in “At Last! A Home TV Tape Recorder Kit,” April, 1965.

Gene L. Graham
El Paso, Tex.

Despair not, Gene, because the Wesgrove Video Tape Recorder is only 20” x 14” x 9” and it weighs only 35 pounds. Somebody must have mixed up meters and inches. The article was written in Germany about a product made in England and sold in the U.S.A. What can you expect? Gene, meet Ted (above); maybe if you help him with his monument, he’ll help you with your tape recorder.
Now with exclusive new Dyna-Boost circuit that intensifies speech signals and extends the range more than ever before!

Greater Range Power

Plus operating features and performance that make you proud to own the best!

Cobra

23 Channel Fully-Equipped AM CB Transceiver

Here is talk-power you'll be glad to talk about! Full 5 watts input plus built-in speech compression Dyna-Boost circuit that puts the power in the sidebands where it does the most good. Increases modulation level to the very maximum at all times, even for a soft woman's voice. Front panel switch enables you to use Dyna-Boost as you need it. Make the dramatic "talk-test" and prove it for yourself!

Fully equipped with all necessary crystals for immediate operation on all 23 CB channels, at a turn of the switch.

Cobra CAM-88, $214.95

Other Features include:
- Transistorized 117 VAC/12 VDC Power Supply
- Double Conversion Superhet Receiver
- Delta-Tune Fine Tuning
- Adjustable Squelch Control and Standby Switch
- Illuminated S and RF OUTPUT Meter
- Modulation Indicator
- Plug-in Microphone
- Use as Public Address Amplifier

See your B&K Communications Distributor for demonstration or Mail Coupon Today

B&K Manufacturing Co.
Division of Dynascan Corporation
1801 W. Belle Plaine, Chicago, Ill. 60613

Please send informative COBRA Bulletin 642-P

Name:__________________________
Address:__________________________
City________________State_________Zip No._________

CIRCLE NO. 5 ON READER SERVICE PAGE

August, 1965
SHURE MICROPHONES

for maximum voice punch!

BASE STATIONS

ALL-NEW... ADJUSTABLE HEIGHT

Model 444
for Ham and CB Use

Gets the message through where other mikes can't. "Shaped" frequency response cuts off below 300 cps, above 3000 cps—with specially developed "rising" characteristic from 1000 to 3000... cuts through QRM, assures top intelligibility and maximum range. Touch-to-talk switch (with built-in switch provision for instant change to VOX or normal operation). Adjustable height stand minimizes operator fatigue. Dozens of other features. Only $25.50 net.

MOBILES

FOR "SOLID" 10-4'S

Model 201
for CB Use


NEW!
MODEL 202

LOW COST NOISE-CANCELLING MICROPHONE

Similar in outward appearance, size and construction to the Shure 201 (above)—but offers superior noise discrimination for crisp, clear, natural voice reproduction in applications with high background noise. Only $12.00 net.

LITERATURE: SHURE BROTHERS, INC., 222 HARTREY AVE., EVANSTON, ILL.

CIRCLE NO. 37 ON READER SERVICE PAGE

AmericanRadioHistory.Com
You can get additional information promptly concerning products advertised or mentioned editorially in this issue.

1

Circle the number on the coupon below which corresponds to the key number at the bottom of the advertisement or is incorporated in the editorial mention that interests you.

2

Add up your total number of requests and fill in the box in the upper right-hand corner of the coupon.

3

Mail the coupon to the address indicated below.

4

Please use this address only for Product Service requests.

POPULAR ELECTRONICS
P. O. BOX 8391
PHILADELPHIA, PA. 19101

Please send me additional information about the products whose code numbers I have circled

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75
76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

NAME (Print clearly)_______________________________

ADDRESS________________________________________

CITY______________________________STATE________ZIP CODE_____

VOID AFTER SEPTEMBER 30, 1965

August, 1965
You can earn more money if you have an FCC License

Employers are paying good money for men holding FCC tickets. Read how to get yours:

When you hold a Commercial License issued by the FCC (Federal Communications Commission) you have written proof that you know and understand basic electronic theory and fundamentals. It's worth plenty . . . particularly to companies on the lookout for qualified electronics technicians. Here's how one of the country's leading office machine manufacturers rates men with FCC Licenses:

"An FCC License is an asset to any man looking to enhance his career in the field of electronics. At our Company, a licensed man is well-rewarded because an FCC License attests to his knowledge of electronics theory . . ."

Thousands of employers will tell you the same thing. Licensed men get the good jobs. They make more money . . . move ahead faster . . . enjoy exciting, challenging work. What's more, they're needed badly in every field of electronics. Industrial electronics. Radio-TV Broadcasting. Aerospace. Electronics Servicing . . . including mobile and marine radio plus CB.

Yes . . . your opportunities are unlimited once you're carrying that FCC Commercial Ticket. AND CLEVELAND INSTITUTE OF ELECTRONICS CAN GET ONE FOR YOU! On the facing page, read how four ambitious men just like you have cashed in on CIE's sure-fire FCC Licensing Program. Read about CIE's exclusive money-back offer. And then send in the postage paid reply card. CIE will quickly send you complete FREE information. You will soon be on your way to a Commercial FCC License and the many rewards that go with it!
These CIE men have good jobs
(they have Commercial FCC Licenses)

Matt Stuczynski, Senior Transmitter Operator, Radio Station WBOE. "I give Cleveland Institute credit for my First Class Commercial FCC License. Even though I had only 6 weeks of high school algebra, CIE's AUTO-PROGRAMMING teaching method makes electronics theory and fundamentals easy. After completing the CIE course, I took and passed the 1st Class Exam. I now have a job in studio operation, transmitting, proof of performance, equipment servicing. Believe me, CIE lives up to its promises!"

Ted Barger, Electronic Technician, Smith Electronics Co. "I've been interested in electronics ever since I started operating my own Ham rig (K8ANF). But now I've turned a hobby into a real interesting career. Cleveland Institute of Electronics prepared me for my Commercial FCC License exam. I passed it on the first try. I'm now designing, building and testing all kinds of electronic equipment. I do a lot of traveling, too. It's a great job and thanks to CIE and my FCC License, I'm on my way up."

Chuck Hawkins, Chief Radio Technician, Division 12, Ohio Dept. of Highways. "Cleveland Institute Training enabled me to pass both the 2nd and 1st Class License Exams on my first attempt, even though I'd had no other electronics training. (Many of the others who took the exam with me were trying to pass for the eighth or ninth time!) I'm now in charge of Division Communications and we service 119 mobile units and six base stations. It's an interesting, challenging and extremely rewarding job. And incidentally, I got it through CIE's Job Placement Service... a free lifetime service for CIE graduates!"

Glenn Horning, Local Equipment Supervisor, Western Reserve Telephone Company (subsidiary of Mid-Continent Telephone Company). "There's no doubt about it. I owe my 2nd Class FCC License to Cleveland Institute. Their FCC License Program really teaches you theory and fundamentals and is particularly strong on transistors, mobile radio, troubleshooting and math. Do I use this knowledge? You bet. We're installing more sophisticated electronic gear all the time and what I learned from CIE sure helps. Our Company has 10 other men enrolled with CIE and take my word for it, it's going to help every one of them just like it helped me."

Two out three men who took the 1st Class Commercial FCC License exam in 1964, failed. Nine out of ten CIE-TRAINED men who take this exam, pass... the very first try!

And that's why CIE can back their courses with the warranty you see at the left. CIE-trained men know their stuff... because CIE AUTO-PROGRAMMED Home Study works!

Get started now. Send postage-paid reply card for free information about a plan that gets you an FCC License or costs you nothing!

Cleveland Institute of Electronics
1776 East 17th Street, Dept PE-31, Cleveland, Ohio 44114

August, 1965
NEW!
from PEARCE-SIMPSON
...THE LEADER

NEW
IBC 301
30 WATT AM 2-WAY BUSINESS
BAND RADIO with remote head*
12 Volt Model $329.90

Frequencies FCC allocated for business/industrial use.
*Can be dash mounted as a complete radio or the removable 2½ lb. remote control head can be installed independently with its own mounting cradle. Solid state power supply and receiver for low power drain (.6 amps).

GUARDIAN 23
CB TWO-WAY RADIO • NEW PRICE—$269.90
23 CHANNELS—features exclusive HETROSYNC circuitry. Two signals are combined instead of the usual 3 providing outstanding stability and maximum protection against spurious signals.
• Dual conversion superhet receiver with low noise Nuvistor front end. RF gain control, tone control and noise limiter switch. Illuminated "S" meter. Transistorized universal (AC/DC) power supply.

SEE THEM AT YOUR PEARCE-SIMPSON DEALER

1965 OTCB JAMBOREE CALENDAR
Planning a jamboree, get-together, banquet or picnic? Send all the details to: 1965 OTCB Jamboree Calendar, POPULAR ELECTRONICS, One Park Avenue, New York, N.Y. 10016. For more information on the jamborees listed below, contact the clubs or club representatives at the addresses given.

Toledo, Ohio. July 24-25
Event: First International CB Jamboree. Location: Lucas County Recreation Center. Sponsor: Ohio Michigan Screwdriver Club, Inc. Contact: Jamboree, Box 38, Pemberville, Ohio.

Columbus, Ohio. July 25
Event: Fifth Annual CB Picnic. Location: Ohio State Fairgrounds. Sponsor: Central Ohio CB Assn., Inc. Contact: Jamboree, Box 92, Columbus, Ohio.

Lewistown, Pa. July 31-Aug. 1

Grayslake, III. Aug. 13-15
Location: Lake County Fairgrounds. Sponsor: Citizens Radio Assn., of Lake County, Ill. Contact: Jack Diamond, Jamboree Chairman, Box 251, Waukegan, Ill.

Pleasanton, Calif. Aug. 14-15
Event: Third Annual West Coast CB Jamboree. Location: Alameda County Fairgrounds. Contact: Jamboree, Box 1152, Mt. View, Calif.

Jacksonville, Fla. Aug. 14-15

Costa Mesa, Calif. Aug. 15
Event: Third Annual CB Rally. Location: Orange County Fairgrounds. Contact: Bill Hudson, Jamboree Chairman, 3550 S. Penn St., Englewood, Colo.

Lebanon, Ohio Aug. 21-22

Norwalk, Ohio Aug. 21-22

Quincy, Ill. Aug. 22

Beaver Falls, Pa. Aug. 28-29

Winona, Kansas Aug. 28-29

Fall City, Wash. Sept. 4-6

Maryville, Tenn. Sept. 4-6

Ft. Wayne, Ind. Sept. 19
Mosley Shakes CB World, Scotch-Master Beams Boost Performance

The outstanding Scotch-Master line includes the popular A-311-S, just one of the outstanding antenna values to appear on the two-way communication market in many years...

A-311-S has 2 more elements than the A-311-S plus an additional 1.5 db. forward gain. Specifically, the A-311-S has 5 elements which are wide spaced, a forward gain of 9.5 db. and weight of 16 1/2 pounds. The boom length is 12 feet more than the A-311-S...24 feet. The maximum element extends 18' 8 3/4". This beam gives Top Performance due to a front-to-back ratio of 20 db. and a standing wave ratio of 1.5/1 or less over full bandwidth. The Mosley A-311-S is a sturdy, durable antenna with a vertical wind load of 112 lbs. and a horizontal wind load of 62 lbs. It offers a uni-directional radiation pattern and a feed point impedance of 52 ohms. The A-311-S is just another of the many superior antennas by Mosley. The very reasonable price of this outstanding beam is only $55.00.

Mosley has a wide variety of other CB antennas including a Standard line, Deluxe line and the All-New Devant. For complete information write Code PE-1, Mosley Electronics, Inc., 4610 N. Lindbergh Blvd., Bridgeton, Missouri, 63044.
New Products

Additional information on products covered in this section is available from the manufacturers. Each new product is identified by a code number. To obtain further details on any of them, simply fill in and mail the coupon on page 15.

TACHOMETER/DWELL-ANGLE METER

Does your car need tuning up? Electronic tune-up of any automobile can be readily performed with the Model 100 tachometer and dwell-angle meter which comes both wired and in kit form from Electronic Measurement Corporation. The compact, self-powered device is connected to the ignition system of the vehicle through a single pair of external leads for all measurements of dwell angle or engine r.p.m. No switching of lead connections is necessary. Three direct-reading scales for all 4-, 6-, and 8-cylinder cars, regardless of make or country of origin, permit adjustment of distributor points for optimum dwell angle, and two r.p.m. scales (0-1200 and 0-6000 r.p.m.) facilitate carburetor adjustment for optimum engine speed. The accompanying instruction book includes step-by-step procedures for making adjustments.

Circle No. 75 on Reader Service Page 15

BATTERY CHARGER DELUXE

All types of dry cell batteries in all common sizes, and 9-volt transistor batteries as well, can be recharged with "PLUG 'N CHARGE DELUXE," an improved version of the Dynamic Instrument home battery charger. From one to four batteries of different types and sizes can be charged simultaneously, and batteries can be recharged from 15 to 50 times, depending upon type and condition. The PNC-12D is attractively styled in turquoise and beige high-impact styrene with textured silver trim. A free battery tester and a timer-reminder dial are included.

Circle No. 76 on Reader Service Page 15

DYNAMIC LAVALIER MICROPHONE

Designed for any application requiring freedom and mobility, the Model S-58 dynamic lavalier microphone introduced by the Turner Microphone Company features a slide-on-off switch. Frequency response of the S-58 is 60-13,000 cycles; output level is —60 db; and impedance is a combination high or 150 ohms. A 25-foot cable and lavalier assembly are furnished.

Circle No. 77 on Reader Service Page 15

INSTANT SOLDERING IRON

Four seconds is the time it takes the "Miniscope" soldering iron to heat up. The current is switched on or off by the user's fingertip on the feather-touch control lever. Announced by Parker Trading Company, the "Miniscope" minimizes the danger of burning adjacent wires, terminals, or insulation in cramped or crowded spaces, since the tip can remain cold until it touches the soldering point. The possibility of overheating is eliminated—the operating voltage is only 2 volts. Although normally used with a transformer, the "Miniscope" can be battery-operated for mobile use. It comes with a spare copper tip, two spare carbon elements, plastic case, and transformer.

Circle No. 78 on Reader Service Page 15

VACUUM-TUBE VOLTMETER

Available both in kit form and wired from Allied Radio, the Knight-Kit KG-625 6" VTVM features a ½-volt full-scale d.c. range. The meter used has a 200-microamp movement with a fluorescent knife-edge pointer, ten separate color correlated scales and 100° meter arc for larger scale area and easy viewing from all angles, plus a gimbal mounting bracket. The instrument reads peak-to-peak a.c. volts directly. Precision 1% resistors are used as multipliers. Accuracy on d.c. ranges is ±3% of full-scale reading; accuracy on a.c. ranges is ±5%.

Circle No. 79 on Reader Service Page 15

"DUO-BEAM" CB ANTENNAS

Two rotatable "Duo-Beam" base station antennas for the Citizens Band have been announced by Hy-Gain Electronics, both of which use horizontally stacked twin-driven beams, each with its own director. Model 114DB uses two-element beams and multiplies...
It's almost absurdly easy. You need no experience whatsoever. The superbly detailed kit construction manual prepared by Fisher StrataKit engineers tells you absolutely everything you need to know to build this magnificent 80-watt stereo control-amplifier. The language is simple; the diagrams are huge and crystal-clear; the exclusive StrataKit method itself is uniquely 'beginner-proof.'

You build your StrataKit in ingeniously simplified stages (Strata). Each stage corresponds to a separate fold-out page in the instruction manual. Each stage is built from a separate, clearly identified packet of parts (StrataPack). The major parts come already mounted on the extra-heavy-gauge steel chassis. Wires are precut for every stage—which means every page. All work can be checked stage-by-stage and page-by-page, before proceeding to the next stage. There is no possibility of last-minute 'surprises.'

When you have built the Fisher KX-200, you are the owner of one of the world's finest amplifiers, easily worth $250.00. Its 80-watt (IHF) stereo power amplifier section will drive the least efficient speakers at extremely low distortion. Its preamplifier section provides a virtually unlimited range of input and control facilities. It even incorporates exclusive features like a laboratory-type d'Arsonval bias/balance meter and a power-derived third-speaker output with separate volume control.

All this is yours in a kit priced at $169.50. The Fisher KX-100, a 50-watt stereo control-amplifier kit of advanced design, costs only $129.50. (Walnut cabinet for either model, $24.95; metal cabinet, $15.95.)

"I personally guarantee that any Fisher StrataKit you assemble, as directed, will be fully equal in performance and reliability to its laboratory-wired prototype."

Avery Fisher
Founder and President
Fisher Radio Corporation

Build the Fisher KX-200 StrataKit and own a $250 stereo control-amplifier for $169.50.

FREE! $1.50 VALUE!
Send for The New Kit Builder's Manual, an illustrated guide to high fidelity kit construction, complete with detailed specifications of all Fisher StrataKits.
Fisher Radio Corporation
21-40 44th Drive
Long Island City, N. Y. 11101

CIRCLE NO. 12 ON READER SERVICE PAGE

August, 1965
New Products
(Continued from page 22)

the effective radiated power of an efficient 5-watt CB transceiver to 42 watts, while Model 116DB uses three-element beams which raise the ERP to 93 watts. Both antennas are designed for 360° mechanical rotation—the 114DB with a standard TV rotator, the 166DB with a heavy-duty TV rotator. Heavy-gauge all-aluminum construction insures maximum mechanical reliability in winds up to 100 m.p.h.

Circle No. 80 on Reader Service Page 15

"KW KOMPACT" FOR HAMS
The Heathkit "KW Kompact" is a full-kw. SSB linear amplifier in a cabinet that measures just 3½" x 12½" x 10"—it's intended to fit in any size car or practically any size operating space you might have at home. A 5-band linear amplifier (80 through 10 meters), the "KW Kompact" develops 1000 watts PEP to a pair of 572-B's (T160-L's) in parallel. It has provisions for ALC, a tuned input circuit, a built-in antenna change-over relay, and a built-in SWR meter. Two special power supplies are available—the HP-14 for mobile operation, and the HP-24 (which can be remotely located) for fixed operation.

Circle No. 81 on Reader Service Page 15

ELECTROLYTIC SUBSTITUTOR
Ever waste a lot of time hunting in your junk box or on your workbench for a particular electrolytic capacitor, only to find that you don't have the right value or working voltage? Sencore's ES132 "Electro-Sub" provides 10 dual electrolytics from 2 µf. to 250 µf., to operate from 2 to 450 volts, d.c. The electrolytics can be used singly, as duals, or paralleled for up to 32 different combinations. You simply hook up the leads and set the selector switch to the value you want, then push the "push to test" switch. A surge protection switch prevents arcing, sparking, or accidental heating of the electrolytic under test; it also discharges the capacitor after it is used, to prevent possible shock. The ES132 can be employed in all types of transistor and vacuum-tube circuits.

Circle No. 82 on Reader Service Page 15

TV COLOR GENERATOR
Receiver alignment time can be cut by 40% through the use of the Amphenol "Color Commander." Compact enough to fit easily into a tube caddy, the "Color Commander" offers nine test patterns, including three never before available in a color generator. With these three new patterns, a serviceman can completely converge and adjust chroma of a TV receiver in 20 minutes—even if he is unfamiliar with the set. The "Color Commander" normally works on battery power, but can be operated from an optional a.c. supply which fits into the battery holder.

Circle No. 83 on Reader Service Page 15

MICROPHONE PREAMPLIFIER
Marlboro Engineering's "MikeAmp" was designed to permit the use of a long cable between microphone and tape recorder—the transistorized, battery-operated unit is capable of driving as much as 2000 feet of typical single-conductor shielded cable with no measurable losses or hum pickup. Its low-noise, high-input impedance circuit provides either 0 db or 20 db voltage gain, each at an impedance level of less than 200 ohms. When in use, the MikeAmp is located near the microphone, which can be either a crystal or dynamic type. The low-impedance output connects via the long cable directly to the normal high-impedance input of the recorder or p.a. amplifier.

Circle No. 84 on Reader Service Page 15

TAPE SPlicing AIDS
If you do much tape editing or splicing, you'll be interested in two new products announced by Elpa Marketing Industries, Inc., and manufactured by the Tall Company. The "EDIT-all" is a tape splicing block that can easily be fastened to any tape machine. It enables the owner to splice standard ¼" tape professionally and accurately, including small sections hitherto considered impossible to splice. When "EDITtabs" tape splices are used in connection with the EDITall block, the result is said to be a spliced tape that is as flexible, as uniform, and as sturdy as the original tape. An EDITall KP-2 editing kit is available.

(Continued on page 98)
SEE THE U.S.A.

Traveling by car to the distant corners of this great country of ours is becoming easier and takes less time than ever before. This year see the U.S.A. Visit the great national parks, the towering and majestic Rocky Mountains, historic New England, the seashore or the broad expanse of the midwest. No matter where you travel, International Citizens Radio transceivers can provide rapid emergency communication. International transceivers are designed and engineered to give reliable mobile service day in and day out under all kinds of conditions. The 1965 International transceivers have hybrid circuits which combine transistors and tubes for greater dependability. There is even one model which has built-in test circuits. You will have more fun traveling and a feeling of security with an International transceiver installed in your car for mobile communication. Write today for our catalog of Citizens Radio transceivers and accessories. Then see your nearest International dealer. He will assist you in selecting the best transceiver for your particular requirements.
A MUST FOR COLOR TV!

NEW JERROLD COLORAXIAL™ Reception System

The old familiar twinlead antenna line, that worked pretty well for black-and-white TV, is hopelessly inadequate for color. When your pictures change color, smear, and ghost, it's usually the fault of the twinlead connecting your set to the antenna.

NOW, Jerrold, pioneer and leader in TV reception systems, announces Coloraxial™—a system for converting any outdoor antenna to shielded coaxial-cable operation. Installs in minutes...keeps color, b&w, and FM stereo signals clean...keeps interference out. Outlasts twinlead up to ten times.

Jerrold Coloraxial Kits give you everything you need for fast, low-cost installation: 50 or 75 feet of shielded Coloraxial cable complete with fittings; matching transformers; even a Coloraxial antenna if your present antenna needs replacing.

Send coupon today for full information.

JERROLD ELECTRONICS, Dept. PE-8

Send me complete information on the new Jerrold Coloraxial™ TV/FM Antenna System.

Name........................................................................
Address......................................................................
City.................................................................State.................

CIRCLE NO. 18 ON READER SERVICE PAGE

POP'tronics Bookshelf

ELECTRONIC MOTOR CONTROL

by Allan Lytel

This book describes many of the electronic control circuits in use today. It provides circuit details on a wide range of vacuum-tube equipped controllers, as well as the newer solid-state versions. A brief summary of the operation of each individual piece of equipment is given, along with descriptions and functions of the various devices included in the equipment. Many of the circuits are of the simple type that can be built even by a novice. The book is well illustrated and easy to read. If you get involved with electric motors and want to know how to control them, you'll find it a handy reference.

Published by Howard W. Sams & Co., Inc., 4300 West 62 St., Indianapolis 6, Ind. Soft cover. 224 pages. $3.95.

HI-FI TROUBLES

by Herman Burstein

If you are about to make your first attempt at installing a stereo hi-fi system—and if you have absolutely no electronics experience—this book is for you! We must congratulate the publisher and author of this surprisingly comprehensive book—it couldn't have been made any plainer or simpler. Practically every possible problem in conjunction with hi-fi is discussed in two-syllable words, and appropriate cures are carefully diagrammed.

Published by Germsback Library, Inc., 154 West 14 St., New York, N.Y. 10011. 160 pages. Soft cover. $3.95.

FUNDAMENTALS OF RADIO

by Murray P. Rosenthal

Books on "getting started" in radio or electronics are deceptive. On one hand, a

POPULAR ELECTRONICS
LIVE BETTER ELECTRONICALLY with LAFAYETTE RADIO ELECTRONICS
HI-FI AND CB EQUIPMENT Headquarters

NEW! LAFAYETTE 70-WATT COMPLETE AM-FM STEREO RECEIVER

Just Add Speakers and Enjoy FM, FM Stereo and High-Quality AM Reception

- A powerful 70-Watt Amplifier plus Complete Preamplifier Control Facilities plus a Standard AM Tuner plus a sensitive FM Tuner plus an FM Stereo Tuner—all on One Compact chassis
- Amazing FM "Stereo Search" Circuit
- Signals Presence of Stereo Broadcasts
- Tuned Nuvistor "Front End" provides Greater Sensitivity, Lower Noise
- Bar-Type Tuning Indicator for AM and FM
- Variable AFC Control
- Imported

TAKES REELS UP TO 7"  

NEW! LAFAYETTE 23-CHANNEL 5-WATT CB TRANSCEIVER

With Authentic Mechanical Filter

- Only 3" high—fits easily in any car
- Special multi-stage noise limiting circuit ends problem of mobile noise
- The same output as the most powerful tube unit yet uses only 1/50th of the battery power

The Perfect Unit For Mobile!

- 12 Crystal Transmitter and Receive Positions
- 23 Channel Tunable Receiver With Spotting Switch
- 3-Stage Transmitter Rated For Full Legal Power
- Dual Conversion Receiver with 5/10 μV Sensitivity
- Multi-Stage Automatic Noise Limiting Circuit
- Rugged Silicon Mesa Transistors
- Compact—3½"x11½"x5½"D
- 12V DC Mobile Operation (Negative or Positive ground)
- 117V AC operation when used with Matching Solid-State AC Power Supply (Optional at $16.95)

THE WIDELY ACCLAIMED LAFAYETTE RK-137A TAPE RECORDER

FEATURING 4 _ TRACK STEREO PLAYBACK
- 4 TRACK MONaurAL RECORD PLAYBACK

With Electronic Track Selector Switch, VU Recording Level Meter and Pause Switch For Instant Editing

Includes Lightweight carrying case, dynamic microphone, output cable, 7 inch empty tape reel.

- Two Speeds—3 3/4 & 7 1/2 ips
- Pause Lever Provides Instant Stop for Editing
- Record—Erase Safety Switch
- Fast, Rugged Shift Lever Control
- Extension Speaker Jack
- High Impedance Monitoring Jack
- VU Meter Recording Level Indicator
- Electronic Track Selector Switch
- Specially Designed Heavy-Duty 6x4" PM Speaker
- Separate Erase and Record Heads
- Imported

NEW! LAFAYETTE 23-CHANNEL 5-WATT CB TRANSCEIVER

With Advanced "Range-Boost" Circuit

- 17-Tube Performance with 13 Tubes
- Low Noise Nuvistor "Front End"
- 5 Double-Tuned IF Transformers
- Meets All FCC Requirements
- Frequency Synthesized Circuit Provides 23 Crystal-Controlled Transmit & Receive Channels—No Extra Crystals to Buy
- Continuous One-Control Channel Tuning
- Full 5-Watt Input
- Push-To-Talk Microphone & Electronic Switching
- Dual Conversion Receiver With 3/10 μV Sensitivity
- Delta Tuning Offers "Fine Tuning" of ±2.5Kc on Receive
- Illuminated "S" and RF Output Meter
- Variable Squelch, Variable Noise Limiter, AGC
- Built-in 117V AC & 12V DC Power Supply
- "Vari-Tilt" Mounting Bracket for Easy Mobile Installation
- Plug-in Facilities For Lafayette Selective Call Unit

FREE! LAFAYETTE RADIO ELECTRONICS
1965 CATALOG NO. 650 516 PAGES!

See The Largest Selection in Our 44-Year History

- Stereo Hi-Fi — Famous Brands plus Lafayette's own Top-Rated Components
- Citizens Band Equipment
- Tape Recorders
- Ham Gear
- Radio's, TV's and Accessories
- P.A. Equipment, Intercoms
- Test Equipment
- Optical Goods
- Auto Accessories
- Musical Instruments

CIRCLE NO. 21 ON READER SERVICE PAGE

August, 1965
Bookshelf

(Continued from page 26)

book in this category may be too simple; on the other, some books are just too difficult for beginners. Unfortunately, this book falls in the latter group. It covers radio and electronics theory from magnetism to antennas, but the pace is so rapid and the subject matter is treated in such an offhand fashion that you begin to wonder what the author is doing. Some subjects are discussed too well and other vital topics are glossed over in a few words or paragraphs. All of this is complicated by what seem to be a number of obvious errors, misstatements, and inclusion of out-of-date information.

Published by John F. Rider Publisher, Inc., 116 West 14 St., New York, N.Y. 10011. Hard cover. 318 pages. $8.95.

SELECTED SEMICONDUCTOR CIRCUITS
by Editorial Staff of TechPress Publications

Here's a book that technicians, experimenters, and hobbyists will find very handy. It contains a compilation of standard semiconductor circuits taken directly from manufacturers' transistor design sheets. The material has been well organized and is presented in a simplified manner. The book has seven sections and presents such easy-to-build projects as a.f. and r.f. oscillators, i.f. amplifiers, power supplies and regulators, and commercial and industrial preamplifiers. Also included are a frequency divider, relay driver, time-delay circuit, and transistor-gain test circuits. Because of the wide selection of circuits, the book is well worth its modest price.

Published by TechPress Publications, Brownsburg, Ind. 46112. Soft cover. 80 pages. $1.25.

TRANSISTOR SPECIFICATIONS MANUAL
by Howard W. Sams Engineering Staff

Over 5000 transistor types have been made since transistors were first introduced. Many of them are no longer available, and many of them have no type numbers. There is much confusion when the need for replacement arises. One redeeming factor when trying to find a replacement is that a transistor can usually be selected by estimating voltage, current, wattage, and frequency response, and then relating these figures to...
August, 1965

G E N E R A L
R A D I O T E L E P H O N E C O M P A N Y

M A N U F A C T U R E R S O F P R E C I S I O N B U I L T
C O M M U N I C A T I O N S A N D T E S T E Q U I P M E N T


Transistorized Solid State: All silicon transistor transceiver, 24 channels. 5 & 15 W construction. High-density Military Type packaging. Vibration-service rated. Designed for applications where absolute reliability is required. From $199.50

CG-3 Counter Generator: Complete ultra-high speed, digital read-out counter coupled with an RF gen. Generates freq. from 100 KC-100 MC. Meets to 1000 MC with plug-ins. Self-checks performance. Outputs for digital or analog equip. avail. From $1785.00 Net.


SB-72: Single Sideband. The ultimate in communications. Contains USB, LSB, and DSB. 24 basic AM channels plus 48 sideband channels. Four times the effective power on a high-performance chassis. For the serious CB user. 12/115 V.---$399.50

Linear Amplifier: First low-cost, high powered, continuous duty, linear amplifier. Fully automatic switching, 25-36 MC for AM, FM, DSB @ 300 W, SSB @ 60 W. $199.50. 150-174 MC FM @ 180 & 250 W. $199.50 Net.


Snap Rack: America's most popular quick-change mobile mounting rack. 800 lbs. test snap-latches. Set insertion or removed in seconds without tools. For all Generals and most popular brands.

615-B: Multifunction Bridge. Measures RF power, SMR, RFS. Calibrates & checks performance of any 2-way radio from 27 to 54 MC. 500 micro-amp meter. A must for every service technician. --- $39.95 Net.


Microcycle Frequency Checker Heterodyne frequency checker and precision microvolt generator with 30% modulated 400/1000 cycle audio, external connection furnished. Integral attenuator down to .1 uV. Complete audio signal tracer system with speaker, 24 crystal control channels, 25 MC-36 MC. 111.1 MHz channels, 100 KC-12 MC. Measures external % modulation. Measures watts with internal 50 ohm dummy load. Measures transmitter freq. error. External crystal test socket, 25 MC-36 MC. External 1.0 crystal test socket. 100 KC-12 MC. Portable battery/115 V. --- from $380.00. This unit can be custom designed to your specifications and all inquiries will be answered immediately.

SS-5 "Silent Service": Complete two-tone encoder/decoder for 2-way radio systems. Fits any General product. Keeps base or mobile gear free of all undesired signals. Requires no power to operate. $39.95 Net.

BB-30: For business, commercial, and industrial use, the BB-30 is unsurpassed for rugged dependability and performance. 50 watts input. Carrier-controlled modulation for constant 100% modulation. 27-36 MC, 12/115 V. --- $249.50 Net.

Telephone Line Remote (TLR): For remixing all types of communications equipment regardless of frequency. Complete with 4 functions. Telephone line termination (TLT) unit matches the remote equipment to the telephone line. TLR --- $199.50 Net. TLT --- $69.50 Net.

Naw, 24-page catalog of General equipment and accessories. Write for your free copy, and the name of your nearest General Distributor.

Constant research and development is basic policy at General. We are constantly broadening and improving our entire line. Since this page was printed, new and advanced equipment may be available in Citizens Band, Business Band, Aircraft and Marine Communications. Please contact us or your local distributor for the latest information.

*CIRCLE NO. 53 ON READER SERVICE PAGE

29

AmericanRadioHistory.Com
Coverage? Our new Range Gain Transceiver has Regency's exclusive Double Side-Band Reduced Carrier.* It gives you four times more range than ordinary equipment under normal conditions. Puts stations you couldn't even reach before ... just a whisper away. Gives you, as well, crystal-controlled transmission and reception on all 23 CB channels. And a Double-Conversion Superhet Receiver. Plus all these other features you've come to expect from Regency: Metered Control • Built-in Crystal Filter • Delta Tuning • Automatic Noise Limiter • Adjustable Squelch. Complete and ready to operate on all 23 channels—AC and 12V DC.................. $269.95

Special Offer! New Romper

For a limited time only get the best deal in CB today—our new Romper plus 23 crystals for crystal-controlled transmission and reception on all channels ... for just $189.95 (normally $232.90). Write for more information. Complete, ready to operate, AC and DC cords, microphone.......$189.95

A 12-month warranty with every Regency Transceiver!

Regency Electronics, Inc., Dept. P-8, 7900 Pendleton Pike, Indianapolis, Ind. 46226

CIRCLE NO. 33 ON READER SERVICE PAGE

Bookshelf

(Continued from page 28)

the types available. This manual lists the electrical and physical specifications for more than 3500 transistors. A section listing older types which are now available under a new type number is also included, and there are more than 300 illustrations that show dimensions and lead locations. The book should prove useful to electronic hobbyists, technicians, and engineers.

Published by Howard W. Sams & Co., Inc., 4500 West 62 St., Indianapolis 6, Ind. Soft cover. 159 pages. $2.95.

COLOR TV REPAIR

by Martin Clifford

As the number of color TV sets spirals upward; TV-service writers are making great efforts to simplify color TV service techniques. This book is one of the best in that category. The writing is informal and fast-paced. The material in the book was collected by Clifford from Radio-Electronics magazine and contains practical hints from Bob Middleton, Jack Darr, Art Margolis, and other well-known TV servicing experts. Included in the book are sections on picture tube replacement, troubleshooting with a bar generator, unexpected causes of color failure, etc. This is a good book for service technicians.

Published by Gernsback Library, Inc., 154 West 11 St., New York, N.Y. 10011. Soft cover. 160 pages. $2.95.

Free Literature

Two new bulletins on crystals are available for the asking. An 8-pager published by Texas Crystals, 1000 Crystal Drive, Fort Myers, Fla., features this company's line of crystals for CB and amateur radio equipment, plus many low-frequency crystals. Included is a discussion of how crystals are manufactured ... All of the crystals listed in the 4-pager put out by Jan Crystals, 2400 Crystal Drive, Fort Myers, Fla., were made for the armed forces by leading crystal manufacturers to rigid specifications, and released by the government (unused, and in the original packing) as excess equipment ... Three quality microphones particularly suitable for installation in churches are described and illustrated in a 4-page brochure available from the Turner Microphone Company, Cedar Rapids, Iowa. Gold mounting accessories are also covered.
Give your mobile installation this

PROFESSIONAL "SPRING" TUNE-UP!

Brand new from the Antenna Specialists—the professional touch to dress up and power up your mobile rig! Famous high-performance, low-noise A/S base-icad design... "17-" stainless steel whip (bend it in a full circle, snaps back to perfect vertical!)... fine-tuning adapter built-in. Now— available with a beautiful, functional stainless steel shock spring! Complete with cable and connectors, wide choice of base mounts. Tool over to your CB dealer today!

M-124

"SUPER MAGGIE MOBILE"

CB ANTENNAS

(Newest "Hot Rod" to match perfectly the great M-117 "Super Magnum" base antenna)

"SPRING" TUNE-UP FOR YOUR PRESENT ANTENNA!

M-126 CONVERSION KIT

Spring, adapter, wrench, all hardware for adding Shock Spring to M-67, M-73, M-74.

the antenna specialists co.

12435 Euclid Ave., Cleveland, Ohio 44106

Send for details on our

AC ELECTRIC GENERATORS

Noise-free portable power... 12 models.

August, 1965
GET ACTION WITH PRECISION MADE, POPULAR PRICED CB UNITS!  

$169.50  Ready to Operate

CITI-FONE 99

$99.50  Ready to Operate

MULTI-ELMAC COMPANY
21470 COOLIDGE HIGHWAY  OAK PARK 37, MICH.

Citi-Fone SS  Citi-Fone 99

Name
Address
City  Zone  State

CIRCLE NO. 24 ON READER SERVICE PAGE

BREAKEHTHOUGHS

Brief news flashes on recent important developments in the field of electronics

• A machine that learns from its own mistakes is being developed by the U.S. Air Force to cope with unexpected and unknown flight conditions encountered by satellites and high performance aircraft. To be incorporated into a self-organizing flight controller, the machine makes use of what scientists refer to as the Artron, or artificial neuron. Researchers at the Air Force's Avionics Laboratory, in an effort to seek machines which perform in a manner similar to living entities, have recreated the function of a nerve cell in the Artron, and a vast network of Artrons is able to achieve memory and problem-solving ability. They respond to punishment and reward by learning desired behavior and capitalizing on their own mistakes. They make decisions and actively seek new and better ways of doing a given task. Knock out some of the Artron network's tools for doing that task, and it will "dream up" an altogether new approach. Researchers say that even with 70% electronic failures, the new apparatus could still find a solution. Thus, it's easy to see the value of its future use in space programs . . .

• CBS-TV added a silent "commentator"—an electronic computer—to the broadcast staff for its nationally televised "Yankee Baseball Game of the Week." The General Electric computer figures out, and flashes on a screen, the probability of a batter "coming through" in various clutch situations based on performance during the first part of the season. A company spokesman reported that there are about 52,800 possible "situations" in a game that a batter could face. Designed to give viewers more of a feeling of participating in the game, it is hoped that the system will also spark an interest in young fans for careers in the computer field . . .

• Ultrasound—signals in the frequency range from about 18,000 cycles to 200 megacycles—is proving to be a valuable aid in "photographing" internal tissues and in treating certain neurological disorders. It is employed in two ways in medicine, according to Dr. Floyd Dunn, Associate Professor of the Biophysical Research Laboratory at the University of Illinois. The first is in a passive sense in which the acoustic field does not alter body structure and function. The second is in an active sense in which either permanent or temporary alteration of the body is the objective. Examples of passive applications are compound scanning of internal tissue in the eye, neck, and other parts of the body by a transducer, and examination of the dynamic (Continued on page 38)
A major breakthrough in Antenna design!

**FINCO**

**ALL BAND**

**UHF • VHF • FM**

"COLOR VE-LOG"

Finco’s new All-Band Color VE-Log Antenna does the work of three — gives startlingly clear black and white pictures and beautiful color on both UHF and VHF television channels. Its superlative design also assures the finest in stereophonic and monophonic FM sound reproduction. Comparison tests have proved the superiority of the All-Band UVF Series — superiority backed by Finco’s guarantee of supremacy and unquestioned warranty.

*Prices and specifications subject to change without notice.*

THE FINNEY COMPANY • 34 W. Interstate Street • Bed ford, Ohio

Write for beautiful color brochure Number 20-322, Dept. FE

August, 1965

CIRCLE NO. 10 ON READER SERVICE PAGE
THE ONE CATALOG THAT REALLY SAVES YOU MONEY!

BECAUSE only Radio Shack has 55 Mail Order Centers coast-to-coast.
BECAUSE you save postage by ordering from the nearest Radio Shack.
BECAUSE you save time, get faster delivery, by shopping your nearest Radio Shack by mail.
BECAUSE Radio Shack has one low price — East, Central, South, West.
BECAUSE Radio Shack is the world's largest chain of electronic stores. We buy better . . . give you exclusive Special Purchases month after month after month!

FILL OUT and MAIL THIS CARD TODAY
It's Radio Shack's 43rd Anniversary issue — just off the press! Loaded with CB, stereo, radio-TV, parts, kits, recorders, antennas, phonos, exclusive Special Purchases — all at our famous low prices!

SPECIAL PURCHASE! Radio Shack Buys Hallicrafters Test Equipment Kit Inventory to Sell at $$$ OFF!

MODEL HP-1
SAVE 44%

MODEL HC-1
SAVE 38%

MODEL HG-1
SAVE 33%

MODEL HO-1 PRECISION 5" OSCilloscope kit — 5 mc bandwidth for TV color servicing. Two preset sweep 'regs. for automatic horizontal and vertical sync. Retrace blanking; 1 V peak-to-peak calibrator; automatic sync. Hallicrafters' $84.95. SALE 59.47

MODEL HP-1 POWER SUPPLY and BATTERY ELIMINATOR kit — instant low-ripple source for testing mobile equipment, auto or transistor radios, more! Filtered and unfiltered outputs! Continuously variable 2-range voltage output 0-16 V. Hallicrafters' $49.95. SALE 27.97

MODEL HC-1 CAPACITANCE-RESISTANCE TESTER kit — 4 capacitance ranges: 10 mmfd to 5000 mmfd. 3 resistance ranges: 0.5Ω to 5 megohms. Internal resistance standard 1%. Tuning eye null indicator. Hallicrafters' $29.95. SALE 18.57

MODEL HG-1 R.F. SIGNAL GENERATOR kit — covers 50 kc to 880 mc in 4 ranges. Pre-wired coils, band switch, modulated and unmodulated RF output. Internal 400 cps audio source. Hallicrafters' $29.95. SALE 19.96

You'll see 100's of BARGAINS like these!!!

POPULAR ELECTRONICS
NOW THERE ARE 55 RADIO SHACKS COAST TO COAST

CALIFORNIA
Bakersfield — 1308 19th St., 522-6418
Los Angeles (Downey) — Stonewood Shop, Ctr., 933-1709
San Diego (La Mesa) — Grossmont Chas. Ctr., 465-4662
Long Beach — 127 W. 7th St., 432-2318
Long Beach — 3976 Atlantic Ave., 426-7514
Oakland (San Leandro) — Bay Fair Shop, Ctr., 351-2990
Sacramento — 600 Fulton Ave., 482-2707

CONNECTICUT
HAMDEN — Hamden Mart Shop, Ctr.
MANCHESTER — Manchester Shopping Park
New Haven — 43 York St., 787-7127
New London — New London Shop, Ctr.
Stamford — 29 High Ridge Rd., 325-4771
West Hartford — 33 S. Main St., 236-5441

ILLINOIS
CHICAGO — Evergreen Plaza at 9th St., 936-9796

MAINE
PORTLAND — Pine Tree Shop, Ctr., 773-7071

MASSACHUSETTS
BOSTON — 167 Washington St., 522-6719
BOSTON — 584 Washington St., 376-4341
BOSTON — 110 Federal St., 426-3897
BRANTFORD — South Shore Plaza, 643-9200
BROOKLINE — 300 Commonwealth Ave., 734-1000
CAMBRIDGE — Fresh Pond Shop, Ctr., 491-2825
FRAMINGHAM — Shoppers’ World, 872-8569
LOWELL — Central Plaza, 455-5469
SAUGUS — N. E. Shop, Ctr., 233-9230
WALTHAM — 734 Washington St., 732-2189
WEST SPRINGFIELD — Century Shop, Ctr., 732-4433
Worcester — Lincoln Plaza, 757-8030

MINNESOTA
ST. PAUL — 16 E 5th St., 222-4801
NEW HAMPSHIRE
MANCHESTER — 1247 Elm St., 686-1303

NEW MEXICO
ALBUQUERQUE — 6315 Lomas, N.E., 258-5722
NEW YORK
NEW YORK — 1170 Ave. of the Americas, 867-4482
SYRACUSE — 305 E. Oneida St., 444-4990

OHIO
CINCINNATI — 852 Swifton Ctr., 631-4570
OKLAHOMA
OKLAMAHOMA CITY — Mayfair Shop, Ctr.
TULSA — 317 S. Main St., 502-3401

PENNSYLVANIA
PHILADELPHIA — 2327 Cottman Ave., 326-4711
PHILADELPHIA — 1129 Walnut St., 922-1919

RHODE ISLAND
CRANSTON — 131 Riverside Ave., 942-6800

EAST PROVIDENCE — Shoppers’ Town, 434-5672

TEXAS
ARINGTON — Colliers at Park Row
DALLAS — 1501 Main St., 741-0779
DALLAS — Medallion Center, 363-6236
DALLAS — 125 Wynwood Village, 948-3201
FORT WORTH — 1351 S. S. Ave., 335-4705
FORT WORTH — 900 East Bruton Rd., 377-7826
FORT WORTH — 3524 East Broad Highway, 831-3951
HOUSTON — 2315 Travis St., 523-0871
HOUSTON — 729 Northline Mall, 693-7914
HOUSTON (Belair) — 4759 Bissonnet, 667-5190
SAKTVND — Wonderland Ctr., 735-9161
SHERMAN — 1620 Highway 75 North, 902-0553
HACO — 1016 Austin Ave., 752-7739

VIRGINIA
ARINGTON — Washington Lee Shop, Ctr., 524-5422
FAIRFIELD — 2119
WASHINGTON — 3201
SEATTLE — 2208 10th Ave., 682-5260
SEATTLE — 637 N. 110th St., 384-8670

60-Pc. JUMBO RECTIFIER SURPRISE PAK: What a buy! Top hats, epoxies, zeners, diodes, etc. Under $4 each!
27-033 Net 1.98
10-Pc. POWER TRANSISTOR PAK: Germanium and silicon types; 4 to 50-watt sizes. assorted TO-3, -5, -8, -13 and -36 cases. 27-036 Net 1.98
100-Pc. SEMICONDUCTOR GRAB PAK: Less than 3c ea! PNP, NPN’s, TO-3, TO-36 cases; top hats, power transistors, etc. 27-037 Net 2.98

INFRA-RED DETECTOR TRANS- DUCER KIT: Parabolic reflector; 3" filter; detector. With pictorial dia. 27-035 Net 1.98

8 TRANSISTOR ELECTROLYT- ICS. Verti-lyrics, axial types. 5 mfd-100 mfd. Asstd. voltages. 27-1571 Net 1.00
5x8" TRANSISTOR BOARDS. or more transistors each. Up to 100 parts. Parts alone worth up to $25; USA made, top quality. 27-1496 Net .99

2%x3%" TRANSISTOR BOARDS. 2 or more transistors, capaci- tors, resistors, modules, diodes, etc. USA made. Parts alone are worth over $7.00! 27-616 4 For $1.29

60-Pc. TRANSISTOR SURPRISE PAK: NPN’s, PNP’s, 10 W, 20 W, 50 W transistors, subminiature types. 27-034 Net 2.98

MAIL TO THE RADIO SHACK NEAREST YOU.

1200’ MYLAR RECORDING TAPE 7” REELS

Lots of 50

Lots of 10-49

Lots of 3-9

79c Ea. 89c Ea. 99c Ea.

Please send me: 

# FE-806

Paks as checked $ 

Tapes $ 

Book $ 

Postage/Handling $ .50 

TOTAL ENCLOSED $ 

NAME 

STREET 

CITY 

STATE 

ZIP

CIRCLE NO. 32 ON READER SERVICE PAGE

August, 1965
characteristics of the heart. Active applications include alleviating tremor and muscular rigidity in neurological disorders such as Parkinson's disease, and the selective destruction of the vestibular portion of the inner ear in the treatment of Meniere's disease in order to preserve hearing . . .

- A laser rangefinder produced in Scotland by Barr and Stroud Ltd., the first available commercially, gives fast, accurate ranging on objects up to six miles away. Weighing only 30 pounds, it's light enough to be carried and operated by one man. Range accuracy is ± 11 yards or better, and range resolution is 16 feet. Minimum range is 328 yards, and maximum range depends upon weather conditions. The transmitter uses a ruby laser with an output of more than 1 mw. and a maximum beam divergence of 0.5 milliradian. Range readout is in digital form. At least 50 shots can be obtained from the batteries that come with the instrument before recharging is necessary . . .

- Sylvania Electric Products Inc. recently developed a one-man command post radio with which artillery, planes, and naval units can be directed against terrorist forces. Weighing 48 pounds, the two-way unit operates on 18 preset channels and employs all frequencies throughout the military bands. Called the AN/PRC-71 Forward Air Controller Command Pack, it has a range of up to 500 miles and works even after being submerged in water. It replaces approximately 300 pounds of conventional radio equipment—it can be operated while attached to a lightweight harness strapped to a man's back—and makes use of plug-in circuit cards to facilitate maintenance . . .

- A tiny device that plugs into any Army radio and makes Morse code as easy to read as an electric signboard has been developed by Regency Electronics for the Army. No bigger than a pack of cigarettes, this code translator transforms dots and dashes into English letters. It contains 350 diodes and 75 transistors, a display panel that frames letters with 17 tiny incandescent lamps, and a power pack of four nickel cadmium penlight batteries. The translator plugs into an Army radio through a tiny jack, and all the operator has to do is to copy down the sequence of letters as they appear on a viewing screen. Advantages of this device are that soldiers don't have to know code to use it and the low CW frequencies on which Morse is carried are better able to penetrate jungle and cover longer distances than voice radios . . .

CIRCLE NO. 18 ON READER SERVICE PAGE
KAAR MOVES CB AHEAD 5 YEARS...OVERNIGHT
...with the most exciting CB unit ever built

KAAR SKYHAWK - 335

YOU GET ALL THESE SKYHAWK FEATURES NOW NOT 5 YEARS FROM NOW!

SPECIAL FEATURES
- Tantalum capacitors
- Sealed plug-in relay
- Filtered power leads
- Paging
- External speaker jack
- Illuminated signal level meter with dynamic modulation indication
- Glass epoxy circuit board
- Provision for plug-in selective call
- Amplified Zener diode voltage regulator
- Fine tuning (Varactor-technique) on channel selector
- External metering socket
- Inter-station and system channels identified
- Smart chrome and charcoal gray epoxy finish

199.95 complete with power cable, mounting bracket, crystal for channel 9 "Help" Channel

*OPTIONAL
6 pack crystals (for Channels 10-11-12-13-14-23) 19.95
22 pack crystals — all 23 channel operation 69.95

SEE THE SKYHAWK-335 ... hand span compact with more features than any CB Unit ever introduced!

SEE THE SKYHAWK-335 . . . 23 channels — or 1-2-3 or more — with specially priced optional added crystal packs.

SEE THE SKYHAWK-335 . . . space age components are GUARANTEED FOR TWO YEARS! Silicon planar transistors and tantalum capacitors, developed for rugged space exploration, make the unit completely reliable on truck, jeep, boat or car.

ALL SOLID STATE
HAND-SPAN COMPACTNESS
23 CHANNELS (no limit on channel choice)
ONLY CB TRANSCEIVER
WITH A 2 YEAR GUARANTEE

KAAR ENGINEERED COMMUNICATIONS
KAAR ENGINEERING COMPANY
2989 Middlefield Road, Palo Alto, California

See American Radio History Group, Inc.
hallicrafters now brings you a new measure of CB transceiver performance—

Maximum Effective Range

Announcing a major breakthrough in noise reduction... new techniques in talk power... combined to provide more miles per watt than ever before!

The quiet one... the powerful one... the compact one... the one with 12 channels, built-in P.A. system and illuminated channel selector... the all-solid state

CB-12
Solid State—12 Channel Citizens Band Transceiver

Hallicrafters • 5th & Kostner Aves. • Chicago, Illinois 60624
EVER HEAR the wail of a distant siren and wonder what's happening... or how police cars and fire trucks communicate with one another during emergencies? You can eavesdrop on this action simply by tuning in on the Land Mobile radio frequencies, particularly the 30- to 50-mc. and 152- to 174-mc. VHF bands. There's never a dull moment here, and with the fine selection of receivers available, you'll find it easy to add some excitement to your everyday life.

What's on VHF? Land Mobile frequencies were established for radio transmissions necessary to business and emergency activities. Four categories of users share these FM bands: business, industrial, public safety, and transportation systems. With more than 300,000 licensed fixed transmitters and countless numbers of mobile units scattered throughout the United States, plus more than 50,000 new ones joining these ranks
every year, you shouldn't have any trouble tuning in a wide variety of broadcasts.

The greatest concentration of users is found in the business category. They include manufacturers, business services, telephone company and other miscellaneous common carriers such as radio dispatchers, paging services, and the like. In the industrial category, industries and utilities make up a large percentage of users, as do the maritime services. You'll also find some 150 wire services, newspapers, and publishing houses using the VHF frequencies. And in the transportation category, you can tune in on taxis, motor carriers, towing and other auto emergency services, and even railroads.

But your most exciting listening will come from tuning in on public safety broadcasts made by police, fire, and emergency crews. You'll find about 90% of all police broadcasts and 95% of fire broadcasts on the 152- to 174-mc. band. Other emergency services in this category include ambulances, civil defense, and rescue squads. Highway maintenance, forest rangers, and local government offices are also heavy users.

As a free service of the U. S. Government, year-round weather information is broadcast by the Weather Bureau on 162.55 mc. in principal cities throughout the country. These broadcasts consist of regional and local forecasts, state of the sea and visibility information obtained from radar surveillance, and reports from Coast Guard lightships and shore installations. Mariners, aviators, farmers, and the like will find these continuous broadcasts indispensable.

Which Receiver to Buy? There are many types of VHF receivers on the market. The accompanying Guide to Tunable VHF Receivers lists manufacturers, models, prices, and features of some 20 tunable units. Many of these same manufacturers also market non-tunable, crystal-controlled models, but since they are fixed-frequency units and designed for special applications, they are not included in the guide.

Designed to fit almost any budget, the units listed range in price from under $60 to over $170. Naturally, the more expensive ones feature added circuitry and conveniences, such as double or triple conversion, and both fixed and variable tuning. Volunteer firemen, policemen, civil defense workers and others who are primarily interested in listening to one or two special frequencies will find it to their advantage to select one of the units featuring both crystal-controlled-channel (push-button type) and manual tuning.

Crystal costs were not considered in the prices given; figure on spending about $10 for one cut to the desired frequency. Squelch controls—designed to mute the receiver during periods of non-transmission—are incorporated in all units, regardless of price.

Although some of these receivers are dual-band, most of them tune in either the 30- to 50-mc. or 152- to 174-mc. range; so determine beforehand which

Two-band receivers work best with separate antennas for the high and low bands. In this Utica receiver, the antenna jacks are of the RCA phono type.

Some of the police/fire receivers offer a crystal-controlled tuning position. You can obtain specially ground crystals for use on specific channels.
Note the two crystal-controlled receive positions in this Hallicrafters unit. "T" is for manual tuning.

Although most of the high-band VHF stations are FM, there are a few straight AM stations. Radio Shack has switched detector to catch both signals.

Dual knobs indicate a two-speed tuning mechanism, a handy item missing from many receivers but really necessary in the selective Hallicrafters units.

There is no standardization on the type of connector between the antenna and receiver. Not only are phono jacks used, but terminal strips are common.

frequencies you'll be working. Two companies, Regency Electronics and Sonar Radio, market mobile units. Before using vehicle-installed police radios, check with local ordinances as there may be laws designed to eliminate ambulance-chasing activities. Also, remember that you must preserve the secrecy of all communications overheard on these bands.

What About an Antenna? Since a base or mobile unit is no more efficient than its antenna, it's important that you select the right type for the right job. This is especially true so far as VHF is concerned, as transmission is essentially line of sight. Under typical conditions, reception range of the 30- to 50-mc. band is between 25 and 50 miles, and that of the 152- to 174-mc. band between 15 and 25 miles. The distance is a function of transmitter power, receiver quality, antenna elevation, terrain, etc.

If you plan to use your receiver for fixed point-to-point reception, it's best to employ a directional antenna since it usually has more gain in one or two directions and reduces interference. But, for general coverage, use a vertical ground plane or other type of omnidirectional antenna.

Selection of a mobile antenna is equally as important as selection of a base unit antenna. A whip is generally employed on the lower VHF frequencies; for the higher frequencies, a roof-top unit can be used.

See "Guide to Tunable VHF Receivers" on next page
# Guide To Tunable VHF Receivers

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>Frequency (mc.)</th>
<th>Price</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Allied Radio</strong></td>
<td>Knight VHF-FM</td>
<td>30-50 or 152-174</td>
<td>$59.95</td>
<td>Single-conversion; manual tuning only; built-in speaker</td>
</tr>
<tr>
<td>100 N. Western Ave. Chicago, Ill.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hallicrafters</strong></td>
<td>CRX-1</td>
<td>30-50</td>
<td>99.95</td>
<td>Triple-conversion; manual tuning plus two crystal-controlled channels; built-in speaker and connector</td>
</tr>
<tr>
<td>5th &amp; Kostner Ave. Chicago, Ill.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CRX-2A</td>
<td>151-174</td>
<td>109.95</td>
<td></td>
<td>Same as CRX-1</td>
</tr>
<tr>
<td>CRX-4</td>
<td>30-50</td>
<td>79.95</td>
<td></td>
<td>Single-conversion; manual tuning only; logging scale on tuning dial; headphone and external speaker jack; built-in speaker</td>
</tr>
<tr>
<td>CRX-5</td>
<td>151-174</td>
<td>79.95</td>
<td></td>
<td>Same as CRX-4</td>
</tr>
<tr>
<td><strong>Lafayette Radio</strong></td>
<td>HA-50</td>
<td>30-50</td>
<td>59.95</td>
<td>Single-conversion; manual tuning only; built-in speaker; phone jack</td>
</tr>
<tr>
<td>Electronics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>111 Jericho Turnpike</td>
<td>HA-52</td>
<td>152-174</td>
<td>59.95</td>
<td>Same as HA-50</td>
</tr>
<tr>
<td>Syosset, L.I., N.Y.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Radio Shack</strong></td>
<td>Realistic RP-30/50</td>
<td>30-50</td>
<td>59.95</td>
<td>AM/FM; manual tuning plus crystal control; built-in speaker; headphone switch and provisions for using external audio amplifier</td>
</tr>
<tr>
<td>Realistic RP-148/175</td>
<td>148-175</td>
<td>59.95</td>
<td></td>
<td>Same as RP-30/50 but without crystal control</td>
</tr>
<tr>
<td><strong>Regency Electronics</strong></td>
<td>MR-33B</td>
<td>30-50</td>
<td>79.95</td>
<td>Single-conversion; manual tuning; built-in speaker; provisions for using external speaker and hookup to two-way radio systems using selective tone-controlled dispatching equipment</td>
</tr>
<tr>
<td>Corp. 7900 Pendleton Pike</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indianapolis, Ind.</td>
<td>MR-10B</td>
<td>152-174</td>
<td>79.95</td>
<td>Same as MR-33B</td>
</tr>
<tr>
<td>Mobile; double-conversion; two-stage limiting; built-in speaker; 4½&quot; x 6½&quot; x 8¾&quot;; 12-volt, 3.9-amp. power source required</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M-40</td>
<td>30-50</td>
<td>114.95</td>
<td></td>
<td>Same as M-40</td>
</tr>
<tr>
<td>M-160</td>
<td>152-174</td>
<td>114.95</td>
<td></td>
<td>Two-band; manual tuning; dual-conversion; 1-watt audio output; no built-in speaker; DRS-1 matching speaker available for $14.95</td>
</tr>
<tr>
<td>DR-200A</td>
<td>30-50 and 152-174</td>
<td>169.50</td>
<td></td>
<td>Single-conversion; manual tuning; built-in speaker; transistorized squelch circuit</td>
</tr>
<tr>
<td>PR-35B</td>
<td>30-50</td>
<td>59.95</td>
<td></td>
<td>Same as PR-35B</td>
</tr>
<tr>
<td>PR-155B</td>
<td>152-174</td>
<td>59.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sonar Radio Corp.</strong></td>
<td>FR-101</td>
<td>25-50</td>
<td>99.95</td>
<td>Double-conversion; manual tuning plus crystal control; built-in speaker; 2-tone-operated squelch; deluxe model available for both mobile and base use</td>
</tr>
<tr>
<td>73 Wortman Ave. Brooklyn, N.Y.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FR-102</td>
<td>150-175</td>
<td>99.95</td>
<td></td>
<td>Same as FR-101</td>
</tr>
<tr>
<td><strong>Squires-Sanders Inc.</strong></td>
<td>FM:ALERT</td>
<td>30-50 or 152-174</td>
<td>79.95</td>
<td>Single-conversion; manual tuning plus two crystal-controlled channels; 3 watts audio; speaker available for $9.95</td>
</tr>
<tr>
<td>Martinsville Rd./Liberty Corner Millington, N.J.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Utica Communications Corp.</strong></td>
<td>DUO-BAND</td>
<td>30-50 or 152-174</td>
<td>164.95</td>
<td>Two-band; dual-conversion; temperature-compensated drift circuit; manual tuning plus two crystal-controlled channels; matching speaker available for $12.95</td>
</tr>
<tr>
<td>2917 W. Irving Park Rd.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicago, Ill.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

44 POPULAR ELECTRONICS
IS THE HRO-500 THE GREATEST RECEIVER EVER MADE?

By JOHN D. DRUMMOND
Technicol Editor

All solid-state, pinpoint dialing, and drift-free performance certainly help

ARE YOU AN SWL who has everything but still wants more? Then take a good look at the new HRO-500 solid-state communications receiver put out by National Radio Company (Melrose, Mass.). Priced at a whopping $1295 (less speaker and optional preselector), the HRO-500 covers the entire VLF and HF spectrums (5 kc. to 30 mc.) continuously in sixty 500-kc. bands, and provides excellent reception of SSB, CW, FSK, and AM signals.

Frequency Determination and Synthesizer. The unit uses a single highly stable 500-kc. master crystal oscillator from which 60 crystal-stable HF oscil-
lator inputs are synthesized. Between 5 kc. and 4 mc., the HRO-500 operates as a triple-conversion receiver. Incoming signals in this region are up-converted to 26 mc., plus the signal frequency. The synthesizer output is then used to convert these signals to the i.f. range of 2750-3250 kc., where they are mixed with the 2980-3480 kc. VFO to produce the last i.f. of 230 kc. Signals in the 4- to 30-mc. range are directly converted by the synthesizer to the tunable i.f. without the necessity for an intermediate up-conversion.

Frequency Stability. We, at POPULAR ELECTRONICS, gave the HRO-500 a thorough going over and frankly were quite impressed. For example, in our tests the HRO-500 was found to be remarkably drift-free over relatively long periods of continuous operation. The manufacturer claims a frequency stability to within 100 cycles from turn-on through any 10-minute interval, including a 30° C change in ambient temperature, and a 40-volt change in the a.c. input voltage. Typical long-range fre-

quency drift is said to be on the order of a few hundred cycles per week. You can't beat that for stability.

Antenna Requirements. Proper antenna matching was found to be very critical, and the HRO-500 does not have an adjustment to compensate for antenna mismatch. The receiver must have a 50-ohm antenna impedance if you are to get all the sensitivity built into the equipment. If your antenna happens to be of the high-impedance type, you can use a separate high-impedance input which is provided.

In our tests we used both a Hy-Gain Model SWO antenna and a Mosley Model 1D-3 Jr. multi-trap dipole antenna, and got excellent results at frequencies down to 4 mc. Below 4 mc. a 100-foot long wire was employed which also provided good signal strength; but when the wire was switched over to the low-frequency antenna input and tuned below 500 kc., there was a noticeable degradation in receiver performance.

Tuning Very Low Frequencies. The manufacturer recommends that a preselector be used when operating at frequencies in the 5-kc. to 500-kc. range, and it didn't take us long to see why. Without the preselector, literally scores of aeronautical beacons were picked up in addition to a considerable amount of 500-kc. marine traffic. At night the 60-kc. signal from WWVB came in; and frequency-shift keying signals were heard loud and clear.

The PRESELECT TUNE control is shown being adjusted for peak performance of the receiver. This control tunes three r.f. circuits in the HRO-500's front end. Left window above PRESELECT TUNE control indicates resonant frequency of preselector.
between 16 and 22 kc., probably from the U. S. Navy communications network. The manufacturer tells us that they are coming out this month with a VLF Pre-selector (Model LF-10) that will practically quadruple receiver sensitivity in the low-frequency range.

Operating the Tuning Dial. The receiver was found quite easy to tune, although it does take a bit of twiddling around with the controls to get the knack of it—tuning, that is. You will find the epicyclic tuning control (main tuning) exceptionally smooth to turn. Aside from easy tuning, another feature worth mentioning is the fact that the receiver will operate from a 12-volt d.c. source (approximately at 200 ma.) as well as from any 117/230-volt, 50/60 cycle source.

Conclusion. Is the HRO-500 the greatest receiver ever built? We don't know... but it could very well be.

These receiver controls and S-meter enable the operator to (1) select upper or lower sideband without changing the frequency of the incoming signal; (2) select any one of four bandwidths; (3) eliminate interfering heterodynes; (4) select stand-by, SSB/CW, amplitude modulation or calibration mode. S-meter is calibrated in db above a 1-µv. signal.

---

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>5 kc. to 30 mc.</td>
</tr>
<tr>
<td>Modes</td>
<td>Upper Sideband, Lower Sideband, AM, CW</td>
</tr>
<tr>
<td>Frequency Stability</td>
<td>Within 100 cycles in any 10-minute period from turn-on</td>
</tr>
<tr>
<td>R.F. Input Impedance</td>
<td>50 ohms unbalanced; separate high-impedance unbalanced input</td>
</tr>
<tr>
<td>Receiver Sensitivity (nominal for 10 db S/N)</td>
<td>AM: 2 µv. with preselector; 25-50 µv. without preselector from 5 kc. to 500 kc.</td>
</tr>
<tr>
<td>Calibration Accuracy</td>
<td>Within 1.0 kc. over entire tuning range of VFO; within 250 cycles when zeroed to nearest calibration point</td>
</tr>
<tr>
<td>Power Requirements</td>
<td>200 ma. at 12 volts d.c., or 100 ma. at 24 volts d.c.; 115/230 volts, 50/60 cycles, 15 watts</td>
</tr>
<tr>
<td>Size (inches)</td>
<td>7 ¾ H, 16 ½ W, 12 ¾ D</td>
</tr>
<tr>
<td>Weight</td>
<td>32 pounds</td>
</tr>
<tr>
<td>Semiconductor Complement</td>
<td>37 transistors; 20 diodes</td>
</tr>
</tbody>
</table>

---

Epicyclic tuning dial, used to tune each 500-kc. band, is calibrated with linear 1-kc. divisions from zero to 500 kc.; it can be locked in position by DIAL LOCK at left. At right is a PHASE LOCK warning lamp which flashes when receiver synthesizer is not locked properly to a 500-kc. frequency increment.
Battery-operated 80-meter CW transmitter for use in the field, or as a standby back in the shack, can be built for less than $10.00

INEXPENSIVE medium-power r.f. transistors make it possible to construct a low-cost but effective dry-battery-powered c.w. transmitter. The "Camper's Special" is a 3.5-mc. portable rig with an input rating of almost 5 watts, yet it can be built for less than $10, plus batteries, key, and crystal. Operating expense is insignificant, running in the neighborhood of three cents per hour when ordinary lantern batteries are used as a power source.

While the transmitter is especially well suited to operate miles from a conventional power source, it also is a worthwhile addition to the shack of the conscientious ham who has been searching for a simple rig for emergency backup. Its signal is strong enough to provide reception of solid copy at a distance of 20 miles or more on ground wave, and up to 1000 miles when skip conditions are optimum. Keep in mind that a 5-watter is only two S-units weaker than a 100-watter. Performance, if the QRM isn't excessive, can be surprisingly good.
How It Works. Resistors $R_1$ and $R_2$ form a voltage divider to provide a small amount of forward bias for the base of $Q_1$. Current flows in the emitter-collector circuit and through $L_1$ when the key is closed. The application of power causes the crystal to vibrate at its resonant frequency and varies the emitter bias at an r.f. rate. If $L_1$ and $C_1$ are now resonated near the crystal frequency and $Q_1$ amplifies sufficiently to overcome circuit losses, the stage will go into sustained oscillation.

Capacitor $C_3$ couples the signal from $Q_1$ to $Q_2$. Transistor $Q_2$ and its tank circuit ($L_2$ and $C_4$) amplify the signal. Resonant tank circuit $L_3$, $C_6$ picks off the signal and couples it to the antenna. This is a basic master oscillator, power amplifier (MOPA) configuration.

A tap on $L_3$ matches the low impedance of the antenna feed line to the high impedance of the tank. When $S_1$ is open, current flowing to the antenna passes through pilot light $I_1$, which serves as a relative indicator of transmitter tuning and power output. Tune all stages for maximum brightness. Keep the switch closed when on the air.

Construction. The larger half of a 5” x 4” x 3” Minibox is both chassis and front panel for the transmitter. Since lead length and parts layout aren’t overly critical on the 80-meter band, you needn’t worry about precisely duplicating the component arrangement. As long as your version resembles the prototype, it should perform satisfactorily.

In order to save both space and money, mica trimmer capacitors are used for $C_1$, $C_4$ and $C_6$. Mount these capacitors behind 3⁄8” holes drilled in the Minibox cover. Note that one trimmer terminal is fastened to the plate which is directly beneath the adjusting screw in each case; fasten this terminal to a grounded solder lug. Support the other terminal on a one-terminal insulated tie strip. If you don’t like to do your tuning with a screwdriver, solder 3⁄4” lengths of 1⁄4” brass shafting, salvaged from old volume controls, to the capacitor adjusting screws.
Larger half of box serves both as chassis and front panel. Shafts mounted on capacitors C1 and C4 accommodate knobs to eliminate screwdriver-tuning.

Then you can put knobs on the shafts, as shown. A large soldering iron is needed for this particular job. Don't let excess solder drip down and short out the trimmer plates or damage the mica insulation.

No socket is required for \( I_1 \). Merely press the bulb into a \( \frac{3}{4}" \) grommet and solder leads from \( S_1 \) directly to the base and tip.

Cover \( L_2 \) with a layer of plastic electrical tape and slide it part way into \( L_3 \). The exact position of the coil will be determined later when the transmitter is adjusted. As you wire the coils, make sure that the collector end of \( L_2 \) and the ground end of \( L_3 \) are nearest \( Q_2 \). This arrangement minimizes capacitive coupling, thus keeping harmonic radiation at a minimum. Put spaghetti over the lead at the \( C_5 \) end of \( L_2 \). Thread this wire through the center of the coil and then run it over to the capacitor.

Since the transistor cases are 24 volts above ground, be certain that the fins on \( Q_2 \)'s heat sink do not contact nearby uninsulated objects. Bend the fins near \( T_5 \) and the edge of the chassis at right angles so that there will be no chance of them shorting out the batteries. For the same reason, position \( Q_1 \) where it will clear the side of the assembled Minibox.

Before plugging the transistors into their respective sockets, trim the leads to a length of \( \frac{3}{8}" \). Grip the wires tightly with a pair of long-nosed pliers, close to the transistor body, to take up the mechanical shock that results from the snipping action. Failure to do this can sometimes fracture the silicon wafer inside the transistor.

Center shield isolates oscillator from amplifier. Coil \( L_2 \) is suspended inside \( L_3 \) and cemented in place after it has been tuned for maximum output.

### PARTS LIST

- **B1**—Four 6-volt lantern batteries in series
- **C1, C4, C6**—80-480 pf. mica trimmer capacitor
- **C2, C5**—0.01-µf. ceramic disc capacitor
- **C3**—100-pf. ceramic disc capacitor
- **I1**—#47 pilot light
- **L1**—22 turns of #20 wire, 1" diameter x 1½" long, tapped 11 turns from \( C_2 \) end (B. & W. 3015 Miniductor, or equivalent)
- **L2**—14½ turns of #24 wire, \( \frac{3}{4}" \) diameter x \( \frac{1}{2}" \) long—see text (B. & W. 3012 Miniductor or equivalent)
- **L3**—23 turns of #20 wire, 1" diameter x 1¼" long, tapped 7 turns from ground end (B. & W. 3015 Miniductor, or equivalent)
- **Q1, Q2**—2N3053 transistor
- **R1**—82,000-ohm, \( \frac{1}{4} \)-watt resistor

---

*Popular Electronics*
Bend fins on Q2's heat sink to avoid contact with cabinet and leads. For best results, locate components as shown. Lead dress is not too critical.

A 2¾" x 3¾" metal shield with a ¼" mounting flange isolates the amplifier from the oscillator stage. Either thin aluminum or coffee can tin may be used for the purpose. Drill a small hole near the center of the shield to pass the spaghetti-covered lead of C5.

Precautions: The amplifier transistor generates quite a bit of heat during normal operation. Consequently, never use the rig unless a heat sink is slipped over Q2, and don't hold the key down for more than 15 seconds at a time while tuning up. Watch the battery polarity, too; accidentally reversing the battery leads can destroy the transistors.

Adjustment. Connect a 100-ohm, 1-watt composition resistor across the terminals of TS2 to act as a dummy antenna. Attach a key and battery to TS1. Set C1 at low capacity and tighten down C4 and C6. Then open S1. Tune your receiver to
Sling the center of the antenna over the highest limb of a tree, and spread it as much as possible. The more horizontal the line, the better. Radiation angle is north and south if the wire runs east and west.

the crystal frequency, and depress key.

Slowly tighten $C1$ until the oscillator can be heard in the receiver. Do not advance $C1$ beyond the point where consistent oscillation occurs each time the key is pushed. Adjust $C4$ and $C6$ for maximum volume on the receiver. By now, $I1$ should start to glow. Slide $L2$ in and out of $L3$, while adjusting $C4$ and $C6$ for the brightest indication. Then cement $L2$ in place.

A milliammeter temporarily connected in series with the key should read somewhere between 175 and 225 ma. with both transistors plugged in. Removal of $Q2$ should drop the reading to 10 or 15 ma.

Now remove the dummy load and hook up the regular antenna. Stick to the specified dimensions. Do not attempt to use a random length of end-fed wire, as it will load the transmitter incorrectly and will radiate a very poor signal. The most important part of the antenna is its center so far as height is concerned. Consequently, as long as you have the center at least 30 feet off the ground, you can tie the ends to any convenient tree or bush.

If possible, use a 46 1/2-foot feeder, rather than a 139 1/2-footer. In either case, however, do not coil up the excess line. Instead, let it “meander” back and forth on its way to the transmitter with no sharp bends.

**Operation.** Working with low power on a crowded band requires a certain amount of skill. When arranging schedules with stations back home, try to choose a time when conditions are optimum between the two locations. If skeds are impractical, pick a net frequency where the gang has been previously alerted to listen for your signals.

During random operation, don’t bother to call CQ. Wait for a strong station to come on the air within 3 or 4 kc. of your frequency and then tap out a reply. With a little patience, and operating know-how, you’ll be surprised and pleased at the number of QSO’s that the Camper’s Special will produce.
If your receiver or transceiver employs a 455-kc. i.f. strip, sharp selectivity can be achieved by substituting a recently introduced mechanical filter (Lafayette 99 K 0123) for the first i.f. transformer to help you cope with today's crowded radio bands. Several important advantages make this installation highly desirable.

Steep skirt selectivity makes it possible to overcome the masking effects of strong or local signals as little as 5 kc. away. Once the filter is installed, it doesn't need to be adjusted while the receiver is in operation. No objectionable effects such as ringing or hollow sounds commonly associated with crystal filters are present. The filter can be installed in most vacuum-tube-type amateur, commercial, or CB equipment. Finally, it works well in AM, CW, and SSB receivers.

**How It Works.** The mechanical filter is basically an electromechanical device. It consists of an input transducer, a resonant mechanical section having several metal discs, and an output transducer, as shown above. Both transducers are crystal types. An electrical signal applied to the input transducer is converted into mechanical vibrations which travel through the resonant mechanical section to the output transducer, where they are reconverted to electrical signals.

The selectivity characteristics of the filter are determined by the resonant metal discs. Each disc is carefully machined to extremely close tolerances to make it vibrate at a desired frequency, such as 455 kc. The discs are made of a ferro-nickel chromium alloy for extreme hardness and resistance to corrosion. Each is supported by—and coupled to the others with—a thin rod. The rod runs the entire length of the filter, and is attached to the transducer at each end. Only those signals within the filter's passband can get through.

Nominal bandpass characteristics of the filter used in this project are shown
in Fig. 1. At 6 db down on the response curve, the bandwidth is approximately 2 kc.; and at 60 db down, the bandwidth is approximately 6 kc.

It is natural for mechanically resonant elements, such as metal discs, to have multiple resonances which allow spurious transmissions through the filter at frequencies other than those in the primary passband. By employing conventional type i.f. transformers at the input and output ends of the filter, these spurious signals are attenuated. Signal frequencies of plus or minus 20 kc. from the i.f. (435 kc. and 475 kc.) are cut by a minimum of 40 db. Frequencies above 475 kc. and below 435 kc. are far enough away from the rest of the receiver’s passband to be blocked, and thus be of no consequence.

Input and output impedance is 10,000 ohms. Capacitive coupling is required to prevent B+ on the input side from getting to the output side, which is in the grid circuit of the next stage, and to prevent B+ from shorting to ground. In order to minimize the number of connections to the filter, the bottom leads of the windings in both transformers are already connected to the ground foil on the filter’s printed circuit board. Only three connections are needed: plate, grid, and ground.

Fig. 2. Typical receiver first i.f. stage before modification. Internal circuitry of transformer can be ignored. However, the frequency of the mechanical filter should be the same as the transformer to be replaced.

Fig. 3. In addition to the mechanical filter, only two capacitors and two resistors are added (within the dotted lines). Once the filter is installed and the remaining i.f. transformers have been peaked, no further adjustments need be made.
Construction. The only parts you will need, in addition to the mechanical filter, are two 10,000-ohm, ½-watt resistors, (R1 and R2), two 0.001-μf ceramic disc capacitors (C1 and C2), a 1” x 1” piece of Vectorbord or other suitable material, six push-in terminals, and an L-shaped mounting bracket.

Except for the removal of the first i.f. transformer, all components and connections in your receiver or transceiver remain the same. A typical circuit before modifications is shown in Fig. 2. Variations in component values or in i.f. transformer design in different receivers are not critical and will not adversely affect the installation of the filter. Figure 3 shows the same portion of the receiver after the filter has been installed.

The actual filter and additional components are mounted on a subassembly as shown in Fig. 4. While it is not necessary to shield the filter—its components are already housed in metal cans which have been grounded to the printed circuit board—it is necessary to have a good ground connection between the board and the receiver’s chassis.

The one-inch-square piece of Vectorbord is bolted to the bottom of the L-
shaped bracket. Resistors $R_1$ and $R_2$ and capacitors $C_1$ and $C_2$ are mounted on the board. The push-in terminals serve to hold the components and the connections to the receiver. Before and after photos show how the subassembly is mounted on the chassis. Check to see that the board fits in the chassis opening, to fully seat the bracket.

Alignment. Generally, once the filter assembly has been installed, no further alignment is necessary. However, you might try to peak the remaining i.f. transformers in the receiver. Just in case the two transformers on the filter have been diddled with, they too should be aligned for maximum output at the designated intermediate frequency.

---

**CLEAN LAYOUT TECHNIQUE**

To give your finished project that professional look, take care not to damage the painted surface of the cabinet when you locate the various mounting holes. Cut a piece of graph paper to cover the area to be drilled or punched and seal it down temporarily with rubber cement. Then lay out your drilling pattern using a sharp-pointed, soft-lead pencil. Centerpunch hole locations and drill (or punch) through the graph paper. When all machine work—including deburring—is finished, simply peel off the paper pattern. Excess cement can be removed by rubbing the surface with a finger or a soft eraser. The resulting surface should be smooth and clean. If you use decals or painted labels, protect them with two or three coats of clear lacquer or acrylic plastic.

—E. G. Louis
A sampler of what's available and what to look for

WHEN IT COMES to choosing equipment, a new radio amateur is in almost the same position as a youngster with a dime to spend in a candy store. There are so many goodies to choose from! Should his first transmitter include both CW and phone? What bands should it cover? How much power output should it have?

What about the ham receiver? Should it cover all frequencies from the broadcast band up, or should it cover just the amateur bands? How good is amateur equipment assembled from kits? How difficult are kits to assemble?

Of course, the type of license held and the ultimate aims of the individual amateur have a large bearing on the answers to these questions. In this article we will discuss the various factors involved, and list specific details of selected amateur equipment.
Transmitters. A Novice whose aim is to obtain his General Class license as soon as possible has clear guide lines for choosing his first transmitter. It must be crystal-controlled, key well, and operate on the 80-, 40-, and 15-meter Novice bands within the Novice power limit of 75 watts. From a practical standpoint, a 50- to 60-watter is virtually as effective as a 75-watter. With such transmitters, the average Novice works around 30 states and makes a few foreign contacts, and many Novices with good antennas work all states and a lot more DX. Then, when they get their General tickets and spread their wings, they run up fantastic DX records, still using the same, simple transmitters.

All but the simplest one-tube transmitters cover the 20-, 10-, and sometimes the 6-meter band, in addition to the 80-, 40-, and 15-meter bands. Also, some of them include a simple screen modulator for low-power AM phone work. A transmitter covering the bands between 80 and 6 meters and containing a modulator as well makes an excellent transmitter for a Novice, Technician, or a General Class operator. The latter two can add an external VFO to the unit for increased versatility.

If you want to start out with a somewhat more elaborate first transmitter, there are a number of them available with power ratings up to 150 watts and optional VFO or crystal control. (Transmitters with a rated power input of no more than 150 watts can be throttled down to the Novice 75-watt power limit, and a Novice can reserve the VFO for later use.)

Some amateurs would doubt the wisdom of investing much money in AM equipment because AM is being rapidly
replaced by single-sideband (SSB) phone. Frankly, we would not advise spending large sums for lower-frequency AM equipment for this reason. Nevertheless, there is still considerable AM operation in the 160- through 10-meter bands, especially in the less crowded operating hours. Consequently, a moderate expenditure for AM equipment for these bands is not necessarily a foolish investment for a dollar-shy Novice who would like to operate a little phone when his General ticket comes through, but who cannot afford the higher cost of SSB gear. Also, let us stress that CW is still very much alive—as a little listening in the low-frequency CW bands will verify.

A typical wide-range, Novice, Technician, General AM/CW transmitter is the E. F. Johnson "Ranger II." Selling for $249.50 in kit form and $359.50 ready to go, the "Ranger II" is rated at 75 watts, CW, and 65 watts, plate-modulated phone, on all amateur bands from 160 through 6 meters, using either crystal or built-in VFO control.

For those who are interested in a CW/SSB transmitter that can be operated as a crystal-controlled Novice CW transmitter, we are breaking the news of the Hallicrafters HT-46 CW/SSB transmitter. Scheduled for fall delivery, the HT-46 has a tentative price of approximately $295, complete with built-in power supply. Hallicrafters' engineers report that the HT-46 will operate on crystal-controlled CW at the 75-watt Novice power limit and VFO control on SSB and CW at the 100-watt output level. In addition, this new transmitter can be "slaved" with the Hallicrafters SX-146 receiver (also just announced) for transceiver-type operation if desired.

KITS

August, 1965
Novices interested in this type of equipment for future expansion might also check with the Hammarlund Manufacturing Co. about the possibilities of operating its Model HX-50A 10-through-80-meter AM/CW/SSB transmitter on reduced-power, crystal-controlled CW. And the Hallicrafters Company will furnish fairly simple instructions for modifying its Model HT-44 AM/CW/SSB transmitter for crystal-controlled operation upon request.

**Receivers.** The most important requirement for an amateur receiver is high selectivity. To combat the heavy interference in the lower-frequency amateur bands, optimum selectivity figures run under 5 kc. for AM phone, 2 to 3 kc. for SSB, and under 500 cycles for CW work, although selectivity in the 2- to 3-kr. region does a good job for all three modes of operation.

High receiver selectivity is obtainable in several ways. Among them is the use of dual (or triple) conversion, starting with a high intermediate frequency (i.f.) for good image rejection and ending with an i.f. in the 50- to 100-kc. region. Another method is the addition of a crystal or mechanical filter to obtain high selectivity at a fairly high i.f.

Also used are electronic "Q-multipliers." Available as an accessory from Heath and WRL in kit form for about $15, a Q-multiplier can make a dramatic improvement in the effective selectivity of an inexpensive receiver with an i.f. in the 455-kr. region. Along the same line is Galaxy's just-announced solid-state, tunable, audio-frequency "Rejector," which connects in the speaker leads of a receiver or transmitter and knocks out annoying whistles and heterodynes.

In selecting a ham receiver, buy the best one you can afford; and, if you don't care particularly what goes on outside the ham bands, a ham-band-only receiver results in superior fre-
The Knight-Kit R-100A is one of the few general-coverage receiver kits usable on the ham bands. Features include bandspread on 10-80 meters and a built-in Q-multiplier. The S-meter is $12.95 extra and a crystal calibrator is also available, at $10.95.

National Radio's NC-190 is tipped back to put the operating controls at a more convenient angle. Tuning from the broadcast band through 10 meters, the ham bands are spread on half of a rotary dial and six short-wave broadcast bands on the other half.

Tuning the ham bands only, the Lafayette HA-350 is a crystal-controlled double-conversion receiver of excellent selectivity and stability. A product detector has been built in for ease of SSB reception. Upper or lower sideband choice is made from panel.

About to be released this fall is the new Hallicrafters SX-146 amateur band receiver. Five hundred kc. segments of the ham bands are spread linearly over a slide rule dial; SSB reception and variable selectivity are but two of the more important features.

The Hammarlund HQ-110A is unique among ham-band-only communications receivers in that the dial is precalibrated for the 6- and 2-meter bands. Outboard converters feed appropriate low frequencies into the receiver to take advantage of the dial.

The VHF Region. Although the frequencies above 50 mc. are the home of the Technician operators, there is really very little difference in the equipment used by the average Novice, Technician, or General Class licensee in this region. Most VHF activity is on AM phone on the 50- and 144-mc. bands. Many of the transmitters are crystal-controlled, and power is seldom over 500 watts. In fact, a very large percentage of 50- and 144-mc. work is done with 5- to 20-watt transceivers.

The majority of VHF gear works on only a single band; and, except for Novices who must operate 145-147 mc., local conditions usually determine whether the 50-mc. or 144-mc. band is more popular in an area. The normal communications range is somewhat greater on 50 mc. than on 144 mc., and there are occasional chances for DX contacts on the 50-mc. band, especially in May, June, July, August, and December. But these advantages are often counterbalanced in television Channel 2 areas by the greater likelihood of neighborhood TVI complaints being generated by 50-mc. operation.

Single-sideband operation on the VHF bands is still at a fairly low level, but it is increasing as suitable equipment becomes more readily obtainable. We doubt, however, that SSB will achieve the popularity on VHF for general operation that it enjoys on the lower frequencies for years to come, if for no other reason than that there is more room to move around on the VHF bands. Also, except for serious workers who use every possible means to stretch their communications range to the utmost, the amount of CW on the VHF bands is pitifully small. Many VHF transmitters do not even have a key jack!

Converters. With a transceiver, one's receiving problems are automatically taken care of for mobile and portable operation. But for the operator who already possesses a good, low-frequency ham receiver, a good crystal-controlled VHF converter ahead of it offers the most economical means of obtaining excellent VHF reception in the home station. It is common, in fact, for VHF operators with transceivers to use them as transceivers for mobile and portable operation, and as transmitters only at home, depending on the converter-receiver combination for reception, especially when interference is bad and signals are weak.

Hammarlund's HQ-110A and HQ-170 receivers actually contain built-in 6- and 2-meter converters, and both receivers cover all the ham bands from 160 meters through 2 meters. Squires-Sanders, Inc. attacks the problem from the opposite end in the "Clegg Interceptor B" receiver, which covers the 6- and 2-meter bands directly; an accessory all-band HF tuner is available to extend the coverage to the lower-frequency amateur bands.

Solid-State Equipment. Except for power supplies and some accessories, the

(Continued on page 101)

See Ham Equipment Sampler on p. 62 to 64
<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>Type</th>
<th>Function</th>
<th>Transmitter Control</th>
<th>Bands</th>
<th>Mode</th>
<th>Power, etc.</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Allied Radio</strong></td>
<td>P-2</td>
<td>Kit</td>
<td>SWR Meter</td>
<td></td>
<td>All</td>
<td>Any</td>
<td>Any</td>
<td>$15.95</td>
</tr>
<tr>
<td>100 N. Western Ave.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BCB/6 m.</td>
<td>AM/CW</td>
<td>8 tubes</td>
<td>59.95</td>
</tr>
<tr>
<td>Chicago, Ill. (“Knight-Kit”)</td>
<td>R-55A</td>
<td>Kit</td>
<td>Receiver</td>
<td></td>
<td>BCB/10 m.</td>
<td>AM/CW/SSB</td>
<td>9 tubes</td>
<td>99.95</td>
</tr>
<tr>
<td></td>
<td>R-100A</td>
<td>Kit</td>
<td>Receiver</td>
<td></td>
<td></td>
<td>AM/CW</td>
<td>60 watts</td>
<td>49.95</td>
</tr>
<tr>
<td></td>
<td>T-60</td>
<td>Kit</td>
<td>Transmitter</td>
<td>Xtal</td>
<td>80/6 m.</td>
<td>AM/CW</td>
<td>150 watts</td>
<td>99.95</td>
</tr>
<tr>
<td></td>
<td>T-150A</td>
<td>Kit</td>
<td>Transmitter</td>
<td>Xtal/VFO</td>
<td>80/6 m.</td>
<td>AM/CW</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>AMECO Equipment Corp.</strong></td>
<td>AC-1T</td>
<td>Kit</td>
<td>Transmitter</td>
<td>Xtal</td>
<td>80/40 m.</td>
<td>CW</td>
<td>15 watts</td>
<td>19.95</td>
</tr>
<tr>
<td>178 Herricks Rd. Mineola, L.I., N.Y.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6/2 m.</td>
<td>AM/CW</td>
<td>75 watts</td>
<td>149.95</td>
</tr>
<tr>
<td></td>
<td>TX-62</td>
<td>Wired</td>
<td>Transmitter</td>
<td>Xtal</td>
<td>80/10 m.</td>
<td>AM/CW</td>
<td>90 watts</td>
<td>89.95</td>
</tr>
<tr>
<td></td>
<td>TX-80</td>
<td>Kit</td>
<td>Power supply for TX-80</td>
<td>CN Series kits</td>
<td></td>
<td></td>
<td>117 volts</td>
<td>44.95</td>
</tr>
<tr>
<td></td>
<td>PS-3</td>
<td>Wired</td>
<td>Power supply for CN series</td>
<td>CN Series kits</td>
<td></td>
<td></td>
<td></td>
<td>34.95</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>and up</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10.50</td>
</tr>
<tr>
<td><strong>Conar Division of National Radio</strong></td>
<td>400</td>
<td>Kit</td>
<td>Transmitter</td>
<td>Xtal</td>
<td>80/40/15 m.</td>
<td>CW</td>
<td>25 watts</td>
<td>32.50</td>
</tr>
<tr>
<td><strong>Institute</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>Kit</td>
<td>Receiver</td>
<td></td>
<td>80/40/15 m.</td>
<td>AM/CW/SSB</td>
<td>4 tubes</td>
<td>37.50</td>
</tr>
<tr>
<td><strong>Washington, D.C.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>R. L. Drake Company</strong></td>
<td>R-4</td>
<td>Wired</td>
<td>Receiver</td>
<td></td>
<td>80/10 m.</td>
<td>AM/CW/SSB</td>
<td>1000 watts</td>
<td>379.95</td>
</tr>
<tr>
<td><strong>Miamisburg, Ohio</strong></td>
<td>TV-1000-LP</td>
<td></td>
<td>Low-Pass Filter</td>
<td></td>
<td>80/6 m.</td>
<td></td>
<td>200 w.-6 m.</td>
<td>16.95</td>
</tr>
<tr>
<td></td>
<td>TV-100-LP</td>
<td></td>
<td>Low-Pass Filter</td>
<td></td>
<td>80/6 m.</td>
<td></td>
<td>100 watts</td>
<td>5.95</td>
</tr>
<tr>
<td><strong>EICO Electronic Instrument Co., Inc.</strong></td>
<td>720</td>
<td>Kit</td>
<td>Transmitter</td>
<td>Xtal</td>
<td>80/10 m.</td>
<td>CW</td>
<td>90 watts</td>
<td>89.95</td>
</tr>
<tr>
<td>1311-01 39th Ave</td>
<td>723</td>
<td>Kit</td>
<td>Transmitter</td>
<td>Xtal</td>
<td>80/10 m.</td>
<td>CW</td>
<td>60 watts</td>
<td>59.95</td>
</tr>
<tr>
<td><strong>Flushing, N.Y.</strong></td>
<td>722</td>
<td>Kit</td>
<td>VFO for 720</td>
<td></td>
<td>80/10 m.</td>
<td></td>
<td></td>
<td>44.95</td>
</tr>
<tr>
<td></td>
<td>730</td>
<td>Kit</td>
<td>Modulator for 720 and 723</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>59.95</td>
</tr>
<tr>
<td><strong>Galaxy Electronics</strong></td>
<td></td>
<td></td>
<td>CW Monitor for any transmitter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 S. 34th St. Council Bluffs, Iowa</td>
<td></td>
<td></td>
<td>Microphone Compression Amp.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>“Rejector” Audio Notch Filter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SAMPLER OF EQUIPMENT FOR THE HAM NEWCOMER
<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>Type</th>
<th>Transceiver</th>
<th>VFO</th>
<th>Xtal/VFO</th>
<th>AM/CW/SSB</th>
<th>Power Supply</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gonset, Inc.</td>
<td>900A</td>
<td>Wired</td>
<td>Transceiver</td>
<td>VFO</td>
<td>2 m.</td>
<td>AM/CW/SSB</td>
<td>20 watts</td>
<td>399.50</td>
</tr>
<tr>
<td></td>
<td>901A</td>
<td>Wired</td>
<td>Power supply for 900A Receiver</td>
<td></td>
<td></td>
<td></td>
<td>117 volts</td>
<td>73.50</td>
</tr>
<tr>
<td></td>
<td>910A</td>
<td>Wired</td>
<td>Power supply for 910A Receiver</td>
<td></td>
<td></td>
<td></td>
<td>20 watts</td>
<td>399.50</td>
</tr>
<tr>
<td></td>
<td>911A</td>
<td>Wired</td>
<td>Power supply for 910A Receiver</td>
<td></td>
<td></td>
<td></td>
<td>117 volts</td>
<td>73.50</td>
</tr>
<tr>
<td></td>
<td>G50</td>
<td>Wired</td>
<td>Transmitter</td>
<td>VFO</td>
<td>80/10 m.</td>
<td>AM/CW/SSB</td>
<td>100 watts</td>
<td>295.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Receiver</td>
<td></td>
<td>80/10 m.</td>
<td>AM/CW/SSB</td>
<td>100 watts</td>
<td>179.95</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Receiver</td>
<td></td>
<td>80/10 m.</td>
<td>AM/CW/SSB</td>
<td>100 watts</td>
<td>249.95</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Transceiver</td>
<td>Xtal</td>
<td>2 m.</td>
<td>AM</td>
<td>12 watts</td>
<td>189.95</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Transceiver</td>
<td>Xtal</td>
<td>6 m.</td>
<td>AM</td>
<td>12 watts</td>
<td>189.95</td>
</tr>
<tr>
<td>Hallicrafters</td>
<td>HT-46</td>
<td>Wired</td>
<td>Transmitter</td>
<td>VFO/Xtal</td>
<td>80/10 m.</td>
<td>AM/CW/SSB</td>
<td>200 watts</td>
<td>495.00</td>
</tr>
<tr>
<td>5th &amp; Kostner Ave.</td>
<td>SX-130</td>
<td>Wired</td>
<td>Receiver</td>
<td></td>
<td>160/2 m.</td>
<td>AM/CW/SSB</td>
<td>309.00</td>
<td></td>
</tr>
<tr>
<td>Chicago, Ill.</td>
<td>SX-146</td>
<td>Wired</td>
<td>Receiver</td>
<td></td>
<td>160/2 m.</td>
<td>AM/CW/SSB</td>
<td>429.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SR-42</td>
<td>Wired</td>
<td>Transceiver</td>
<td>Xtal</td>
<td>2 m.</td>
<td>AM</td>
<td>18 watts</td>
<td>199.95</td>
</tr>
<tr>
<td></td>
<td>SR-46</td>
<td>Wired</td>
<td>Transceiver</td>
<td>Xtal</td>
<td>6 m.</td>
<td>AM</td>
<td>18 watts</td>
<td>199.95</td>
</tr>
<tr>
<td>Hammarlund Mfg. Co.</td>
<td>HX-50A</td>
<td>Wired</td>
<td>Transmitter</td>
<td>Xtal/VFO</td>
<td>80/10 m.</td>
<td>AM/CW/SSB</td>
<td>117 volts</td>
<td>429.00</td>
</tr>
<tr>
<td>73-88 Hammarlund Dr.</td>
<td>HQ-110A</td>
<td>Wired</td>
<td>Receiver</td>
<td></td>
<td>160/2 m.</td>
<td>AM/CW/SSB</td>
<td>429.00</td>
<td></td>
</tr>
<tr>
<td>Mars Hill, N.C.</td>
<td>HQ-170A</td>
<td>Wired</td>
<td>Receiver</td>
<td></td>
<td>160/2 m.</td>
<td>AM/CW/SSB</td>
<td>429.00</td>
<td></td>
</tr>
<tr>
<td>Heath Company</td>
<td>DX-60A</td>
<td>Kit</td>
<td>Transmitter</td>
<td>Xtal</td>
<td>80/10 m.</td>
<td>AM/CW</td>
<td>90 watts</td>
<td>79.95</td>
</tr>
<tr>
<td>Benton Harbor, Mich.</td>
<td>HG-10</td>
<td>Kit</td>
<td>VFO for DX-60</td>
<td>VFO</td>
<td>80/2 m.</td>
<td>AM/CW/SSB</td>
<td>34.96</td>
<td></td>
</tr>
<tr>
<td>(“Heathkit”)</td>
<td>HR-10</td>
<td>Kit</td>
<td>Receiver</td>
<td></td>
<td>80/10 m.</td>
<td>AM/CW/SSB</td>
<td>79.95</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HW-29A</td>
<td>Kit</td>
<td>Transceiver</td>
<td>Xtal</td>
<td>6 m.</td>
<td>AM</td>
<td>44.95</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HW-30</td>
<td>Kit</td>
<td>Transceiver</td>
<td>Xtal</td>
<td>2 m.</td>
<td>AM</td>
<td>44.95</td>
<td></td>
</tr>
<tr>
<td></td>
<td>HW-10</td>
<td>Kit</td>
<td>Transceiver</td>
<td>Xtal</td>
<td>6 m.</td>
<td>AM</td>
<td>18 watts</td>
<td>199.95</td>
</tr>
<tr>
<td></td>
<td>HW-12</td>
<td>Kit</td>
<td>Transceiver</td>
<td>Xtal/VFO</td>
<td>2 m.</td>
<td>AM</td>
<td>18 watts</td>
<td>199.95</td>
</tr>
<tr>
<td></td>
<td>HD-11</td>
<td>Kit</td>
<td>Q-Multiplier</td>
<td></td>
<td>450-460 kc.</td>
<td></td>
<td>117 volts</td>
<td>14.95</td>
</tr>
<tr>
<td>International Crystal Mfg. Co., Inc.</td>
<td>AOD-57</td>
<td>Wired</td>
<td>Transmitter</td>
<td>Xtal</td>
<td>6 m.</td>
<td>CW</td>
<td>5 watts</td>
<td>69.50</td>
</tr>
<tr>
<td>18 N. Lee St.</td>
<td>AOA-144</td>
<td>Wired</td>
<td>Amplifier</td>
<td></td>
<td>2 m.</td>
<td>CW</td>
<td>39.50</td>
<td></td>
</tr>
<tr>
<td>Oklahoma City, Okla.</td>
<td>AMD-10</td>
<td>Wired</td>
<td>Modulator for above units</td>
<td></td>
<td></td>
<td></td>
<td>24.50</td>
<td></td>
</tr>
<tr>
<td>E. F. Johnson Co.</td>
<td>Ranger II</td>
<td>Kit</td>
<td>Transmitter</td>
<td>Xtal/VFO</td>
<td>160/6 m.</td>
<td>AM/CW</td>
<td>65-75 watts</td>
<td>249.50</td>
</tr>
<tr>
<td>Waseca, Minn.</td>
<td>Ranger II</td>
<td>Wired</td>
<td>Transmitter</td>
<td>Xtal/VFO</td>
<td>160/6 m.</td>
<td>AM/CW</td>
<td>65-75 watts</td>
<td>395.00</td>
</tr>
<tr>
<td></td>
<td>250-20</td>
<td>Wired</td>
<td>Low-Pass Filter</td>
<td></td>
<td>160/10 m.</td>
<td>AM/CW</td>
<td>1000 watts</td>
<td>14.95</td>
</tr>
<tr>
<td></td>
<td>250-23-1</td>
<td>Wired</td>
<td>“Match Box“ Antenna Coupler</td>
<td></td>
<td></td>
<td></td>
<td>275 watts</td>
<td>64.95</td>
</tr>
<tr>
<td>Lafayette Radio Electronics</td>
<td>HA-225</td>
<td>Wired</td>
<td>Receiver</td>
<td></td>
<td>.15/54 mc.</td>
<td>AM/CW/SSB</td>
<td>14 tubes</td>
<td>139.50</td>
</tr>
<tr>
<td>111 Jericho Turnpike</td>
<td>HA-350</td>
<td>Wired</td>
<td>Receiver</td>
<td></td>
<td>80/10 m.</td>
<td>AM/CW/SSB</td>
<td>11 tubes</td>
<td>189.50</td>
</tr>
<tr>
<td>Syosset, L.I., N.Y.</td>
<td>99-2501</td>
<td>Wired</td>
<td>VFO</td>
<td></td>
<td>80/10 m.</td>
<td>AM/CW/SSB</td>
<td>117 volts</td>
<td>34.50</td>
</tr>
<tr>
<td></td>
<td>99-2536</td>
<td>Wired</td>
<td>VFO</td>
<td></td>
<td>6/2 m.</td>
<td></td>
<td>117 volts</td>
<td>29.95</td>
</tr>
<tr>
<td>National Radio Co., Inc.</td>
<td>NC-190</td>
<td>Wired</td>
<td>Receiver</td>
<td></td>
<td>BCB/10 m.</td>
<td>AM/CW/SSB</td>
<td>10 tubes</td>
<td>239.95</td>
</tr>
</tbody>
</table>

(Continued on next page)
## SAMPLER OF EQUIPMENT FOR THE HAM NEWCOMER

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>Type</th>
<th>Function</th>
<th>Transmitter Control</th>
<th>Bands</th>
<th>Mode</th>
<th>Power, etc.</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polytronics Laboratories, Inc.</td>
<td>PC-2 AC/DC</td>
<td>Wired</td>
<td>Transceiver</td>
<td>Xtal/VFO</td>
<td>2 m.</td>
<td>AM</td>
<td>18 watts</td>
<td>349.50</td>
</tr>
<tr>
<td></td>
<td>PC-6 AC/DC</td>
<td>Wired</td>
<td>Transceiver</td>
<td>Xtal/VFO</td>
<td>6 m.</td>
<td>AM</td>
<td>18 watts</td>
<td>329.50</td>
</tr>
<tr>
<td>Squires-Sanders, Inc.</td>
<td>22'er</td>
<td>Wired</td>
<td>Transceiver</td>
<td>Xtal</td>
<td>2 m.</td>
<td>AM</td>
<td>18 watts</td>
<td>239.50</td>
</tr>
<tr>
<td>Martinville Rd./Thor VI</td>
<td>99'er</td>
<td>Wired</td>
<td>Transceiver</td>
<td>Xtal</td>
<td>6 m.</td>
<td>AM</td>
<td>18 watts</td>
<td>179.95</td>
</tr>
<tr>
<td>Millington, N.J.</td>
<td>Interceptor B</td>
<td>Wired</td>
<td>Receiver</td>
<td>Xtal/VFO</td>
<td>2/6 m.</td>
<td>AM/CW/SSB</td>
<td>495.00</td>
<td></td>
</tr>
<tr>
<td>The Equipment Crafters</td>
<td>TR-20/50</td>
<td>Wired</td>
<td>Transmitter</td>
<td>Xtal</td>
<td>6 m.</td>
<td>AM/CW</td>
<td>20 watts</td>
<td>65.95</td>
</tr>
<tr>
<td>Box 84</td>
<td>TR-20/144</td>
<td>Wired</td>
<td>Transmitter</td>
<td>Xtal</td>
<td>2 m.</td>
<td>AM/CW</td>
<td>20 watts</td>
<td>65.95</td>
</tr>
<tr>
<td>Hackensack, N.J.</td>
<td>PTR-2</td>
<td>Wired</td>
<td>Power supply for above</td>
<td>Converter</td>
<td>6 m.</td>
<td></td>
<td>117 volts</td>
<td>39.95</td>
</tr>
<tr>
<td>(&quot;Tecraft&quot;)</td>
<td>50</td>
<td>Wired</td>
<td>Converter</td>
<td></td>
<td>2 m.</td>
<td></td>
<td>117 volts</td>
<td>54.95</td>
</tr>
<tr>
<td>Utica Communications Corp.</td>
<td>650</td>
<td>Wired</td>
<td>Transceiver</td>
<td>Xtal/VFO</td>
<td>6 m.</td>
<td>AM</td>
<td></td>
<td>189.95</td>
</tr>
<tr>
<td>Chicago, Ill.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Less VFO</td>
<td>169.95</td>
<td></td>
</tr>
<tr>
<td>Vanguard Electronic Labs.</td>
<td>300</td>
<td>Wired</td>
<td>Converter</td>
<td></td>
<td>6 m.</td>
<td></td>
<td></td>
<td>10.95</td>
</tr>
<tr>
<td>300</td>
<td>Wired</td>
<td>Converter</td>
<td></td>
<td>2 m.</td>
<td></td>
<td></td>
<td>12.95</td>
<td></td>
</tr>
<tr>
<td>Whippany Laboratories, Inc.</td>
<td>Li'l Lulu</td>
<td>Wired</td>
<td>Transmitter Receiver</td>
<td>VFO</td>
<td>6 m.</td>
<td>AM/CW</td>
<td>17 watts</td>
<td>225.00</td>
</tr>
<tr>
<td>1275 Bloomfield Ave. Fairfield, N.J.</td>
<td>Li'l Lulu</td>
<td>Wired</td>
<td></td>
<td></td>
<td>6 m.</td>
<td>AM/CW/SSB</td>
<td></td>
<td>250.00</td>
</tr>
<tr>
<td>World Radio Laboratories</td>
<td>TC-6A</td>
<td>Kit</td>
<td>Transceiver</td>
<td>Xtal</td>
<td>6 m.</td>
<td>AM</td>
<td>5 watts</td>
<td>39.95</td>
</tr>
<tr>
<td>3415 Broadway Council Bluffs, Iowa</td>
<td>TCA</td>
<td>Kit</td>
<td>Power supply for TC-6A</td>
<td></td>
<td></td>
<td></td>
<td>117 volts</td>
<td>15.95</td>
</tr>
<tr>
<td>CA-27</td>
<td>Wired</td>
<td>Microphone</td>
<td>Compressor Amp.</td>
<td>Antenna Tuner</td>
<td>80/10 m.</td>
<td>AM/CW</td>
<td>14.95</td>
<td></td>
</tr>
<tr>
<td>MM-100</td>
<td>Kit</td>
<td>Q-Multiplier</td>
<td></td>
<td></td>
<td>455 kc.</td>
<td></td>
<td></td>
<td>10.95</td>
</tr>
<tr>
<td>SS-3</td>
<td>Kit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>117 volts</td>
</tr>
</tbody>
</table>

1. Available from manufacturer as a wired unit at increased price.
2. Tentative price at press time.
PHOTO STORAGE—Photo at far right is the output of a computer. A transparency of the original (right) was scanned and digitalized by a flying spot scanner at Cornell Aeronautical Laboratory. Photo was stored on magnetic tape, then transferred back to the flying spot scanner, which converted the information as shown. Computer indicates elements of a picture in 64 shades of gray.

PHONOVID—Westinghouse’s “Phonovid” system plays television pictures as well as voice and music from a phonograph record. Up to 400 still pictures and 40 minutes of sound can be recorded on the two sides of a 12”, 33 1/3-rpm record called a “Videodisc.” The record is not just an audio recording that triggers pictures from a slide projector; both audio and video signals are present in the grooves of the record and are picked up by the needle. The “pictures” can be line drawings, charts, printed text, etc. Unit works with standard TV sets.

BATTLEFIELD TERMINAL—Mobile communications terminals that provide battlefield commanders with virtually instantaneous worldwide communications via satellites are being developed by Sylvania Electric Products Inc. Each terminal will contain tracking equipment, a control console, a transmitter, and a receiver. It will be possible to transport an entire unit, including a 12”-diameter collapsible dish antenna, on a medium-sized truck.

ONE TEACHER FOR MANY SCHOOLS—Five New York State schools are among the first in the nation where students receive instructions simultaneously from one lecturer through equipment and facilities provided by General Telephone & Electronics Corporation. The “blackboard” handwriting and voice of lecturer (left) are transmitted to distant classes (above) through conventional telephone circuits.

August, 1965
BUILD
PLUG-IN MODULES
TO SIMPLIFY
YOUR
PROJECTS

ELECTRONIC CIRCUITS that are used repeatedly as experimental building blocks can be modularized to save time and provide flexibility. Plug-in modules containing standardized circuits have been used by industrial laboratories for many years; they eliminate repetitive labor in the construction of commonly used circuits such as power supplies, voltage amplifiers, power amplifiers, etc. Hobbyists can also use the plug-in module principle to speed construction of an experimental circuit.

Although commercial plug-in modules are available, they may be a little expensive. You can construct your own and save money. Bases from old octal tubes can be cleaned out and made to hold components. Terminal strips and small perforated boards with push-in terminals can be mounted on the tube bases to achieve proper lead dress and to accommodate more components. Octal plugs can be used instead of the bases; with proper brackets or spacers, they will hold small power and output transformers.

Plug-in modules such as those shown in Fig. 1 can be easily connected together on a breadboard to form a complete functional circuit. Input and output connections, and operating power, are made through Fahnestock clips. Figure 2 shows the schematic of a transistor amplifier stage along with its suggested modular layout. The components are mounted on a small board, which is then secured to the base with epoxy cement. Follow the examples shown—it's easy.

—Charles Green, W3IKH

Fig. 1. Modules plugged into convenient sockets mounted on a breadboard quickly form a two-stage audio amplifier complete with its own power supply.

Fig. 2. A modularized transistor amplifier can be made by mounting components on a small perforated board cemented into a salvaged octal tube base.
THE YEAR 1965 will be remembered in the history of the Citizens Radio Service (CB) as the year of “maturity.” Implementation of the new CB Rules governing permissible use of the 23 channels gave most of the band back to legitimate users. Ham-style chit-chat activity has rapidly declined, and “round tables” that blocked channels for hours are being dispersed. Small businesses, husbands and wives, doctors, garage owners, etc., are finding that CB provides communication facilities between homes and offices and mobile units at a modest investment. Contrary to many claims that the “hobbyists” supported CB growth, the legitimate users are filling up any vacuum that might have been created.

For the fourth year in succession, CB dominated the Federal Communications Commission rolls of newly licensed radio stations. From May 1964 to the end of April 1965, the FCC granted 130,000 CB licenses. During the previous similar twelve months in 1963-64, approximately 241,000 licenses were granted, and between May 1962 and April 1963, the number of licenses issued was 208,000.

August, 1965
The grand total of CB licenses on the books at the end of April 1965 was an astonishing 801,000.

H.E.L.P. Bursting on the CB scene in 1965 was a publicity program called H.E.L.P. (Highway Emergency Locating Plan). Initiated by the Automobile Manufacturers Association, H.E.L.P. was described as a means of providing radio communications from automobiles on the roads to fixed stations in case of emergency. The natural choice of frequencies fit perfectly into the CB picture and the concept of H.E.L.P. was tied in with the REACT monitoring network.

So powerful was the impetus of the H.E.L.P. project and its backer, the A.M.A., that a petition was filed with the FCC requesting assignment of two new CB channels exclusively for H.E.L.P. services. The philosophy of H.E.L.P. is incontrovertible and CB'ers have been doing yeoman work in times of emergency and disaster for several years—largely organized under the auspices of REACT and MCEU. The A.M.A. has provided resources and funds not previously available to popularize the “good” of CB.

Within weeks after the petition for these channels was filed, a variety of safety and insurance foundations announced their support of the project. CB equipment manufacturers are obviously interested in H.E.L.P. and several have filed supporting statements recommending the granting of exclusive channels. However, whether the requested channels will be made available to H.E.L.P. has not been resolved at press time.

Equipment—New, Or Upcoming. On the following pages, the Editors of POPULAR ELECTRONICS have summarized—manufacturer by manufacturer—the CB equipment marketplace. This summary is designed to give the new or potential buyer an idea of what’s available and at what price. The CB operator wanting to upgrade his communications system will find the summary useful in determining the type of gear currently manufactured and what to expect in the near future.

Although the overall number of manufacturers producing CB equipment has remained at the same level for the past three years, the variety of gear available has markedly increased. Transceivers are offered at prices ranging from $70 to close to $400.00. As the price spread expands, manufacturers are about equally divided on just what the CB operator wants—more channels and more versatility, or fewer channels and simpler operation. Prices of many transceivers have come down in the past few months and the best bargains are in the kits. Dozens of new transceivers are scheduled for appearance this fall.

An overwhelming number of the new models will be transistorized, or hybrid—combining tubes and transistors. Prices of transistorized gear are still high, although not disproportionately so. The advantages more than offset the extra cost—lower current drain from the car battery, and minimum possible size cabinets.

The “Power” Switch. Something new in CB gear this year has been the "Power" switch on the front panel of transceivers. This switch alters the internal circuits so that input power can be dropped from 5 watts to 100 milliwatts. With 5 watts input, the CB'er operates under Part 95 of the FCC Rules and must have a license. At 100 milliwatts input, the operator—thoretically—could be unlicensed since the transmitter would fall under Part 15 of the Rules. With 100 milliwatts, two-way contacts at any distance are permitted, and several more channels are available. However, the FCC has questioned the intent of the “Power” switch and indicated that the operator must be licensed regardless of whether or not the transceiver draws 5 watts or 100 milliwatts.

Although the FCC Rules are not clear on the specifics of the “Power” switch, the Editors stress that the Commission's interpretations of the “intent” of the Rules are not clear-cut on this point either.

What Else Is New? The enigma of whether or not single-sideband (SSB) transmission can become a useful CB tool is still up in the air. However, General Radiotelephone is forging ahead and has a 48-channel SSB transceiver on the market. The 48 channels are made up of the regular 23 assigned to Part 95, Class D service (splitting the upper and lower sidebands for two channels) plus the (Continued on page 100)
ALLIED RADIO CORP. (100 N. Western Ave., Chicago, Ill. 60606) Price-breakers will be the order of business in the Knight-Kit line for 1966. Two transceivers will be announced. A Knight-Kit Model C-540 is new at $44.95 (a.c., only) and $49.95 (universal supply). This kit will have noise limiting, squelch, and transmit crystal plug-in from the front panel. Receiver is tunable over all 23 channels. The second new kit is the “Safari I,” a 23-channel synthesized circuit selling for $129.95. Specs call for 19-tube performance with a doubleconversion receiver and low-noise Nuvistor r.f. stage. The popular Knight-Kit C-560 will be continued, but reduced in price to $84.95 (a.c., only). A universal power supply model of the C-540 goes for $94.95. In the Allied regular wired line sold under the Knight brand name, the KN-2565 has been up-dated with an audio compression system. Price remains at $169.85. A new addition is the Knight KN-2585 with eight channels plus tunable receive at $119.95. Last but not least in the line is the new KN-2590 ($79.95); this 8-channel unit has a tunable receive section and provisions to operate at either 5 watts or 100 milliwatts input.

AMPHENOL-BORG ELECTRONICS CORP. (2875 S. 25th Ave., Broadview, Ill.) Having purchased the CB manufacturing facilities of Cadre Industries, Amphenol now distributes the Model C-75 ($114.50), a hand-held 1.5-watt transceiver, and the Model 510-B ($199.50), a 5-watt transistorized fixed or mobile unit. The latter can be converted to portable operation with a battery field pack ($37.95). A new transceiver just being introduced is the Model 600 ($179.50): it is fully transistorized, with 10 channels for 12-volt d.c. operation. A similar unit, Model 625 ($189.50), is for base station use with 117 volts a.c. All of the larger Amphenol transceivers use tuned ceramic filters for good adjacent-channel rejection. Either the Model 510-B or 600 can be used with the Model 524 selective calling adapter. The Model 524 permits 24 tone signal combinations.

B&K MANUFACTURING CO. (1801 W. Belle Plaine, Chicago, Ill. 60613) The “Cobra” introduced last year has been improved through the addition of “Dyna-Boost”—a speech compression circuit controlled from the front panel. Price remains at $214.95.

BROWNING LABORATORIES, INC. (1269 Union Ave., Laconia, N. H. 03246) Birds continue to fly at Browning with the popular “Drake” ($260.00) and “Eagle” ($359.00) being very hot items. Two new units will be offered this fall. The “Raven,” a luxurious 10- or 23-channel transceiver, will be aimed at the mobile market, and a second unit (unnamed) will be announced shortly.

BURSTEIN-APPLEBEE CO. (1012 McGee St., Kansas City, Mo.) The Model BA-22 ($119.95) is being continued. This is a universally powered unit with 12 channels and tunable receiver.

CONCORD ELECTRONICS CORP. (1935 Armacost Ave., Los Angeles, Calif. 90025) New for 1966 is the Model TG-132B, a 1-watt hand-held transceiver. Loaded with eight type C cells, the TG-132 weighs in at 2.5 lb. There are provisions for external antenna and use on 12 volts d.c. or 117 volts a.c. List price, $99.95.

DEMAC ELECTRONICS (Bristol, Ind. 46507) A 4-piece base station called the “Satellite” ($295.00, plus microphone) is still at the top of the Demac line. A matching cabinet speech compressor is an extra $41.00. For mobile operation, the “Traveler” ($180.00, plus microphone) is still offered. New unit just out is the “Raveller” ($124.50), fitted for 12-volt d.c. or 117-volt a.c. power. Featured in the “Raveller” is a low-noise triode mixer and six crystal-controlled channels. A Model CH-300 control head ($29.50, extra) permits 23-channel receiver tuning, use of the audio amplifier for p.a., and incorporates an S-meter.

E.C.I. ELECTRONICS COMMUNICATIONS, INC. (56 Hamilton Ave., White Plains, N.Y.) The popular “Courier 23” ($189.50) has been improved through the addition of a “Range Boost” speech clipper. The “23” is frequency-synthesized for 23-channel operation. New from e.c.i. is the “Courier 12” ($109.50), a 12-channel crystal-controlled transmit and receive unit with provisions to drop output power to 100 milliwatts. Universally powered, the “Courier 12” can also be used for p.a. work.

EICO ELECTRONIC INSTRUMENT CO., INC. (131-01 39th Ave., Flushing, N.Y. 11352) Still in the EICO line are the Models 772 ($69.95, kit: $99.95, wired) and 777 ($99.95, kit: $149.95, wired). Just being announced is the Model 779 “Sentinel-23” ($169.95, wired only). Universally powered, the “Sentinel-23” has frequency-synthesis circuitry for 23-channel operation. This unit can also be used for p.a. work. Coming up from EICO for late 1965 will be a 12-channel transceiver and a special transistorized kit with 10 or 11 channels.

FANON-MASCO INDUSTRIES, INC. (439 Frelighuysen Ave., Newark, N.J. 07114) Two medium-power walkie-talkies are being intro-
duced this fall. The Model FCB-12 “Pathfinder” ($37.50) has an input of 240 milliwatts. It uses 11 transistors and weighs 19 oz with batteries. The second unit, the Model FCB-13 “Commander” ($64.95), has an input of 750 milliwatts. It uses 13 transistors and weighs 24 oz with batteries.

**GC ELECTRONICS CO.** (400 South Wyman St., Rockford, Ill.) All three popular transceivers manufactured by GC Electronics are being continued. The 11-channel “Globe Master” sells for $229.95. Price of the “Globe Star” has been dropped to about $139.50. This is a 5-channel crystal-controlled unit. The versatile “President” ($169.50) is still available also.

**GENERAL RADIO TELEPHONE CO.** (3501 W. Burbank Blvd., Burbank, Calif.) An entirely new lineup of transceivers has been developed for the 1965-66 market. Heading the list is the Model SB-72 ($399.50), a single-sideband unit with compatible AM double-sideband transmission. Universally powered, the SB-72 has a 24-channel “tuner” for double sideband, or 48 channels of single sideband. Upper or lower sideband can be selected from the panel. A Collins Radio mechanical filter is used for sideband selection. The new VS-6 ($99.50) is a universally-powered straight AM transceiver with 5-channel crystal-controlled receive and transmit. This unit is weatherproofed and can be used in p.a. work. Last of the new ones is the “Super MC-8” ($199.50), a straight AM unit with 24-channel “tuner” (24th channel is for CAP). Universally powered, the MC-8 can be attached to the “Silent Service” selective calling adapter ($39.95). This unit may also be used for p.a. or, as the manufacturer calls it, “bull horn” work.

**HALLICRAFTERS** (Fifth & Kosine Avenues, Chicago, Ill. 60624) Three brand new transceivers have been announced since our August 1964 equipment directory was published. All three units are transistorized. The CB-10 ($149.95, list) is a 5-channel, crystal-controlled transceiver for 12-volt d.c. mobile operation. Fourteen transistors, six diodes and two zener diodes are used in the CB-10. A pedestal power supply (Model P-10) has been designed to permit operation of the CB-10 at a 117-volt a.c. base station. The new CB 12 ($179.95) is somewhat similar to the CB-10, but has provisions for 12-channel operation and p.a. use. Both the CB-10 and CB-12 are compact and draw minimal current from the car battery. An a.c. power supply pedestal (Model P-12) is available at $34.95. Not yet in production as this is written is the CB-14 (price n.a.), a deluxe unit with a 23-channel crystal-controlled synthesizer. An a.c. pedestal will be available and the CB-14 can be used in p.a. work.

**HALLMARK INSTRUMENTS** (2620 Freewood, Dallas, Texas 75220) Both the Model 512 ($149.50, list) and Model 1250 ($169.50, list) are being continued. The latter unit now has a transistorized vibrator substitute built in. Both transceivers are 12-channel with universal power supplies.

**HAMMARLUND MFG. CO. INC.** (73-88 Hammarlund Drive, Mars Hill, N.C. 28754) Three new units have been produced for CB’ers. The CB-205 ($249.50) is an all-band short-wave receiver with 6-channel transmit added. It is roughly similar in concept to the popular HQ-105 short-wave receiver CB transmitter that is now discontinued. The CB-212 ($134.95) is a new 6-channel transceiver with universal power. The identical model is available in an a.c.-only version for $119.95. Third in the string of new gear is the CB-214 ($114.95) for 12-volt d.c. mobile operation, it is similar to the CB-212, but lacks the latter's S-meter.

**HARMON MORSE RADIO** (Holton, Kansas 66436) This is a new company just going into the CB business. First off the line is a 6-channel unit, called the CB-15 ($175.00), fully transistorized, and set for 12 volts d.c. power. There are provisions for p.a. use.

**HEATH COMPANY** (Benton Harbor, Mich. 49023) Plenty of things have happened, or are about to happen, at Heath. The single-channel GW-12A kit has been cut in price to $34.95 and the GW-22A kit (a.c. only) got a reduction to $47.95. The GW-22D is a similar 5-channel unit, but for 6 or 12 volts d.c. It has been dropped in price to $49.95. The 22 series is available with selective calling provisions for $69.95 (GW-32A, a.c. only) and $74.95 (GW-32D, 6 or 12 volts d.c.). The deluxe Heathkit "Master Station" GW-42 kit is now down to $99.95. The modified 1-watt walkie-talkie kit becomes the GW-52A this month and drops in price to $69.95. Brand-new from Heath in October will be the GW-14 kit, an all-transistorized unit for 23-channel operation. While it is primarily designed for 12-volt d.c. operation, an accessory 117-volt a.c. power supply will be available at extra cost. This kit will be sold at $89.95. The MW-33 has been replaced by the MW-34 Selling at $84.95, the MW-34 has a tunable receiver and four crystal-controlled channels built in, and a crystal plug-in socket on the front panel.
INTERNATIONAL CRYSTAL MFG. CO. INC. (18 N. Lee, Oklahoma City, Okla.) Two brand-new transceivers have been announced. The Model 440 ($259.50) is a 23-channel unit mixing tubes and transistors in the jobs they do best. Universally powered, the Model 440 has a double-conversion receiver with all of the usual squelch, noise limiting, and operating convenience features. The second new unit, the Model 660 ($279.50), is somewhat similar in circuitry design although it includes metering on the front panel and zener diode speech clipping. Both of these transceivers have the robust construction associated with this company’s CB products.

E.F. JOHNSON CO. (Waseca, Minn.) One of the pioneers in the CB field, E.F. Johnson will continue to market its five extremely popular units. These include the “Messenger” ($114.95), the “Messenger II” ($169.95), the “Messenger III” ($189.95), the “Personal Messenger” ($129.95), and the “Messenger III” in a field pack ($169.95 extra). The first two units in the line are tube-type transceivers (5 and 10 channels, respectively). The latter units are all transistorized. Both the “Messenger” and “Messenger II” may be used with the “Tone Alert” ($59.95) selective calling system.

KAAR ENGINEERING CORP. (2898 Middlefield Rd., Palo Alto, Calif 94302) The Models D333 ($194.50) and D333B ($229.50) are being continued. A new transceiver, the “Skyhawk 335,” is being introduced this fall. Fully transistorized, the “Skyhawk” has a frequency translator that permits one crystal to serve both on transmit and receive. The user can arrange to keep initial cost at a minimum by installing only those channels required—up to a maximum of 23. Kaar has been a winner in various style contests, and from the looks of the “Skyhawk,” it may have another strong contender.

LAFAYETTE RADIO ELECTRONICS CORP. (111 Jericho Turnpike, Syosset, L. I., N.Y.) This major supplier of CB gear has many new items coming up this fall. First, the HB-111, HB-222, HB-333 and that old favorite, the HE-20C, have been discontinued. A new one is the HA-450. This is a portable 6-channel unit rated at 2½ watts input. Nickel-cadmium batteries will be an optional extra. Price will include carrying case and shoulder strap. Possibly replacing the HE-20 will be the new HB-200 ($109.50). This is a universally powered transceiver with eight channels and a double-conversion tunable receiver. The HA-300 ($99.95) is a new hand-held unit rated at 2 watts input. Sold with nickel-cadmium rechargeable batteries, the HA-300 operates on either of two channels selected by a thumb switch. Top of the Lafayette tube-type line is the popular HB-400 ($169.50). Introduced several months ago, the HB-400 has 23-channel operation using frequency synthesis, “Range Boost,” and double-conversion receiver. Added to the Lafayette line early this year was the HB-500 ($139.50). This is a fully transistorized unit with 12 channels and tunable receiver. A mechanical filter is used in the receiver for maximum selectivity. While the HB-500 is designed for 12-volt d-c use, a separate 117-volt a-c power supply, Model HB-501 ($16.95), is available. Coming out this fall will be the HB-555 (under $100), also transistorized and set for 12-volt d-c use. Specs call for 12 channels, mechanical filter, series-gate noise limiting, etc. Top of the transistorized line at Lafayette will be the brand-new HB-600 ($219.95). With 26 crystals, the HB-600 can cover everything including the proposed H.E.L.P. frequencies outside the present band. The receiver will be double-conversion with a mechanical filter. Last but not least from Lafayette is the HE-20D (under $90) which will feature switching from 100 milliwatts to 5 watts input. Universally powered, the HE-20D will also have a mechanical filter for selectivity and may be used for p-a work. Practically all Lafayette transceivers have provisions for plugging in the “Priva-Com” selective calling system.

MAXWELL ELECTRONICS CORP. (229 Garvon St., Garland, Texas) A 5-watt hand-held transceiver is the major item being produced at this time. Incorporating 20 transistors, the Model 54C-1 ($169.50) weighs 2½ lbs. The rechargeable battery snaps off the bottom of the unit and is good for 75 hours of receiver-only operation, or 50 hours of average transmit-receive usage.

METROTEK ELECTRONICS, INC. (205 W. Cabarrus St., Raleigh, N.C.) An all-new line has been introduced at Metrotek since its purchase by Regency Electronics. The “Mustang” ($74.95) is available with six channels and tunable receiver. While it is designed for 117-volt a-c operation, a 12-volt d-c power supply, mobile mounting bracket and hardware cost $14.75 extra. The second new unit, the “Pacer II” ($99.95), is universally powered and features 11 channels plus a tunable receiver. Both units have built-in speech clipping and the “Pacer II” has an S-meter.

MIDLAND INTERNATIONAL CORP. (1519 Atlantic St., North Kansas City, Mo.) This im-

August, 1965
porting concern is offering a variety of CB units. The Model 13-133 ($89.95) is being continued at a price reduction. It is also being sold with a "Shoulder-Talk" microphone/speaker/antenna combination for hands-free operation. Model 13-143 (price n.a.) is new. This is an 18-transistor mobile unit with five channels and tunable receiver. A solid-state 1.17-volt a.c. power supply will be made available shortly. The Model 13-160 ($99.95) is being continued at a $10 price reduction.

MULTI-ELMAC CO. (21470 Coolidge, Oak Park, Mich. 48237) The "Citi-Fone SS" is being continued at $169.50. A new transceiver is the "Citi-Fone 99". This unit is crystal-controlled on eight channels and sells for $99.00. Fitted for universal power, the "Citi-Fone 99" has special noise-immune transistorized squelch circuitry.

OLSON ELECTRONICS, INC. (260 S. Forge St., Akron, Ohio) The "Sidebander" ($214.95) is being continued. This unit features 23-channel operation and double-sideband transmissions with reduced carrier. New this summer is the "Olson 717" ($79.98). Universally powered, the "717" has seven channels built in and a crystal plug-in socket on the front panel. The receiver is fully tunable over 23 channels.

PACE COMMUNICATIONS CORP. (520 W. 182nd St., Gardena, Calif. 90247) The popular Model 5000 is being continued, and purchasers are reminded that the transistorized module construction of this transceiver permits updating. As the manufacturer changes or improves receiver or audio modules, users can exchange their older modules—for a nominal charge—to bring their units up to date. A new portable Model 5000P ($320.00) has been announced. This field pack holds both batteries and transceiver and weighs only 7 lbs. Brand-new from Pace is the "PACE II" ($169.50). Like the two models above, this unit uses silicon transistors in a 5-watt input circuit. The "PACE II" has 12 channels, but uses printed circuit boards rather than the modules of the Model 5000.

PEARCE-SIMPSON, INC. (P.O. Box 308, Riverside Station, Miami, Fla. 33135) The "Companion II" ($189.50) and the "Escort" ($229.50) are being continued. Both units have been very popular. Introduced earlier this year was the "Guardian 23" ($299.50). This 23-channel unit has a special frequency synthesis circuit to provide maximum rejection of spurious signals. The universal-power, double-conversion receiver, corrosion-proof construction with an epoxy finish, and full metering round off this unit. About to be released from Pearce-Simpson is the "Sentry" (low price, n.a.). This unit will combine hybrid tubes and transistors to secure a low standby current drain. It will be set up for six channels. In line with its marine interests, Pearce-Simpson is also offering the "Sea-B-Mate" ($189.90) which can be coupled to the manufacturer's "Catalina" marine radiotelephone. This adds six CB channels to the five marine channels available.

POLYTRONICS LABORATORIES, INC. (88 Clinton Rd., West Caldwell, N.J. 07007) The most versatile CB transceiver, the "Poly Comm Sr. 23" ($349.50) is being continued. The same model without built-in selective calling circuitry sells for $299.50. For an additional $30, either unit can be obtained with a crystal filter for maximum receiver selectivity. Brand-new from Polytronics is the "Poly-Comm 30" ($329.50). Using frequency synthesis, the "Poly-Comm 30" can be set up on any one of the 23 Part 95 CB channels or the seven Part 15 channels. Output power is automatically reduced from 5 watts input to 100 milliwatts input during the switching operation. Universally powered, the "Poly-Comm 30" is also available with a factory-installed crystal filter at $358.45. Both the "Poly-Comm Pro" ($269.50) and the "Poly-Comm N" ($199.50) are being continued. A 4-channel version of the "Poly-Comm N" is available for $189.50. Replacing the Osborne 320 is the "Poly-Compact" ($199.50). This 12-volt d.c. power unit has 11 channels and is fully transistorized. It is probably one of the smallest CB transceivers ever made.

RADIO CORPORATION OF AMERICA (Harrison, N.J. 07029) The "Mark VIII" ($114.75, a.c. only) is being continued. Six or 12-volt d.c. power supplies are $19.95 extra. The "Mark Nine" ($134.75) is also being continued and the d.c. supplies are the same as above. These two units are somewhat similar, although the "Mark Nine" has a tunable receiver, S-meter, and other features. Just coming up from RCA is the "Mark 10" ($189.95). Designed for 12-volt d.c. operation, the "Mark 10" has 12 channels, tunable receiver, separate a.g.c. amplifier, and may be used for p.a. work.

RADIO SHACK CORP. (730 Commonwealth Ave., Boston, Mass.) The Model TRC-X23 ($169.95) is being continued. A new transceiver just added to the line is the Model TRC-X20 ($109.50). Universally powered, the Model TRC-X20 is set for 12 channels and has a tunable receiver. Another new unit from Radio Shack is the TRC-6 ($69.95) with five

74
crystal channels on transmit, one on receive, plus tunable receiver.

RAY-TEL PRODUCTS (Raytheon Co., 213 East Grand Ave., South San Francisco, Calif.) Three models are being offered. The TWR-5 ($179.50) is all solid-state (14 transistors and 5 diodes) designed for 12-volt d.c. operation. A separate 117-volt a.c. power supply is available as an optional extra. The "Ray-Call" selective calling system can be plugged into the back of the TWR-5. A hand-held transceiver Model TWR-6 ($119.50)—has been announced. It will be set up for two-channel operation. Introduced several months ago was the TWR-7 ($129.95) aimed at the motorist (with Ford Motor Co. distribution) wanting a H E L P. installation. This unit is all-transistorized and set for five channels.

REGENCY ELECTRONICS INC. (7900 Pendleton Pike, Indianapolis, Ind. 46226) Both the very popular "Range Gain" ($269.95)—first of the double-sideband suppressed-carrier transceivers—and the "Romper" ($189.95) are being continued. The only announced change at press time is that the "Romper" has been upgraded to 23-channel operation.

SONAR RADIO CORP. (73 Wortman Ave., Brooklyn, N.Y. 11207) All models introduced in the past 15 months are being continued. These include the Model E ($179.50), Model FS-23 ($299.95), and Model G ($229.50). Just appearing on dealer shelves is the Model H ($159.95). Featured in the Model H is a fine tuning control usable with internal receiving crystals. Universally powered, the Model H has seven internal crystal positions and two panel-mounted sockets (transmit and receive) for additional coverage.

SQUIRES-SANDERS, INC. (Martinsville Rd./Liberty Corner, Millington, N.J. 07946) One of the few companies to enter the CB field in the past year, Squires-Sanders manufactures the "23'er" ($235.00). This unit is all-transistorized (frequency synthesis for 23-channel operation) and set for 12-volt d.c. power. A separate base station 117-volt a.c. supply ($24.50) is available. The "23'er" has a built-in speech clipper, crystal filter for selectivity, and can be used for p.a. work.

TECRAFT SALES CORP. (P. O. Box 84, South Hackensack, N.J.) The popular Falcon "Mark V" is being continued at $169.95. A special model with T.N.S. noise limiting is available for $20 extra.

TRAM ELECTRONICS INC. (Box 187, Winnisquam, N.H.) The TR-27E ($273) is being continued. New from Tram is the Model XL-100 ($318). Custom-designed into three separate units (control, modulator and speaker), the XL-100 has frequency-synthesis circuitry and 23-channel capability. While in mobile use, the control unit can be locked to the mounting bracket. The power switch is also key-operated for safety. Receiver is double-conversion and speech compression has been built in.

UNITED SCIENTIFIC LABS. (35-15 37th Ave., Long Island City, N.Y.) Two new units are being offered by this company. At the top of the line is the "Contact 23" ($199.50) with frequency synthesis and set for 23-channel operation. Universally powered, the "Contact 23" features a built-in speech compressor, double-conversion receiver, and switching for p.a. use. The "Contact 8" ($149.50) is also new from U.S.L. With seven internal crystal positions, the "Contact 8" has a tunable receiver and a pair of panel-mounted crystal sockets (transmit and receive) for additional coverage. Universally powered, this unit can also be used for p.a. work.

UTICA COMMUNICATIONS CORP. (2917 W. Irving Park Rd., Chicago, Ill. 60618) Both of the popular models, MC27 ($142.50), and "Town & Country II" ($162.50), are being continued as is. The top of the Utica line, the "Town & Country III" ($259.95), with 23 channels, has been modified and improved. Receiving stability is excellent, the built-in clipper has been dropped to improve audio quality, and power line consumption is lower.

VOCALINE COMPANY OF AMERICA, INC. (Old Saybrook, Conn.) No information received at press time.

WEBSTER MANUFACTURING. (317 Roebling Rd., South San Francisco, Calif.) Buyers will see some similarity between the transceivers marketed by Raytheon (Ray-Tel Products) and Webster. The "Band Spanner 550" is almost a carbon copy of the Raytheon TWR-5 and the "Band Spanner 565" resembles the Raytheon TWR-7. Both are sold at the Raytheon prices ($179.50 and $129.95, respectively). New and different from Webster is the "575 Com-Pac" (price n.a.) which incorporates a TWR-7 and rechargeable batteries in a field-pack carrying case.

WORLD RADIO LABORATORIES. (3415 West Broadway, Council Bluffs, Iowa.) New from WRL is a 1-watt hand-held transceiver. Cataloged as the 66P004 ($64.95, plus batteries), this unit has built-in squelch and noise-limiting circuitry. Being continued is the "DX'er" ($119.95), a universally powered unit with tunable receiver and 12-channel operation.
In the past, relatively complex circuits were needed to develop vibrato, tremolo and percussion effects in electronic organs, guitars, and other electronically assisted instruments. Typical circuits generally included one or more variable gain amplifier stages, input and output coupling circuits, isolation filters, bypass switches, a low-frequency oscillator, etc. Today, such complex circuits are no longer required. Emotion-filled trembling and throbbing musical effects can be obtained by using nothing more complicated than a simple photoconductor optically coupled to an incandescent lamp which, in turn, is powered from a suitable low-frequency source on the order of 6 cycles.

A block diagram of a typical "photo-tremolo" circuit developed by Sylvania Electric Products (1100 Main St., Buffalo, N.Y. 14209) is shown in Fig. 1. The photoconductor is used as one leg of a simple resistive voltage divider between the tone generator and the audio amplifier. The photoconductor's resistance varies with the intensity of the light applied to the lamp to which it is coupled. Thus, the audio signal delivered to the amplifier can be varied at the desired rate by applying low frequency a.c. to the lamp. In practice, the tremolo "speed" is varied by changing the frequency of the lamp power, while "weight" is adjusted by controlling lamp current.

Sylvania has introduced two self-contained photoconductor-lamp assemblies for tremolo circuit applications. Identified as "PL assemblies," each unit consists of a 50-mw. cadmium sulfide photocell and a low-current incandescent lamp packaged in a sealed, lightproof metal cylinder approximately 1 1/2" long by 5/16" in diameter. Type PL-8224C is equipped with a 24-volt, 15-20 ma. lamp; type PL-8212E comes with a 12-volt, 35-45 ma. lamp.

Versatile UJTO. The unijunction transistor oscillator, or UJTO, is one of the most versatile basic oscillator circuits. It can be used as a pulse or tone generator, as a code practice oscillator, as a timer, or as a control element for SCR's, in a host of general control applications. Recognizing this fact, a midwest manufacturer, Midland Standard (161 E. Chicago St., Elgin, Ill. 60120), is now producing a series of small preassembled—but low-cost—UJTO modules. A typical unit, the Model 5100-X-B, is shown in Fig. 2. The module's overall size is only 1 1/2" square by a little over 1/4" thick.

Designed for operation on a standard 117-volt a.c. or d.c. line, the entire series of modules uses the same basic circuit, with individual units differing only in exact component values and hence in frequency range.

Fig. 1. Simple photo-tremolo circuit from Sylvania creates sound effects for electronic instruments.

Fig. 2. A series of five matchbook-size unijunction transistor modules, made by Midland Standard, satisfies a wide range of timing and control needs.
The circuit used, a direct adaptation of a patented GE design, is shown in Fig. 3. The line voltage is rectified by DI and filtered by an L-type filter (R1 and C1). The resulting d.c. voltage is regulated to a fixed value by zener diode DI and applied to the unijunction transistor (Q1), which is hooked up in a relaxation oscillator circuit.

In operation, Q1 is normally in a non-conducting or "open" state. Timing capacitor C2 is charged through R2 and an external resistance connected to terminals A and B. As the voltage across C2 increases (building up Q1's emitter potential), Q1 switches to a conducting state, discharges C2 through R4, and develops signal pulses of opposite polarity across load resistors R3 and R4. Output diode D2 serves as a simple unilateral coupling element. The circuit's repetition rate, or frequency, is determined by the time constant of the capacitor charging circuit (C2, R2) and the external resistance across points A and B.

There are five modules covering frequency ranges from 1 to 100 cycles per minute to as high as 100 to 10,000 cycles per second. Prices vary also, of course, but in general, are between $5 and $6 for each module.

A few of the UJTO's many potential applications are shown in semi-block diagram form in Fig. 4. The terminal letters given correspond to those of the schematic diagram in Fig. 3.

A simple audible timer or metronome is shown in Fig. 4(A). Potentiometer R1 serves as a rate control while the output device is a standard loudspeaker.

The temperature controller circuit in Fig. 4(B) uses the UJTO in conjunction with a potentiometer, a thermistor, and an SCR to control the power applied to a heavy-duty heater element, or other load.

A variation of the metronome circuit is shown in Fig. 4(C). Simply by employing a different UJTO module and adding a bypass capacitor, C1, the device can be used as a tone generator or code practice oscillator. In practice, a handkey (or "bug") would be connected in series with one of the loudspeaker leads.

Finally, a full-wave manual incandescent lamp dimmer circuit is shown in Fig. 4(D). Here, the basic UJTO module is used in conjunction with a potentiometer (R1), an SCR, and a full-wave bridge rectifier to control the power applied to the lamp.

Readers' Circuits. The interesting electronic latching circuit in Fig. 5 was submitted by reader Charles D. Rakes (Oak

(Continued on page 102)
DIODE FUNCTION QUIZ

By ROBERT P. BALIN

The versatile semiconductor diode serves in many different ways in electronic circuits. See if you can match the diode functions (1-10) listed below with the commonly used circuits (A-J) illustrated.

1. Clamper
2. Detector
3. Gate
4. Limiter
5. Modulator
6. Noise Generator
7. Oscillator
8. Overload Protection
9. Regulation
10. Scale Expander

(Answers on page 99)
Across the Ham Bands

By HERBERT S. BRIER, W9EGQ
Amateur Radio Editor

LEARNING THE CODE AND INCREASING SPEED

RENEWED INTEREST in the radio code has been created by the FCC's recent tightening of the CB regulations and its proposals to (1) cut in half the phone frequencies available to General Class licensees, (2) initiate a new First Class license with a 16-wpm code test and full phone privileges, and (3) implement the Extra Class license with its 20-wpm code test for full CW privileges. Of course, getting an amateur license has always required learning the code. In recent years, however, some operators have evaded this requirement by doing their hamming on the CB channels. But now that the FCC has specifically outlawed all CB hobby operations, there is a greater incentive for obtaining an amateur license.

Too many prospective amateurs believe that learning the code is extremely difficult. Well, maybe, but literally millions of people have already learned it, and thousands more are doing so right now.

The first step is to learn the alphabet. If you have a teacher (or a friend who will serve as a teacher), he will send the code characters while you write down the corresponding letter—never the dit's and dah's—every time it is sent. The teacher will introduce new letters in random sequence until you have mastered them all. He will undoubtedly send each letter at a speed equivalent to approximately 15 wpm, with long spaces between letters, to force you to learn them by sound, rather than by counting dit's and dah's.

Learning the code in this manner usually takes five or six 1-hour sessions, plus another couple of sessions for the numbers, comma, period, question mark, and slant bar. (Only the alphabet is required for the Novice code test, but the numbers are needed to copy call letters and signal reports on the air. Both numbers and punctuation marks appear in the higher-grade code tests.) Once you have learned to recognize the letters

It took Roger Smalley, WA9JMG, Alton, Ill., ten months to go from Novice to General Class license. His Heathkit "Apache" transmitter and SB-10 SSB adapter, Drake 2-B receiver, and Mosley V-4-6 antenna have worked 23 states on 40, 20, 15, and 10 meters; a Heathkit "Twoer" feeds a 10-element beam on 2 meters for local contacts. Roger, a student at Southern Illinois University, will receive a one-year subscription for submitting the winning photograph in our Amateur Station of the Month contest for August. If you would like to enter the contest, send us a clear picture of your station, preferably showing you at the controls, with some information about your equipment and your ham career. Mail all entries to: Amateur Photo Contest, c/o Herb S. Brier, W9EGQ, Amateur Radio Editor, P.O. Box 678, Gary, Ind.

Amateur Station of the Month

August, 1965
and numbers by their sound, you will probably be able to copy at a speed of six or seven words per minute.

If you cannot find a local code class or an individual to teach you the code, a recorded course available from any of the amateur supply houses and from other sources will do the job for you—if you carefully follow the instructions that come with it. Don't assume, however, that the records

(or tapes) will furnish all the practice material you will need. After playing a code recording several times, the average student has half memorized it, which gives him an exaggerated opinion of his copying ability. As a result, he falls flat on his face when he has to copy unfamiliar material.

Whether you are a beginner or an old-timer who has allowed his code speed to drop off from long disuse, only regular practice copying new material at a speed slightly faster than you can copy 100% will build up your copying speed. A wonderful source of code practice material is the ARRL's Station W1AW. Every night of the year, W1AW transmits code practice at 7:30 p.m. and 9:30 p.m. (EST in the winter, EDT in the summer) on 1805, 3555, and 7080 kc. and on 14.1, 50.7, and 145.6 mc. During the earlier sessions, the transmitting speeds are 10, 13, and 15 wpm daily. During the later sessions, the speeds are 5, 7½, 10, and 13 wpm on Sunday, Tuesday, Thursday and Saturday; on Monday, Wednesday, and Friday, the speeds are 15 to 35 wpm.

When you can consistently copy W1AW's transmissions without error at the next higher speed than the speed required for the class of license you are shooting for, you are ready for the code test. Once you get your license, your regular c.w. contacts will automatically improve your code ability. But continue copying W1AW, because its perfect, machine-sent code is an accurate yardstick with which to measure progress.

Amateur Radio Week. The Honorable Otto Kerner, governor of Illinois, has proclaimed the week of August 2 through August 8 as official Amateur Radio Week in Illinois, in recognition of the great service amateur radio performs by providing emergency communications in time of need.

Phillip E. Haller, W9HPG, ARRL Central Division Director, has announced that many amateur activities and demonstrations are planned throughout the state during the week. And a gala celebration at the annual Hamfesters Radio Club's Midwest Hamfest at Santa Fe Park, 91st Ave. and Wolf Rd., Chicago, on Sunday, August 8, will be the high point of the activities.

For information on the hamfest, contact Tony J. Seckus, WA9EOC, president of Hamfesters Radio Club, Inc., 2152 West 49th Place, Chicago, Ill. 60609. Attendance at this annual affair is usually around 5000.

Emergency Communications. Early this spring a tornado practically wiped out the towns of Crystal Lake, Illinois, Russiaville and Dunlap, Indiana, and caused widespread death and destruction in other towns in

(Continued on page 105)
Radio New York Worldwide is the only station of its kind in the United States. Founded on an experimental basis in 1933 as W1XAL, it began programming as the World Radio University in December, 1934, disseminating educational courses on a regular basis. In 1939 the station became known as WRUL. Since 1963, it has been owned and operated by the International Broadcasting Corporation under its present name.

What makes Radio New York Worldwide unique? The station operates five interconnected short-wave transmitters on as many as 15 different frequencies, yet there are more than 3000 such frequencies in daily use all over the world. Nearly every country has at least one short-wave station. But most of these long-distance short-wave radio stations are owned and operated by governments and must serve as official spokesmen. Radio New York Worldwide speaks for itself. It is a privately owned, independent, international broadcasting station—a commercial radio service which offers program time for private commercial sponsorship.

The studios and offices of Radio New York Worldwide are located in the New Worldwide Communications Center at 4 West 58th Street in New York City. The programs are produced, for the most part, by members of the station staff. News services are based on United Press International, Reuters, and other wire facilities, direct telephone reports, short-wave pickups from around the world, and a large group of specially picked foreign correspondents. In addition, since Radio New York Worldwide is the only international affiliate of the American Broadcasting Corp. radio network, the station has access to ABC's worldwide reporting and news analysis.

Radio New York Worldwide maintains its own broadcasting facilities at the United Nations to keep up to the minute on UN activities. In 1962 the top broadcasting honor in the U. S.—the George Foster Peabody Award for "Outstanding Contribution to International Understanding By Radio"—was given to this station for its unprecedented coverage of the UN 16th General Assembly. It is also a two-time winner of the coveted Freedoms Foundation Medal for its weekly series called "Great Moments In History."

Letters and tapes indicating reception conditions are invited by the station. Frequently these letters and tapes are featured on various programs. Descriptions of any phase of life in the listener's country (music, hobbies, occupations, etc.) are also wel-
### English-Language Newscasts to North America

*All of the stations below specifically beam English-language newscasts to the U.S.A. The times may vary a few minutes from day to day.*

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>STATION</th>
<th>FREQUENCY (kc.)</th>
<th>TIMES (EST)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>Buenos Aires</td>
<td>11,780, 9690, 6090</td>
<td>2200, 0100 (Mon.-Fri.)</td>
</tr>
<tr>
<td></td>
<td>Melbourne</td>
<td>17,780, 15,220</td>
<td>2030, 2130, 2230</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9580</td>
<td>0745</td>
</tr>
<tr>
<td>Australia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulgaria</td>
<td>Sofia</td>
<td>6070</td>
<td>1900, 2300</td>
</tr>
<tr>
<td></td>
<td>Montreal</td>
<td>15,190, 11,760, 9625</td>
<td>1800 (E. Coast)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9625, 5970</td>
<td>0230 (W. Coast)</td>
</tr>
<tr>
<td>Canada</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Congo (East)</td>
<td>Leopoldville</td>
<td>11,755</td>
<td>1630</td>
</tr>
<tr>
<td>Congo (West)</td>
<td>Brazzaville</td>
<td>15,370, 11,930</td>
<td>1430</td>
</tr>
<tr>
<td>Czechoslovakia</td>
<td>Prague</td>
<td>11,990, 9795, 7345, 7120, 5930</td>
<td>2000, 2230</td>
</tr>
<tr>
<td>Denmark</td>
<td>Copenhagen</td>
<td>15,165</td>
<td>0730</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9520</td>
<td>2100</td>
</tr>
<tr>
<td>West Germany</td>
<td>Cologne</td>
<td>11,925, 11,795, 9735</td>
<td>1010</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9640, 6075</td>
<td>2040</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9735, 6145</td>
<td>0000</td>
</tr>
<tr>
<td>Hungary</td>
<td>Budapest</td>
<td>9833, 9540, 7305, 6234</td>
<td>1930, 2030</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9833, 7305, 7215, 6234</td>
<td>2200, 2330</td>
</tr>
<tr>
<td>Italy</td>
<td>Rome</td>
<td>9575, 5960</td>
<td>1930, 2205</td>
</tr>
<tr>
<td>Japan</td>
<td>Tokyo</td>
<td>15,135, 11,780</td>
<td>1900</td>
</tr>
<tr>
<td>Jordan</td>
<td>Amman</td>
<td>9560</td>
<td>2000</td>
</tr>
<tr>
<td>Lebanon</td>
<td>Beirut</td>
<td>9660</td>
<td>2030</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Hilversum</td>
<td>15,425, 11,950</td>
<td>1235 (Tues., Fri.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15,425, 11,730</td>
<td>1535 (Tues., Fri.)</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Antilles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antilles</td>
<td>Bonaire</td>
<td>9690</td>
<td>2030</td>
</tr>
<tr>
<td>Portugal</td>
<td>Lisbon</td>
<td>6185, 6025</td>
<td>2100, 2245</td>
</tr>
<tr>
<td>Romania</td>
<td>Bucharest</td>
<td>11,940, 11,810, 9590, 9510, 6190, 6150</td>
<td>2230, 2200, 2030</td>
</tr>
<tr>
<td>Spain</td>
<td>Madrid</td>
<td>11,715, 9615, 6140</td>
<td>2200, 2100, 2000</td>
</tr>
<tr>
<td></td>
<td>Stockholm</td>
<td>15,195</td>
<td>0900</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9705</td>
<td>2215, 2045</td>
</tr>
<tr>
<td>Switzerland</td>
<td>Berne</td>
<td>9665, 9535, 6120</td>
<td>2105</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9665, 9535</td>
<td>2315</td>
</tr>
<tr>
<td>Turkey</td>
<td>Ankara</td>
<td>15,165</td>
<td>1700</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>London</td>
<td>15,300, 11,860</td>
<td>1100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9610, 6195</td>
<td>1700, 1800, 1900, 2100</td>
</tr>
<tr>
<td>U.S.S.R.</td>
<td>Moscow</td>
<td>15,180, 15,140, 9730, 9660, 9640, 9630, 9570, 9540, 9540, 9360, 7330, 7320, 7310, 730, 7250, 7240, 7230, 7200, 7150, 7130, 6070 (all channels not in use at any one time)</td>
<td>1730, 1900, 2000, 2100, 2300, 0040</td>
</tr>
<tr>
<td>Vatican City</td>
<td>Vatican City</td>
<td>9645, 7250, 5985</td>
<td>1950</td>
</tr>
</tbody>
</table>

comed, and QSL cards are sent to all who request them. The station encourages comments and suggestions on all programs.

At press time, *Radio New York Worldwide* is scheduled to broadcast to Europe at 0700-1900 on 15,440 kc., at 0745-1100 on 17,845 kc., and at 1100-1645 on 17,840 kc.; to Latin America at 0700-1900 on 15,440 kc. and at 0945-1700 on 17,730 kc.; and to Africa at 1000-1645 on 17,730 kc. The “DX-ing Worldwide” program is aired on Saturdays at 1400 and once a month a special Norwegian DX report is included. “Club de Radioaficionados,” the Spanish version of “DX'ing Worldwide,” is broadcast twice weekly, on Thursdays at 0745 and 2145.

**News Items.** The Antilles Radio Corporation, Ltd., is opening a new 200,000-watt medium-wave station on the Caribbean island of Montserrat which will operate on 930 kc. with programs in English, French, and Spanish. Look for it.

Word has just been received from the *Voice of America* that its “Radio Amateur Notebook” has been discontinued. No reason was given in the announcement.

(Continued on page 108)
Some plain talk from Kodak about tape:

Slitting accuracy and skew angle

Tape is made in wide rolls which are slit to width—1/4" for most audio tapes. There are three main considerations in this process: cleanliness, dimensional accuracy and trueeness of cut. Cleanliness cannot be given too much consideration. When the tape is slit, particles of the oxide and the base can flake off. This condition arises from poor oxide adhesion and poor quality-control standards on slitters. Slitting dirt is virtually nonexistent in Kodak tapes because of our "R-type" binder and our unique slitting techniques.

Tape dirt clogs the recording gap and prevents the tape from making intimate contact with the head, thus causing dropouts and high-frequency losses. Oxide dirt can also cause a phenomenon known as re-deposit. During tape transport operation, gummy oxide dirt can actually re-deposit on the magnetic layer and fuse in position.

To get some idea about how Kodak tape slitting compares to ordinary slitting, take a look at these two photomicrographs. The dirt you see between the turns on the left is oxide dirt. Compare it to the virtually spotless edges of Kodak recording tape on the right.

It's like splitting hairs, only more critical

From our 42-inch-wide master web, we have to cut 160 1/4-inch ribbons of tape—each almost two miles long. That's a lot of total mileage, especially when you think how straight and true those edges must be to assure optimum tracking on your recorder. In terms of slitting accuracy the standard specs call for a tolerance on width of ±.0020 inches. We decided that that was just about double what it really should be, so we hold ours to ±.0010 inches.

But the really critical part of slitting is a bad guy known as weave. When a tape weaves, it passes the head at a continuously changing skew angle. Look at the graph.

Note how losses pile up as skew angle increases. As you'd guess, the losses are in proportion to frequency. Higher frequencies, higher losses. Same principle, really, as an azimuth loss.

Proper tape tension is important in order to prevent "stepping." Stepping usually takes place about 3/4 of the way from the core of the reel. (That's the point at which there are no clockwise or counterclockwise forces acting upon the tape.) You can visualize it as a lateral shearing of a roadway during an earthquake. Shades of old San Francisco. This sets up stresses which cause fluted edges and prevent proper head contact. From winding billions of feet of motion picture film, Kodak has developed some pretty specialized tension-control techniques. The end result, of course, is that when you get Kodak tape on a roll, you know it's wound properly, not too loose, not too tight. Just right. Our Thread-Easy Reel is part of the story, too. Because it is dynamically balanced, we get a good wind right off the bat and you get a good rewind, too.

Kodak Sound Recording Tape in a complete variety of lengths and types is available at most tape outlets: electronic supply stores, specialty shops, department stores, camera stores ... everywhere.

FREE! New comprehensive booklet covers the entire field of tape technology. Entitled "Some Plain Talk from Kodak about Sound Recording Tape," it's yours on request when you write Department 8, Eastman Kodak Company, Rochester, N. Y. 14650.

EASTMAN KODAK COMPANY, Rochester, N.Y.

CIRCLE NO. 8 ON READER SERVICE PAGE
FREE
send today for your
ALLIED
1966 CATALOG
the most-used electronics catalog
508 VALUE-PACKED PAGES

SAVE MOST ON
EVERYTHING IN ELECTRONICS
including exclusive products
and special values available only
from ALLIED

SEE WHAT'S NEW—
SEE THE BIG VALUES!

ALLIED RADIOTO
The World's Largest Electronic Supply House
satisfaction guaranteed or your money back

EASY TERMS
Use the convenient
Allied Credit Fund Plan
—over 24 months to pay

84 POPULAR ELECTRONICS
Special in your FREE 1966 Allied Catalog

see what's new in the wonderful world of Knight-Kits®

Knight-Kit GUARANTEE: Buy any Knight-Kit. Build it. Operate it. You must be satisfied or we refund your money.

Free! Send today for your 508-page Allied 1966 value-packed catalog

ALLIED RADIO CIRCLE NO. 2 ON READER SERVICE PAGE
**SIMPLE GO NO-GO DIODE TESTERS**

**Pilot Light Method**

HERE'S an inexpensive diode tester with colored lamps which instantly tells you the condition of a diode. It costs less than $5 to build and can be housed in a small utility box. To operate, simply plug in a diode with the polarity as shown below. If only the green lamp lights, the diode is okay; if only the red lamp lights, the diode under test is reversed. If both lamps light, the diode is shorted; and if neither lamp lights, the diode is opened. Parts required include two No. 1493 lamps (General Electric or equivalent) and sockets, two 750-ma. diodes, a 6.3-volt, 1-ampere transformer, a push-button switch, and a utility box.

—James R. Barela & E. Edward Cook

Diode polarity as well as open and short conditions can be predicted with the use of two colored pilot lights. If the diode is good, the green light goes on when the cathode is connected to the test terminal marked with the plus sign. A red light only shows a good diode but with its leads reversed.

**Scope Technique**

YOU CAN use your oscilloscope to check diode operation as shown in the diagram at right, below. The circuit checks the forward-to-backward resistance ratio of the diode under test, thus giving an indication of its worth. Adjust the scope gain controls to provide vertical and horizontal deflection in the presence of signal in the respective scope input. If the “good” and “poor” rectification indications appear inverted, the conclusions are still valid, since the diode connections or scope polarity may be reversed. Connect the common “X” and “Y” terminal to the low side of the scope’s vertical and horizontal input terminals.

—A 2/C George Wlodarski, K8ABR

Signals across the “Y” and “X” inputs cause vertical and horizontal deflection respectively. A shorted diode will kill the vertical signal and an open diode removes horizontal deflection. A good diode provides a right-angle display. Adjustment of the scope’s gain and position controls is not critical.
Who Pays $30 Or More For Portable Radios These Days?

Thousands Of Heathkit® Builders!

Why? Pride! And a desire for better quality! Not just the pride of owning something new, but a special kind that comes from building it yourself. From watching it grow and take shape. From creating a sophisticated piece of electronics with your own hands.

True, it takes a little effort... about 4 to 6 hours. But it's a labor of love. And the large "exploded" diagrams and simple, step-by-step instructions make it a breeze. And a lot of fun.

And when you finish and turn it on. Pow! You glow all over with a unique pride and self-satisfaction. You've just joined the millions of people, from 79-year old grandmothers to 11 year olds, who build Heathkits. People with no special skills or technical knowledge. People like you.

Quality? The sound of these superb portables is special. A clean, bold "big-set" sound... the kind you can't get with miniatures. Compare the performance of your Heathkit portable with any!

A New Deluxe All-Transistor AM Portable... $29.95
- 6 silicon, 2 diode circuit gives 8 transistor performance
- Uses standard size "D" flashlight batteries, protected against corrosion by a plastic holder
- only 1/10 the operating cost of typical pocket-size portables
- Large 4" x 6" oval PM speaker for big-set sound
- Easy-to-read slide-rule dial, positive vernier tuning, and convenient "thumb-touch" controls
- RF stage & double tuned I.F. stage assure greater sensitivity & selectivity
- Big 1/2" diameter built-in rod antenna for distant stations pick up
- Handsome black simulated leather case
- Fast circuit board construction

Kit GR-24, 5 lbs.

B Deluxe All-Transistor FM Portable... $47.95
- Powerful 10-transistor, 2-diode circuit for instant operation, long trouble-free performance
- Large 4" x 6" oval PM speaker for clear, bold sound
- Automatic frequency control for drift-free reception
- Treble-cut tone control for finer tone
- Vernier tuning for accurate station selection
- 34" telescopic antenna-headphone jack for private listening
- Attractive simulated tan leather case
- Fast circuit board construction
- Operates on 9 v. battery (model GRA-131-1...$1.10) Kit GR-61, 6 lbs.

FREE!
1965 Heathkit Catalog. Contains descriptions of these and over 250 kits... world's largest selection. Save up to 50% by doing the easy assembly yourself. Use coupon & send for your FREE copy now!

HEATH COMPANY, Dept. 10-8
Benton Harbor, Michigan 49023
In Canada: Daysstrom, Ltd., Cooksville, Ontario

Enclosed is $__________________________, plus postage.

Please send model(s) __________________________.

Please send my Free 1965 Heathkit Catalog.

Name ____________________________ (Please Print)

Address ____________________________

City ____________________________ State _______ Zip _______

Prices & specifications subject to change without notice.

CIRCLE NO. 14 ON READER SERVICE PAGE
ARE you a DX ham with a sked coming up in Zanzibar? Suppose your contact gave you the time in GMT or in his time zone? Would you have to go through a maze of mental gymnastics to find GMT or the local time in his zone? Or say you're an SWL who particularly wants to pick up an English-language broadcast from Tokyo, and the short-wave broadcast listing indicates either the local time in Tokyo or the GMT time. If you add a 24-hour world time indicator to your DX'ing equipment, you won't have any trouble.

Since short-wave stations are scattered around the world, it has become the custom to report time in terms of Greenwich Mean Time, or as it is sometimes called, Universal Time, rather than in local time. This method of time-keeping has long been a favorite of hams as well, and you'll find the large majority of government agencies and the military using it exclusively.

To equate your local 24-hour day with the rest of the surface of the earth, keep in mind that an increment of one hour occurs at each 15° of change in longitude. And GMT is simply the time at the point of 0 longitude, which happens to pass through Sussex, England. The word "Greenwich" in the term results from the fact that the Royal Greenwich Observatory is located in Sussex.

The Greenwich zone is called the "zero" zone; each of the other zones is numbered from 1 to 12 according to the hourly difference from Greenwich. Zones to the east are called "minus" zones since in each of them the zone number must be subtracted from standard time to obtain GMT. Conversely, zones to the
west are called "plus" zones. The 12th zone is divided by the 180th meridian and the terms "minus" and "plus" are used in the halves of this zone which lie in east longitude and west longitude, respectively. For example, New York—which is east of London—is five hours behind GMT, while Moscow—located more than 2000 miles west of London—is three hours ahead of GMT.

With the 24-hour clock, the hours from 1 a.m. to 11 a.m. are expressed as 0100 to 1100. Noon is referred to as 1200. From 1 p.m. to 11 p.m., times are expressed as 1300 to 2300. Midnight is referred to as 2400 or 0000. So far as minutes GMT-wise are concerned, 5:15 p.m. converts to 1715, 2:07 a.m. to 0207, etc. When it's 6 a.m. in Tokyo, it's also 2100 GMT, as well as 1600 EST.

Sure you can figure time conversion using a regular clock—but how much easier it is merely to glance at a 24-hour clock. Most of the 24-hour clocks on the market are fitted with an adjustable disc or a hand in the center of the dial which you set manually for your time zone. From the data on the clock you can tell the time in any other time zone.

If you are a ham, remember that the FCC requires you to have an accurate clock of some sort in your shack in order to keep an accurate log and to make the necessary 10-minute station breaks.

Wall- and desk-type clocks, such as those shown here, are available from many manufacturers. Ranging in price from a few dollars to over $180 for deluxe models, they come in many sizes and shapes—and represent one of the most important accessories you can add to your shack.
Features:
- 5 Transistors and 1 Thermistor
- Shielded Input Transformer with TWO PRIMARY WINDINGS... 50 Ohms and High Impedance
- Output Transformer with TWO SECONDARY WINDINGS... 8 Ohms (for Speakers), 500 Ohms (for Modulation and High Impedance Loads)
- Volume Control Included and Mounted on Circuit Board
- Low Distortion... 400 Milliwatt Push-Pull Output
- Extremely High Gain... 80 DB! Handles low-level mikes, phono pickups, telephone pickups, etc.
- Sturdy Printed Circuit Board 5½" long, 1¾" wide
- Weight... 3½ ounces
- Power Supply... Any 9-Volt DC Source

Use it for:
- PA System
- Hi-Fi System (Use 2 for Stereo)
- Guitar Amplifier
- Surveillance Listening System
- Electronic Stethoscope

COMPLETE AMPLIFIER $6.75 each
INCLUDING SCHEMATIC DIAGRAM We pay postage!

MOLO ELECTRONICS CORP.
Dept. K, 530 Canal St., New York, N.Y. 10013

Please rush me_____ (qty) of your compact transistor audio amplifiers at $6.75 each postpaid. My check or money order for $______ is enclosed.

NAME__________________________
ADDRESS__________________________
CITY________________ STATE____ ZIP____

CIRCLE NO. 34 ON READER SERVICE PAGE

Tips and Techniques

"MAGIC" TAPE MARKS CABLES LIKE MAGIC

A professional-looking lead or cable marker can be made with Scotch "Magic" tape. You just print the desired information on the tape using almost any medium and wrap it around the cable. For durability, the tape should be long enough to cover the printing a couple of times when wrapped around the cable. Better contrast can be obtained by sticking a small strip of paper on the tape behind the printing. —Don E. Watson

HEAT-SHRINKABLE PLASTIC COVERS COMPONENTS COMPLETELY

We often run the risk of short circuits for the sake of miniaturization. For instance, when mounting a capacitor or resistor on a printed circuit board, it's a common practice to bend the lead parallel to the component and mount the component standing erect. A real space-saver — but that long lead is a potential troublemaker! One neat way of preventing a short is to cover the component and the lead with a plastic "Fit-Cap," such as manufactured by the Alpha Wire Co., and apply a bit of heat. The shrinkable plastic reduces in size, grips and insulates the component.

—Byron G. Wels, K2AVB

HYBRID ADAPTER PATCHES

Phono Plug to Coax Connector

Phono plug connections can be made directly to equipment having coaxial termi-
BUILD 20 RADIO CIRCUITS AT HOME only $29.95

PROGRESSIVE RADIO "EDU-KIT"® A Practical Home Radio Course

Now Includes
★ 12 RECEIVERS
★ TRANSMITTERS
★ SQ. WAVE GENERATOR
★ SIGNAL TRACER
★ AMPLIFIER
★ RADIO INJECTOR
★ CODE OSCILLATOR

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 practical methods of radio training. You will learn theory, construction, practice and servicing. THIS IS A COMPLETE RADIO COURSE IN EVERY DETAIL. You will learn theory, construction, theory of operation, components, layout, assembling, soldering, and all the fundamentals, as well as the latest development of Printed Circuit chassis. We will teach you the latest techniques with use of new, unique components that are not available in any other kit.

You will receive all parts and instructions necessary to build twenty different radio and electronic circuits, each guaranteed to operate, Our kits contain tubes, tube sockets, variable, electrolytic, mica, ceramic and paper dielectric condensers, resistors, terminal strips, hardware, tubing, punched metal chassis, Instruction Manuals, hook-up wire, solder, set screw, rubber tubing,尼龙 bands, brass bands, and other parts as required.

You will receive a complete set of Printed Circuit instruction material, "Printed Circuit" is a general title for the "Edu-Kit." There are many methods and ideas that have successfully used the "Edu-Kit" in more than 79 countries around the world. The "Edu-Kit" is a carefully designed, step-by-step, so that you cannot make a mistake. The "Edu-Kit" allows you to teach yourself at your own pace, without requiring any previous knowledge.

THE KIT FOR EVERYONE

You do not need the slightest background in electronics. If you are interested in radio, then you are interested in this Kit. If you want an interesting hobby, a useful one at that, you will find the "Edu-Kit" a worthwhile investment. Many thousands of individuals have successfully used the "Edu-Kit" in more than 79 countries around the world. A Radio as well as a Radio Circuit is necessary.

PROGRESSIVE TEACHING METHOD

The Progressive "Edu-Kit" Program 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 and learn electronics, study theory, practice trouble shooting and do it all in a closely integrated program designed to provide an easily learned, thorough and practical background in radio.

You begin by examining the various radio parts of the "Edu-Kit." Then you learn the fundamentals of radio receivers. Then you build a simple radio. With this first set you will have the knowledge to operate regular schematic diagrams. Then you build a transmitter, radio, and soldered chassis that will fit the new, unique technique of radio. After the basic radio is understood and the fundamentals mastered, you use the "Edu-Kit" as a trouble-shooting aid. This is the standard in the field of electronics.

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, professional, electric soldering iron, and a self-powered Dynamic Radio and Electronics Tester. The "Edu-Kit" also includes Code instructions and the Progressive Code Oscillator. In addition to F.C.C. Radio Amateur License training. You will also receive lessons for servicing the Progressive Signal Tracer and the Progressive Signal Generator, a high Fidelity Guide and a Quiz Book. You receive Membership in Radio-TV Club, Free Consultation Services, Certificate of Merit and Discount Privileges. You receive all parts, tools, instructions, etc. Everything is yours to keep.

PRINTED CIRCUITRY

At no increase in price, the "Edu-Kit" now includes Printed Circuitry. You build a Printed Circuit Signal Injector, a unique servicing technique that can detect any Radio and TV troubles. This revolutionary new technique of Printed Circuitry is now becoming popular in commercial radio and TV sets.

Printed Circuitry is the basis of modern Automation in Electronics. A little knowledge of this subject is necessary today for anyone interested in Electronics.
Tips (Continued from page 92)

nals of the SO-139 type, thus avoiding hum and stray r.f. pickup from exposed leads. The necessary adapter is constructed from a Cinch-Jones 81A or Switchcraft 3501F phono jack, and an Amphenol PL-259 coaxial plug. Straighten the lugs of the phono jack and remove the fiber base. Grind the base down to a diameter of ½" and remount it—but leave the lugs extended. Then solder a 2" wire to the jack's center lug and cover with protective tubing. Insert the wire into the plug's center connection and solder. Finally, bend the outer lugs of the socket against the plug's outer shell and solder. Be sure not to short out the inner connections to the shell.

—F. W. Chesson

SILICONE RUBBER HOLDS POPPED CLIPPINGS

Wire clippings won't pop out of your diagonal cutters if you fabricate some rubber pads for the jaw opening with a new Bathtub Seal made by General Electric Company. Holding the cutters shut with rubber bands, you squeeze the sealant out of a tube into the opening, and let it set for 24 hours. Trim off the excess rubber neatly, and center-cut the jaw opening with a razor. Clippings will then be held by the pads until you can dump them in a safe place.

—Bob Sheridan

ADJUSTABLE RESISTOR KEEPS MODEL RACER ON TRACK

Racing model cars has become a popular indoor sport for grown-ups as well as for the kids, but Pop usually winds up repeatedly replacing cars that Junior lets fly end over end as he cranks the rheostat control to full throttle. Such "accidents" can be prevented by inserting a 20-ohm, 10-
watt, variable-tap resistor in series with the rheostat, thus limiting the speed of the car. The resistor is adjusted to keep the racer on the track at full throttle. A switch connected in parallel with the resistor will eliminate it from the circuit if Pop and his friends want to get down to some serious racing.

—Ken Greenberg

A “PLUMB” IN TIME KEEPS A MAST IN LINE

You can use a "break-away" plumb line for easy and precise alignment of your antenna mast. Before hoisting the antenna, tie a short length of thread to it at a selected distance (D) from the mast. Then attach a plumb line to the thread. When the antenna is up and the mast temporarily guyed, adjust the plumb bob so that it just swings clear of the roof. Adjust the tilt of the mast so that the distance from the mast to the plumb line is the same on the bottom (D') as on the top. If the mast can be rotated, it is possible to align it without tilt in any direction. When alignment is complete, a slight tug on the plumb line will break it away from the antenna.

—Wm. B. Rasmussen

OLD SUCTION CUP HOLDS NEW FUSES

Keeping a spare fuse handy near the chassis of a TV set, line amplifier, radio, or hi-fi offers a certain amount of insurance against interrupted service. Press a rubber suction cup to the chassis or to the inside of the cabinet. Then place the fuse into the cup opening as shown. A drop of cement underneath the cup will fasten it indefinitely.

—John A. Comstock

August, 1965

23'er...

the finest Citizens Band mobile transceiver...

The 23'er twenty three channel, all transistor Citizens Band transceiver is the choice for any mobile application — car, truck or boat — because only the 23'er has the Squires-Sanders Noise Silencer. This exclusive device virtually eliminates interference due to noisy ignition systems and saves up to $35.00 in installation expense for ignition noise suppressors. Weak signals are clearly intelligible on the 23'er under electrical noise conditions that would make the ordinary transceiver almost helpless. The 4 watt audio output and the large 3 x 5" front facing speaker are important features for mobile use also, to provide powerful voice reproduction that can be understood over the background of highway tire noise and wind whistle.

The ultra sensitive 23'er receiver (number one in a recent impartial test of the currently available transceivers) is a must for mobile — weak signals can be heard clearly for greater distances.

Compare just some of the other outstanding features of the 23'er and be convinced that it is the only unit for your mobile installation:

ALL TWENTY THREE CHANNELS — complete coverage of both unit to unit and station to station communication channels
ALL SILICON TRANSISTOR — the least battery drain
SMALL — it fits anywhere, even in the compacts
LIGHT — weighs only 4 lbs.
SIMPLE TO OPERATE — only three controls
COLOR CODED CHANNEL DIAL — specially marked for read-at-a-glance identification of channel 9 (N.E.L.P.) and legal station to station channels.
PUBLIC ADDRESS AND REMOTE SPEAKER — Provision for converting to Public Address service with a small, inexpensive accessory and provision for plug-in external speaker for either CB or PA service.
PRICE — You will save over the cost of less expensive equipment since all crystals are furnished and no ignition suppressors are required. READY TO OPERATE $235. AC Power Supply for base station operation $24.50.

See your distributor today or write to 23'er Department

Squires-Sanders, Inc.

Millington, New Jersey 07946

SPECIAL OFFER: If you would like an 8 x 10 glossy photo of the 23'er and a shirt pocket size call book to record frequently contacted station call signs, send 25¢ with your request for information.
Get Your First Class Commercial

F. C. C. LICENSE

QUICKLY!

Career opportunities in communications electronics are almost unlimited. Prepare now. Let Grantham train you—by correspondence, or by classroom and laboratory instruction. Get your first class commercial F. C. C. license in as little as 4 months, or at a slower pace if you prefer. Then, continue in more advanced electronics training if you wish. Diploma awarded. Our catalog gives full details.

Learn how our training can prepare you for your F. C. C. license; write or telephone the School at any one of the teaching divisions listed below, and ask for "Catalog 53."

Grantham School of Electronics
1505 N. Western Av., Hollywood, Cal. 90027
(Phone: HO 9-7878)
408 Marion Street, Seattle, Wash. 98104
(Phone: MA 2-7227)
3123 Gillham Road, Kansas City, Mo. 64109
(Phone: JE 1-6320)
818-18th St., NW, Washington, D. C. 20006
(Phone: 298-7460)

AIRCRAFT • POLICE • FIRE
AM/FM VHF RECEIVERS

353B covers 26-54 and 88-174 MC in eight overlapping calibrated bands. Advanced circuitry, higher sensitivity, vernier dial drive, large full vision dial. Completely self-contained with internal AC power supply and speaker. Headphone jack for private listening.

348A transistized tuneable converter. Powered with self-contained battery. Excellent sensitivity. Designed for use with car, home, or portable radio. Also complete line of crystal controlled converters for monitoring police, fire, aircraft, etc. signals.

316C AUDIO EQUALIZER

$44.95

Variable equalizer necessary for professional quality recording or playback. Ideal for use between mixer and tape recorder or tape to tape, etc. Write for details or send $2.00 for LP demonstration record. Covers tape and disc recording techniques. Refunded with purchase.

CIRCLE NO. 20 ON READER SERVICE PAGE

Operation Assist

THROUGH THIS COLUMN we try to make it possible for readers needing information on outdated, obscure, and unusual radio-electronics gear to get help from other F. E. readers. Here's how it works: Check the list below. If you can help anyone with a schematic or other information, write him directly—he'll appreciate it. If you need help, send a postcard direct to OPERATION ASSIST, POPULAR ELECTRONICS, One Park Avenue, New York, N. Y. 10016. Give maker's name, model number, year of manufacture, bands covered, tubes used, etc. State specifically what you want, i.e., schematic, source for parts, etc. Be sure to print or type everything legibly, including your name and address. Because we get so many inquiries, none can be acknowledged, and POPULAR ELECTRONICS reserves the right to publish only those items that are not available from normal sources.

Schematic Drawings

RCA Model 158 oscilloscope. Magnolia Electronics "Town & Country" Model TC27 transceiver. (Robert M. Smith, 3534 1st Ave., N. E., Cedar Rapids, Iowa 52402)

Emerson Model BU230 receiver, ser. BU-1876919, circa 1936. Has 6 tubes and magic eye. (Earl Lindow, 3920 Brookwood, Houston, Texas 77018)

Bendix Radio Model CCR 74026 frequency meter, circa WWII. Tunes 125 kc. to 20 mc. Part of LM-20 radio equipment. (Pete Vitello, 1198 E. Turkeyfoot Lake Rd., Akron, Ohio 44312)

Grumman Model 700 superhet receiver, circa 1940. Tunes 500 to 3500 kc. Has 1 s. tube, 1 6P6, 3 78's, 1 75 and 1 37. (John H. Hardy, 4244 N. E. Washington, Minneapolis, Minn. 55421)

Zenith Model 62222 or 88222 receiver. Tunes BC 1.5 to 18 mc. Has 6 tubes. (James E. Halpin, 13176 Gla Ave., Riverside, Calif. 92508)

Philo Model 41-290 receiver, circa 1930. Tunes BC and s.w. Has 10 tubes. (Dan Waterstreet, 1418 W. Bloomfield Rd., Honeye Fall, N. Y. 14472)

GE Model 428 receiver, circa 1946. Tunes BC. Has a 12BE6, 12BA6, 12AV6, and 50C5. (James H. Rea, 172 Burrill St., Swampscott, Mass. 01907)

Farnsworth Model CC-90 receiver, ser. 901446(?). Tunes AM, FM, and S.W. (William Valcarcel, 322 Elmire Place, Bronx, 60, N. Y.)

Solar Manufacturing Model CE "Exam-eter," capacitor analyzer, circa 1950. (Ross R. Sherman, Main St., Schaghticoke, N. Y.)

Philo Model 38-40 receiver, code 121. Tunes BC and s.w. Has 5 tubes. (Lou Turelukas, 29 Rocky Pool Ln., Levittown, Pa.)

Class "B" modulator for phone operation. 500-watt output transmitter (c.w.). (William Taylor, 326 Riverside Dr., Ormond Beach, Fla. 32074)

Hallicrafters "Sky Champion" Model S-20-R receiver. (George Stevenson, 4711 Tennessee, St. Louis, Mo.)

Bendix Model TA-12 D aircraft transmitter. (Chandran Kumar C. Panchani, 47 East Periaswamy Rd., R. S. Puram, Coimbatore-2, Madras, India)

Scott Model SLRM marine receiver. Tunes BC to 15 mc. (Robert M. Smith, 3534 1st Ave., N.E., Cedar Rapids, Iowa.)

P.O. Box 2134, Bedford, Ohio 44122

20 GLENWOOD CINCINNATI 17, OHIO

96 POPULAR ELECTRONICS
Sony Model 101 transistorized tape recorder. Has 2 tubes. (Nicholas Raczk, 33 Dorothy St., Carteret, N. J. 07008)

Carron Model CCH signal tracing amplifier. (George L. Wanko, Box 134, Lincroymes, Pa. 19754)

Stromberg Carlson Model 17857 TRF receiver, ser. 156101. Tunes BC. Has 5 27 tubes. 1 7LA and 1 60. (Otto C. Andrews, 634 Beaumont Rd., Fairless Hills, Pa. 19030)

Harvey Wells’ “Bandmaster Z-Match” receiver, circa 1955. (R. B. Wolfe, 5771 45th St., Riverside, Calif. 92509)

“All-Star Jr.” kit-built s.w. receiver, circa 1936. Tunes s.w. bands. (Henry Bess, 200 Lynn St., Washington, Ill.)

Meissner superhet receiver kit, circa 1949. BC and s.w. (6 to 18 mc.). Has 6 tubes. (Ed Lawlor, 5 Feudine St., Carteret, N. J. 07008)


American Bosch “Magneto” Model 28 receiver, ser. 17499. Tunes 550 to 1440 kc. Has 8 tubes. (John Van Oosbrée, 2508 7th St., Emmetsburg, Iowa 50536)

Stewart Warner Model A61F3 portable receiver, circa 1945(?). Tunes BC band. Has 6 tubes. (Von J. Taylor, 1817 S. 16 East, Salt Lake City, Utah)

Western Electric Model AM-129/A amplifier. Mixes 4 tubes, output, 150/600 ohms. Has 4 tubes. (Paul W. Miller, 150 S. Franklin, Red Lion, Pa.)

Special Data or Parts

Hallicrafters Model S-76 receiver, circa 1951; tunes 553 kc. to 34 mc. Translucent dial scale and main tuning part 83B3N7 needed. (H. Waltz, Jr., 7437 S. Boulder Rd., Boulder, Colo. 80302)

Zenith Model 12420F receiver, tunes BC, FM and s.w. bands. Transformer S12252 or equivalent wanted. (P. Austin, 2494 W. 91 Place, Oak Lawn, Ill. 60453)


Atwater Kent receiver, ser. 5862283, circa 1930; type H chassis; has 9 tubes. Schematic and parts source needed. (Fred O. Bridges, USPHS Hospital, Carville, La. 70721)

Atwater Kent Model 33 receiver, ser. 2913586, circa 1926. Tubes and schematic needed. (Henry Rodzen, Jr., 287 Buffinton St., Fail River, Mass.)

American Bosch Model 48 receiver, circa 1930; has 7 tubes. Speaker and schematic needed. Philco Model 20 receiver. Parts values and schematic needed. (Gary Hunt, 1155 San Luis Rey Dr., Glendale, Calif.)

Packard Bell “Phonocard” receiver, circa 1946; tunes AM and FM; has 12 tubes, phone monitor and recording output. Glass tuning scale and schematic needed. (Craig Radich, 4401 N. 3rd St. E., Lancaster, Calif.)

Fresher Masterpiece receiver, ser. G72267. Tube source, schematic, and power supply source needed. (Walter Lane, Box 2321, Bell Gardens, Calif.)

Atwater Kent Model 84 superhet receiver; 110-120 volts, 80 watts. Power supply needed. (C. W. Sutherland, 1243 Whitney Ave., New Orleans, La. 70114)

Superior Instrument Model 670-A QVM. Source for selenium and copper oxide rectifiers needed. (G. Harris, 2924 Palmrya St., New Orleans, La.)

Airline Model 14B-R-913A receiver; tunes BC and s.w. bands. UV-199 tube and schematic needed. (Hubert Siegel, Shambo Route, Havre, Montana 59501)

Regal receiver, ser. 176020; tunes AM and FM; has 9 tubes. Alignment instructions and schematic needed. (Alvin N. Nelson, 65 S. Madison, Denver, Colo. 80209)

Pierson Electronic Model KP-81 receiver. Manual, schematic, and manufacturer’s address wanted. (Dick Margavitch, 406 E. Elm St., Hazleton, Pa. 18201)


RCA Model AR-88 receiver; tunes 535 to 32,000 kc. in 6 bands; has 14 tubes. Parts source and schematic wanted. (SP/5 Jimmy J. Cheek, 82nd Ordnance Battalion, APO, New York 09188)

Radio City Products Model 123 flyback transformer and your tester, ser. 4421. Operating instructions or address of manufacturer needed. (Dave’s Radio & TV Service, 500 Cottonwood St., Ardmore, Okla.)

Link Model 2210 transceiver: tunes FM, 150 to 170 mc. Crystal data and schematic or servicing manual needed. (Stanley S. Dowgiallo, 141 Hopkins Ave., Jersey City, N. J. 07306)

Hansen Electric Products Model M-70 vacuum-tube voltmeter. ser. PE2522. Schematic and/or address of manufacturer needed. (Leonard Shustek, 166-117 Rd., Whitestone 51, N. Y.)

Zenith Model 39A TRF receiver, circa 1929. Two UX-281 receiver tubes needed for power pack. (Vic Molek, RD 1, Box 312, New Salem, Pa. 15468)

Westinghouse receiver, chassis assembly V-2105; tunes AM, FM and s.w.; has 14 tubes. Tube layout and schematic needed. RCA “Bandmaster II” receiver, circa 1922. Battery info, schematic, and source for tubes needed. (Richard Easton, 947 Armstrong Ave., St. Paul, Minn. 55102)

Bush & Lane receiver, chassis 12932. Schematic and date of manufacture wanted, plus kind of tubes used. (Allen R. Harris, 399 Sternberg Rd., Muskegon, Mich.)

Solar Model CE capacitor analyzer, ser. 80527, type 160; 115 volts, 60 cycles. Instruction booklet needed. (William Cardani, 3538 Atlantic Ave., Atlantic City, N. J.)

Zenith Model 8G00FT “Trans-Oceanic” receiver; tunes BC and s.w. bands. Tube layout, schematic info. and schematic. (Walt Szatkowski, 115 Evelyn Ave., Amsterdam, N. Y.)

Philco Model 41-230 receiver, code 121; tunes BC and s.w. bands; has 14 tubes; has manual for pictorial and any other available info wanted. (Andrew Irving, 736 Harvard Ave., Swarthmore, Pa. 19081)

Atwater Kent Model 89 receiver; has 8 tubes. Service and operating data needed. (Anthony S. Kogut, Frank- fort 2, N. Y.)

SONARBUSINESSRADIO

Excellent performance and dependability provided by the experience and design ability that has made Sonar the leader in business radio. Greater range-Voice-Power designed circuitry • Compact and lightweight • Easily installed in smallest vehicles • Smartly styled for office use • Noise free sound which far exceeds BFM • Accessory plug for Sonar Call, Selective Calling, H.P. Linear Amplifier • 12 VDC & 117 VAC • Size: 4¾” x 9¾” x 7¼” • Wt.: 10 lbs.

SONAR RADIO CORP. 73 Wortman Ave., Brooklyn 7, N. Y.

Please send me complete information on Business Radio FM-40
Which microphone should I use?

- for tape recording
- for broadcasting
- for CB and ham
- for public address
- for any application...

Free Booklet—Everything You Want To Know About Microphones! Send Coupon Today!

ULTV UNIVERSITY.
Dept. 8, P.O. Box 1056, Oklahoma City, Okla.

Name __________________________
Address _________________________
City ___________ State _____ Zip Code ______

CIRCLE NO. 49 ON READER SERVICE PAGE

SAY YOU SAW IT IN POPULAR ELECTRONICS

SSBCO TRUE SINGLE SIDEBAND for CB
Go 558 on 27mc Citizens Band
TREMENDOUS BARGAIN!
SSB-27 SIDEWINDER...$164.95
write for MONEY BACK Trial Offer
SSBCO-P.O. Box 101 Northtown Station, Chicago, Ill. 60645

EARN Electronics Engineering DEGREE
You can earn an A.S.E.E. degree at home. College level HOME STUDY courses taught so you can understand them. Continue your education, earn more in the highly paid electronics industry. Missiles, computers, transistors, automation, complete electronics. Over 37,000 graduates now employed. Resident school available at our Chicago campus—Founded 1934. Send for free catalog.
AMERICAN INSTITUTE OF ENGINEERING & TECHNOLOGY
1137 West Fullerton Parkway, Chicago 14, Ill.

New Products

(Continued from page 24)

which contains an EDITall block, 30 EDITabs, a marking pencil, a specially treated demagnetized razor blade, and complete instructions for use. Additional packages of 50 EDITabs are sold separately.

Circle No. 85 on Reader Service Page 15

STEREO TAPE RECORDER

A new stereo tape recorder, the Model 1620, has been released by Roberts Electronics, a division of Rheem Mfg. Co. It features 4-track stereo/mono record/play, record interlock, edit-pause control, automatic shutoff, and a professional vu meter. There are stereo mike inputs, FM multiplex inputs, and separate stereo tone and volume controls. In addition to the stereo 7-inch oval speakers, outputs for extension speakers and outputs for stereo-phones are included. The Model 1620 operates at three tape speeds: 3½ ips and 7¼ ips are built-in, and 15 ips can be obtained with an optional accessory.

Circle No. 86 on Reader Service Page 15

FM STEREO TUNER-AMPLIFIER

The tuner section of the new H. H. Scott 344 tuner-amplifier incorporates a silver-plated four-nuvistor front end for 2.2-µv. sensitivity (IHF) with 80 db cross modulation rejection; flat line limiting makes the 344 impervious to ignition pulse noises and overloading caused by strong local stations. The stereo multiplex section utilizes solid-state time-switching multiplex circuitry, and separation is over 35 db. Automatic stereo switching is accomplished by means of a computer-like device which compares the incoming signal with a fixed noise signal. The solid-state amplifier stage of the 344 delivers a conservative 25 watts music power per channel into an 8-ohm load.

Circle No. 87 on Reader Service Page 15
Diode Function Quiz Answers

(Quiz appears on page 78)

1 — H In a positive clamping circuit, diode conduction during the negative half cycle permits the capacitor to charge up to a voltage nearly equal to the peak value of the input signal, but the output is zero. On the positive half cycle, the diode stops conducting. The voltage across the capacitor adds to the signal voltage and the output is approximately twice the peak voltage.

2 — C A diode detector passes only one-half of the input signal’s waveform to recover the audio portion of the signal.

3 — F In an “And” or “Coincidence” gate, used in logic circuits, two simultaneous input signals of proper polarity and sufficient amplitude to overcome the forward bias of both diodes are required to produce an output signal.

4 — I In limiter circuits, a single reverse-biased diode can be used to clip one side of the waveform at a preselected voltage level.

5 — E In a double-sideband modulator, the carrier is suppressed while upper and lower sidebands are developed.

6 — A A small current passed through a silicon crystal diode in the reverse direction creates a noise or hiss, which can be used to test a radio receiver and other equipment.

7 — G In a zener diode relaxation oscillator, a charging capacitor increases the reverse voltage across the diode until its zener breakdown point is reached. The capacitor then discharges through the diode. When the diode stops conducting, the charging cycle repeats itself.

8 — D A reverse-biased zener diode is often connected in parallel with a meter to provide overload protection. When the preselected diode breakdown voltage is exceeded, the diode acts as a shunt.

9 — B Two zener diodes connected back-to-back are used to regulate an a.c. supply voltage by alternately clipping the voltage peaks at a preselected level.

10 — J In a depressed-zero meter, a reverse-connected zener diode in series with the meter prevents any indication until the breakdown voltage is reached. Input voltages ranging from the diode’s breakdown point to the meter’s limit can then be spread to fill the entire scale, from one end to the other.

August, 1965

VALUABLE books from E. & E.
great “how-to-build” data in the famous

RADIO HANDBOOK (16th Ed.)

 Tells how to design, build, and operate the latest types of amateur transmitters, receivers, transceivers, and amplifiers. Provides extensive, simplified theory on practically every phase of radio. Broadest coverage; all original data, up-to-date, complete. 816 pages. Order No. 166, only………………..$9.50

RADIO TELEPHONE LICENSE MANUAL

Helps you prepare for all commercial radio-telephone operator’s license exams. Provides complete study-guide questions and answers in a single volume. Helps you understand fully every subject you need to know to obtain an operator’s license. 200 pp. Order No. 030, only.$5.75

LEADING BOOK ON TRANSISTORIZED COMMUNICATIONS EQUIPMENT

TRANSISTOR RADIO HANDBOOK, by Donald L. Stoner, W6TNS. Lester A. Earnshaw, ZLIAAX. Covers a wide range of communication uses for both amateur and commercial applications. Includes audio and speech amplifiers, VHF transmitting and receiving equipment, SSB exciters, and complete SSB transceivers. 180 pages. Order No. 044, only………………..$5.00

HOW TO CONVERT SURPLUS RADIO GEAR INTO AMATEUR AND CB EQUIPMENT

Here is a wealth of conversion data in 3 volumes; includes photos, diagrams, instructions:


Order from your electronic parts distributor or send coupon below.

EDITORS and ENGINEERS, Ltd.

P.O. Box 68003, New Augusta, Indiana, Dept. PE-8
Ship me the following books:
[ ] No. 166 [ ] No. 044 [ ] No. 322
[ ] No. 030 [ ] No. 311 [ ] No. 333 $____. encl.

Name ____________________________
Address ____________________________
City________________ State________________ Zip________________

CIRCLE NO. 35 ON READER SERVICE PAGE
CB Silicon Transistor transceivers from PACE

—the quality line, unmatched in performance and dependability

Superior talk power—3½ watt output—developed by the most efficient transmitter circuitry available. Greater receiver sensitivity plus double noise limiters bring in even the weakest signals. Outstanding dependability assured by use of all silicon transistors and lifetime guaranteed glass-fiber circuit boards.

PACE 5000 INCOMPARABLE

One basic radiophone serves all your needs. Use as a base station, as a portable, or mobile (auto, truck, aircraft, marine) by selecting appropriate power pack. Measures 6¾" x 2" x 8". Write for Bulletin 5000.

From $250.00

PACE II 12 CHANNEL MOBILE $169.00

Exclusive noise limiter extender for best mobile operation plus exclusive squelch sensitivity adjustment. PA facility with volume control and external speaker jack, plus velvet touch controls. Quick disconnect “Latch Rak” mobile mount. Power Source: 12VDC, pos. or neg. ground, or AC Power Pack (optional). Measures 7" x 2¾" x 8¾". Write for Bulletin Pace II. Available through authorized Pace distributors and dealers.

FCC station license required. All use must conform to part 95, FCC regulations. Hobby-type communications or any aimless small talk prohibited.

CAP channel on 26.62 mc. (used by authorized CAP members only). This transceiver has "compatibility," meaning that it can be used to transmit a suppressed-carrier signal suitable for contacting regular AM stations.

Several manufacturers (including Sonar and U.S.L.) are putting a "receive" crystal socket on the front panel. This is a feature that is long overdue; transmit crystal sockets on the panel have been common, but few companies have given serious consideration to the necessity for a similar socket for receiving. U.S.L. has an unusual speech compression system involving a "Rayistor" that may be a harbinger of things to come—simple and possibly very effective.

What appears to be the very first 23-channel transceiver using synthesis circuitry, and available as a kit, is upcoming from Allied Radio. Heath is aiming at a different 23-channel unit to be offered at a very low price. EICO plans to compromise on the number of necessary channels and will also offer a transistorized unit—as will Heath.

Transceivers with control heads are on their way, according to Trum. Putting the main body of the transceiver in the trunk is common practice in the $600-plus Business Radio transceivers. This arrangement has never been used successfully in CB, but legitimate users are now asking for it. Besides reducing the amount of space required under the dash, the separate-unit transceiver is generally much more convenient to operate. And speaking of convenience, the Editors note a distinct change in CB toward eliminating frills. Amphenol, Raytheon, and others are working in this direction.

Last but not least, don’t forget to investigate the tremendous variety of base station and mobile antennas being offered. With the CB power limitation at 5 watts, your only method of boosting your radiated signal is with a good antenna. A feature story containing basic information on CB antennas appeared in the May issue (page 62).
transistor revolution has been quite slow in reaching amateur equipment. The reason is not hard to find: transistorized ham gear has not been able to equal the performance of tube units at competitive prices. Today, however, hybrid SSB transceivers, using transistors and other solid-state devices in the low-level stages and vacuum tubes in the transmitter output stages, are available for operation in both the HF and VHF amateur bands.

One such unit is the 135-watt SBE-24 SSB transceiver, covering 80 through 10 meters. Another pair is the Gonset 900-A and 901-A VHF SSB transceivers rated at 20 watts on 50 and 144 mc., respectively. The latter units should be of interest to the advanced Technician.

Kits vs. Assembled Units. The advantages of factory-assembled and guaranteed equipment are obvious. Nevertheless, any amateur kit on the market today produces a piece of gear that performs exactly as it is supposed to, if carefully constructed according to the instructions furnished with it. In addition, it should cost substantially less than an equivalent factory-assembled unit.

Accessories. For hams using crystal-controlled transmitters, crystals are very important accessories. While you can occasionally pick up a good bargain in crystals, you will never go wrong by paying a few pennies more for the best. Also, when a Novice gets his General license, or a Technician wants to shake free of crystal control, a good external VFO rates as a desirable accessory. Then there are low-pass filters to be connected between the transmitter and its antenna system for protection against TV interference. They come in two types. If you work 50 mc., as well as the lower-frequency bands, make certain that the low-pass filter you select will pass 50-mc. signals. If you are not interested in 50 mc., a low-pass filter with a cutoff frequency below 50 mc. offers more protection against TVI.

The equipment “sampler” on pages 62-64 contains information on transmitters, receivers, and other products which should be of interest to the newly licensed Novice or Technician. Do not hesitate to write to any manufacturer for further information.

Ham Gear for the Newcomer
(Continued from page 61)
DELTA PRODUCTS

It's Delta's new Series 112, Mark 10 SCR Capacitive Discharge Ignition System, the true electronic solution to major problems of engine operation.

You read about it in the October 5 edition of Electronics, and the November issue of Electronics World. These earlier models have undergone millions of miles of field testing from Cape Town to Fairbanks.

Now, from Delta, the original designer of the famous Thunderbolt Mark 10, comes a radically improved, high performance model, offering new levels of performance and economy. Series 112, with its higher energy output and improved circuitry, easily outperforms any other ignition system, regardless of cost.

AND, the Mark 10 DeltaKit can give you the fun of making this system yourself, with it's easy to follow instructions.

BOTH units available in 6 or 12 volt, positive or negative ground. A Delta Exclusive! Specify automobile year and model with order.

Assembled Unit  MARK 10 DELTAKIT
$49.50  $34.95
from dealers or factory available ONLY from factory

Dealer and distributor inquiries invited

DELTA PRODUCTS  Box 974  Grand Junction, Colo.
Enclosed is $__________ Ship Prepaid ______ C.O.D.
Please send:
Mark 10 Assembled at $49.50
Mark 10 DeltaKit at $34.95
SPECIFY: Positive or Negative: 6 or 12 Volt

Car Year__________ Make__________
Name__________________________
Address________________________
City__________ State__________

CIRCLE NO. 47 ON READER SERVICE PAGE

102

Transistor Topics

(Continued from page 77)

Grove, Mo.). An electronic equivalent of a self-latching electromagnetic relay, it can be used as a steady "on until reset" indicator in alarm, control, and call systems. Transistor Q2's bias is a function of Q1's collector-to-ground voltage, and is applied through R3 and S2.

When Q2 is in an "off" state, its collector draws relatively little current. Its collector-to-ground potential approaches the battery voltage. There is little or no voltage drop across the indicator lamp I1 and series resistor R5. As a result, a moderately high bias is applied to Q1, causing it to conduct heavily. When Q1 conducts, most of the supply voltage appears across Q1's collector load (R4) and a more positive voltage is applied to the base of Q2, which keeps Q2 in a cutoff condition.

If, at this point, a positive pulse is applied to the base of Q1, this transistor's collector current decreases, swings Q2's bias voltage in the negative direction, and causes Q2 to conduct. The resulting current flow through Q2's collector-emitter circuit lights I1 and drops the voltage below D1's zener point. The diode stops conducting and cuts off Q1's bias. The entire circuit is now stabilized ...

Q1 is cut off and Q2 is conducting. To stop this action and extinguish the light, and to reset the circuit, it is only necessary to momentarily open S2, a normally-closed, push-to-open switch.

Parts arrangement and wiring is not critical, and the circuit can be assembled on a small chassis or board. It can be housed in its own plastic or metal case, or installed with other equipment as an additional circuit. The resistors are all half-watters.

Fig. 5. Electronic latching circuit sent in by reader Charles Rakes goes on when a positive pulse is applied to Q1's base, and stays on until reset.
To operate the unit, close S1 and set R1 to its minimum resistance value. Then press and release S2. The lamp should go off and remain off. Slowly increase R1's resistance until the light turns off, then back off slightly from this setting. Press and release again. The lamp should go out and remain dark until a positive trigger pulse is applied to Q1's base.

The AM wireless microphone circuit illustrated in Fig. 6 was submitted by reader Gerry S. Franklin (Arlington, Texas). A single untapped coil (L1) is used and no feedback winding is required. Transistor Q1 is a pnp unit in a common-base arrangement and differs from the common-emitter circuit in that signals in its input and output circuits are in phase. As a result, oscillation can be obtained by adding a simple feedback capacitor C1 between the collector and emitter circuits.

Transistor Q1's base bias is supplied through R1. The circuit's frequency of operation is determined by the tuned circuit (L1, C3), which also serves as the collector load. Modulation is introduced in the emitter circuit by means of a carbon microphone.

Standard parts are used. Resistor R1 is a half-watt unit and C1 and C2 are small ceramic capacitors. Capacitor C3 is a 365-pf. variable or padder type. Coil L1 is wound on a two-inch length of $\frac{1}{4}''$ ferrite core and consists of 70 turns of #20 enameled wire, close-wound. A high impedance carbon microphone cartridge is used.

Gerry chose a 2N1264 for Q1, but indicates that a 2N508, CK722 or 2N107 should work as well if R1's value is changed—the best value being determined experimentally. Switch S1 can be either a slide or pushbutton switch, while B1 can be any combination of batteries supplying from 6 to 20 volts.

Capacitor C3 should be adjusted so that

---

Fig. 6. Reader Gerry Franklin's AM wireless microphone takes advantage of in-phase signal condition at collector and emitter to sustain oscillation.

---

Thinking of college and a space age career in electronics?

Send for this booklet on
ENGINEERING TECHNOLOGY
AND ENGINEERING

Learn how you can prepare for a dynamic career as an electrical or mechanical engineering technician or engineer in such exciting, growing fields as avionics, missiles, reliability control, fluid mechanics, data processing, metallurgy, microelectronics, and advanced aerospace research.

MSOE offers residence study programs leading to these degrees in engineering technology and engineering:

- 2 years — Associate in Applied Science
- 4 years — Bachelor of Science

Also get facts about scholarships and financial aids, job placement and other student services, plus photographs of MSOE technical laboratories and student activities. For your copy, just mail the coupon — no obligation.

---

MSOE
Milwaukee School of Engineering

Milwaukee School of Engineering
Dept. PE-865 1025 N. Milwaukee Street
Milwaukee, Wisconsin 53201

Please send the "Your Career" booklet.
I'm interested in:

☐ Electrical fields ☐ Mechanical fields

Name................................. Age...........
Address...........................................

City................................. State........ ZIP...........

CIRCLE NO. 22 ON READER SERVICE PAGE 103
NOW TO LISTEN TO THE WORLD contains inside advice from experts on catching rare DX stations—$2.75. WORLD RADIO TV HANDBOOK has frequencies, schedules, and addresses of short-wave broadcasting stations throughout world—$4.95. Summer Supplement—$2.00. Log sheets for SWL's—$1.89 per hundred. Many other books and accessories.

GILFER Associates
P.O. Box 249B, Park Ridge, N.J. 07656

GET INTO ELECTRONICS

VALPARAISO TECHNICAL INSTITUTE
DEPARTMENT PE, VALPARAISO, INDIANA

the unit's output signal is picked up at a "dead" spot on the AM dial of a nearby receiver. Maximum range will vary, of course, but Gerry says that he obtained a range of about 30 feet with his model, using a two-foot antenna.

Transitips. If you assemble a fair number of projects each year, you may find it worthwhile to take a tip from computer design engineers and consider "modular" construction, i.e., the preassembly and use of the same basic circuitry for a variety of projects. While there are, of course, many circuits that are unique to specific projects, there are just as many which are essentially the same in various types of equipment.

The audio amplifier is a prime example. An amplifier capable of delivering, say, from 500 milliwatts to several watts, can be used in such projects as electronic guitars, radio receivers, phonographs, tape recorders, power megaphones, intercoms, theremins, signal "sniffers," voice-controlled relays, intrusion detectors, and signal tracers.

High-powered engineering is not required. Simply pick a circuit that you have tried successfully in the past, choose one from back issues of POPULAR ELECTRONICS, or select one from any of the circuit manuals offered by such manufacturers as RCA, General Electric or Motorola.

Assemble your first circuit breadboard-fashion to check operation, adjusting component values experimentally, if necessary, for optimum performance. Next, work up a tentative layout, either for an etched circuit board or on a small chassis. You may have to try two or three layouts before you find the one best suited to your needs.

Finally, assemble two or three duplicates of your completed design. Use these, as needed, in future projects in much the same way as you would use components such as loudspeakers or batteries.

The "ideal" audio amplifier for general-purpose applications should have moderate to high gain and a moderate to high input impedance. It should be capable of delivering sufficient power for good room volume, and should have a standard output impedance . . . typically, 4 or 8 ohms. The components used should be standard "off-the-shelf" items rather than surplus or salvaged parts. And, naturally, the circuit should operate on readily available power sources: 6-, 9- or 12-volt batteries.

With a suitable assortment of basic circuit "modules" on hand, you can complete a greater number of projects each year, can reduce your trouble-shooting time, and can concentrate on the unique features of new projects rather than on familiar circuitry.

More next month. . .

—Lou
Across the Ham Bands
(Continued from page 80)

Indiana. Within minutes after the tornado had passed, however, amateurs were in operation on the Indiana c.w. and phone net frequencies handling emergency and welfare messages in and out of the disaster areas. Your Amateur Radio Editor personally logged over 100 other amateurs who helped provide emergency communications for three days until regular forms of communications could be restored to the disaster areas.

Undoubtedly, the most surprised ham taking part in the operation was Art, K8MET/9, who was set up in the emergency communications center at the fire station in Dunlap, Indiana. Art looked up from his receiver at one point and saw the President of the United States standing a few feet away drinking a cup of coffee. This incident occurred during Mr. Johnson's inspection of the tornado destruction.

Notes from Club Bulletins. Phyllis Denham, W8GJW/EP2AB, reports in the Marion, Ohio, High Banders Log that when she and her husband, John, arrived in Iran in June, 1962, for a two-year stay, you could only get an Iranian license if you already held an amateur license from some other country, because there were no Iranian radio laws or examinations. Phyllis, licensed in the U.S.A. as W8GJW, was issued the call of EP2AB, and she was drafted into the job of secretary for a radio club in Iran. The club drew up a set of radio regulations based on the best features of other regulations around the world as a guide for the Iranian government. (One feature of the regulations is that anyone, regardless of national origin, is eligible for an Iranian

B. Bobbit, WA5GOW/5, and D. Gannon, WA5ANF/5, operate at Saint Mary's Seminary, in Houston, Texas. They would like skeds with similar institutions.

August, 1965

NEW
from the World Leader in Soldering Technology

Weller
"PENCIL" SOLDERING IRON

- SMALL
- LIGHTWEIGHT
- HIGHLY EFFICIENT

Ideal for miniature soldering, this new 25 watt, 115 volt iron weighs only 1 ¼ ounces. You can hold and maneuver it as easily as a pencil. Gets into tight places. Does the work of irons having much more weight, much higher wattage. Recovers heat rapidly. Maximum tip temperature is 860°F. Complete with tip and cord. Model WPS. $5.20 list

NOW at your Electronic Parts Distributor

WELLER ELECTRIC CORP., EASTON, PA.

FOR MOBILE EQUIPMENT
TRANSISTORIZED VIBRATOR ELIMINATOR
VI-TRAN ELIMINATES VIBRATOR HASH
INCREASES EFFICIENCY

The new Vi-Tran is a solid state vibrator eliminator for mobile units using mechanical vibrators. It has a high efficiency rating, conserves power, boosts output, eliminates noise, and costs only $5.95. No tools required to install it; the Vi-Tran just plugs in.

The Vi-Tran is superbly engineered and thoroughly field tested. Oscillates as low as 5 volts; environmental test: -50°F. to +180°F. Power is maximum as authorized by FCC.

Two models are available: VE-194 P (vibrator pin #1 pos.)
VE-195 N (vibrator pin #1 neg.)

In a dustfree aluminum case. Blister packed with complete installation instructions on card. Now at your local parts jobber or dealer. Or write:

102 Prince St., New York, N.Y., 10012
(212) 877-1881 — TWX 212-867-7990

Subsidiary of Industrial Electronic Hardware Corp.

CIRCLE NO. 52 ON READER SERVICE PAGE
ATTENTION CLASSIFIED ADVERTISERS

175,000 Active, Eager Electronics Hobbyists—who bought and thoroughly enjoyed the SPRING 1965 ELECTRONIC EXPERIMENTER’S HANDBOOK—anxiously await FALL 1965 ELECTRONIC EXPERIMENTER’S HANDBOOK. If your Classified Advertising appeared in the Spring Edition, you should receive even better responses in the Fall Edition, but if your ad is not presently scheduled for this great Handbook, don’t miss out—Act At Once! FALL 1965 ELECTRONIC EXPERIMENTER’S HANDBOOK—75¢ Word CLOSING DATE: August 13, 1965 Send Order and Payment Today to: Hal Cymes, Classified Advertising Manager Electronic Experimenter’s Handbook One Park Avenue New York, New York 10016

OPERATE A FIX-IT SHOP

Earn Big Money. Repair household appliances, rewind motors, sharpen mowers, saws, do house wiring, etc. Every neighbor, assigns a project. We show you how to make repairs, secure business, what to charge, buy needed parts wholesale, etc. FREE BOOK.

CHRISTY TRADES SCHOOL
Dept. A-2514 3214 W. Lawrence Chicago 60625

106 POPULAR ELECTRONICS

amateur license.) The radio club then started code and theory lessons—Phyllis was one of the instructors—and in April, 1963, the first Iranian ever to be licensed in his own country received his ham ticket. Phyllis’s husband also graduated from the class and qualified both for a U.S. Conditional license and an Iranian license.

In the RSGB Bulletin published last November, there was a breakdown of the latest complaints of radio and TV interference in England Of the 15,134 complaints investigated, amateur transmitters were guilty only 82 times! Fifty-four of these were TVI complaints. But over the same period of time 343 causes of TVI were traced back to radiation from other TV receivers. Sewing machines took the rap 824 times and neon signs 366 times.

News and Views

Brad Tillery, WN4YHP, 1302 Hawthorne Rd., Wilmington, N.C., is a 2-band man—80 and 40 meters. His Knight-Kit T-60 transmitter and R-100A receiver share an 80/40-meter dipole 20 feet high. Brad’s log shows 21 states worked in six weeks on the air... Alex B. W2BLE, 5713 Moyer Rd., North Tonawanda, N.Y., put 26 states and Canada in his logbook on 80 meters using a 30-watt transmitter and an old, odd Hallcrafters SX-24 receiver. Now, with a new General Class license, a new rig—a Heathkit “Taylormade”—and a new 40-meter, he has 47 states and six more countries worked... Arthur Castrup, Jr., W9NKV, R 2, Bretz St., Huntington, Ind., has made 32 contacts with a home-brew 15-watt transmitter feeding a Hy-Gain 14AVQ vertical antenna. But he spends most of his time studying for his General ticket, and a commercial one, too, and building an operating console to house his gear. So far, the console contains a Heathkit HR-10 receiver, a converted ARC-4 surplus receiver for two meters, two “Command” transmitters for 80 and 40 meters, and four power supplies.

Charles A. Rankin, WA2HMM/5, 222 E. Curtis Dr., Midwest City, Okla., and his wife, WB2NS/5, will sked anyone needing Oklahoma on any band from 80 through 15 meter phone or c.w. Their rig consists of a Collins 32V1 transmitter, a Hammarlund R-274D receiver, a Mosley TA-32 beam, and an 80/40-meter dipole... James Melby, WMUJA, Box 236, Dalton, Minn., started a Heathkit GR-81 and transmits on a Knight-Kit T-50. He didn’t mention his antenna, but he probably has one, because he worked 23 states and two Canadian provinces in six weeks on the air... In between hamming and other activities, John Zuris, WB6MEQ, 18252 Bermuda, Northbridge, Calif., studies Russian and Spanish in school. He reports that it helps in working DX, as indicated by his record of 31 countries, 50 JA’s (Japan) and 25 UA0’s (Russia) worked in two months. John didn’t say whether he spoke Spanish or Russian to the JA’s. An EICO 720 transmitter, Knight VFO, Hallcrafters SX-59 receiver, and Hy-Gain 14-AVQ vertical antenna are John’s weapons.

Dave Wojcinski, WAF9PG, 5556 Hohman, Munster, Ind., describes how a traffic handler is born. When he got his license nine months ago, he worked 40-meter c.w. and then phone. Later, he tried 15 meters, working a handful of DX stations and many U.S. stations. Getting tired of “just talking,” Dave moved to 80 meters and started reporting into the Indiana phone and c.w. nets, where he often acts as net control station now. He finds keen satisfaction in delivering messages he has received. But other hams try traffic handling: he thinks they will like it... Ken Orton, VE3CCB, 1593 Dale St., London,
Ontario, Canada, likes c.w. contests, chasing DX on 2-meter SSB and c.w., and rag-chewing on 2 meters. A Heathkit "Apache" transmitter with an SB-10 SSB adapter, feeding a Cubical Quad antenna, and a Hallicrafters SX-117 receiver handle the lower frequencies; a converted war-surplus "522" and a 10-element beam cover 2 meters. QSL cards from 83 countries and 42 different certificates cover the VE3CCB shack walls. . . Kenneth Snyder, W43CHY, P.O. Box 367, Penn Run, Pa., got a "hot" start in radio. He put together a Heathkit GR-91 receiver, which began to smoke when he turned it on. Removing the short in the power supply cooled off that problem. Then he put together a Heathkit DX-60 transmitter, which he still uses in conjunction with a National NC-109 receiver. Ken worked 21 states as a Novice and has the total up to 35 states now. He offers to sked stations needing a Pennsylvania contact and to help prospective hams get their tickets.

Stanley, WN5JKW, and Stephen Clark, WN5KIX, 808 West 11th St., Plainview, Texas, are identical twins. They keep their EICO 720 transmitter and Hammarlund HQ-110 receiver on the air every spare moment. Stanley has 44 states worked and confirmed, plus several Canadians and a Mexican, while Stephen has 39 states worked—36 confirmed—and a couple of VE3's. Look for them on 80 and 40 meters almost every evening and on 15 meters weekends and holidays. . . Gary Clark, W9EGQ, 537 W. Diamond Ave., Hazleton, Pa., spreads his operating over the 80-, 40-, and 15-meter Novice bands, but he prefers 80 meters. His score is five countries and 33 states worked using an EICO 720 transmitter feeding a multiband dipole. He receives on a Hammarlund HX-100. Gary made W9EGQ a member of the "Non Lids Anonymous," complete with a Code "Deficiency" Certificate. Send your "News and Views," pictures, and comments to: Herb S. Brier, W9EGQ, Amateur Radio Editor, Popular Electronics, P.O. Box 678, Gary, Indiana 46401. We would appreciate receiving your club paper, too. Until next month, 73, Herb, W9EGQ

The Federal Aviation Agency recently stated that radio-controlled garage doors are becoming a menace to aviation in some parts of the country. In the Los Angeles area alone, some 58 offenders were tracked down in one week and taken off the air. According to the agency, main offenders are units operating illegally in the 230- to 290-mc. band. This band includes the military emergency frequency of 243 mc. Signals from some receivers activating the door-opening devices are strong enough to be picked up by aircraft as far away as 16 miles. Thus, it is possible for a pilot to inadvertently "home in" on a garage door signal and fly directly toward it with great accuracy and with possible disastrous results. According to Norman Ackerman, president of Perma-Power Co., a Chicago manufacturer of radio-controlled garage door controllers, units in the 27-mc. band do meet government regulations and were not among the culprits apprehended.
Gilfer Associates is now selling an SWL log sheet punched for a three-ring binder. All of the columns pertain to SWL activities. Samples are available, or supplies at $1.89 per hundred, from Gilfer Associates (Box 239, Park Ridge, N.J. 07656).

**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 SHORT-WAVE REPORT, P.O. Box 333, Cherry Hill, N.J., 08034, in time to reach your Short-Wave Editor by the fifth of each month; be sure to include your WPE identification, and the make and model number of your receiver.

**Andorra—**R. Andorra is noted on 5895 kc. around 1800 with an 1D in French. This station is rarely heard except along the East Coast.

**Bolivia—**Station CF39, La Cruz del Sur, La Paz, is definitely operating on 11,765 kc.; it was noted at 2145 s/off in Spanish and English asking for reports.

A new station is R. Universo, Casilla 232, La Paz, heard around 2000 and later on 5013-5015 kc.

**Brasil—**Station ZYE2, R. Difusora Macapa, Territorio do Amapa, 4911 kc., verified after two reports, stating that they have been operating since last October with 75 watts (they are listed for 1500 watts—Ed.). Reports from abroad evidently are not appreciated.

Station ZYE57, Sao Paulo, 9745 kc., has been logged at 1755 mixing with R. Malt and La Voz de Andes. Radio Excelsior is often very strong on 9585 kc. at 1835, with news items.

**SHORT-WAVE ABBREVIATIONS**

AM/T—Announcement

ENG—English

1D—Identification

IS—Interval signal

Kc.—Kilocycles

N.A.—North America

QRM—Station interference

QSL—Verification

R.—Radio

s/off—Sign-off

s/on—Sign-on

VOA—Voice of America

XM—Transmitter

**The only lab instrument you need to complete Scott's new 80-watt solid-state stereo amplifier kit**

Scott's new solid state amplifier kit is completely protected against transistor blow-out. An ingenious "Fail-Safe" circuit using an ordinary light bulb takes the load off expensive silicon transistors when you first plug in your LK-60... so, if you've made a wiring error (almost impossible with this kit), no harm done! Other bright new ideas from Scott: preassembled, factory-tested modular circuit boards; full-color instruction book; amazingly low price: $189.95


CIRCLE NO. 36 ON READER SERVICE PAGE
Richard Hardt, WPE9HQR, lives in Crown Point, Ind., but this picture shows his listening post at Ball State University in Muncie, Ind. Richard's receiver is a Knight-Kit R-55A, and his antenna at the university is a 35' vertical long-wire mounted against the side of the dormitory. As of now Richard has 19 verifications from 25 countries heard.

Ecuador—La Voz de Esmeraldas has been noted on 4875 kc. from 2330 to 2355 s/off. all-Spanish. They feature—in addition to the usual Latin American music—time checks that are evidently spoken by a little girl. We have no other information on this station.

Egypt—The latest schedule on hand from Cairo lists Eng. on 7075 kc. at 0130-0200 to the Middle East, N. Africa, and Europe; on 9475 and 11,915 kc. at 1630-1720 to Europe; on 15,210 kc. at 1545-1645 to W. Africa; on 17,520 kc. at 0830-0930 to East Asia and at 1245-1530 to East and Central Africa.

England—London has been heard with a single-sideband xmsn on 6930 kc. from 2218 to 2245 s/off. "From the Weeklies" runs to 2230, and is followed by program anns.

Ethiopia—Station ETLF, The Radio Voice of the Gospel, Addis Ababa, has adopted the following schedule, effective until early September. Xmtr #1: 0815-1000 on 15,410 kc., 1000-1045 on 9755 kc., 1045-1155 on 6010 kc., 1200-1325 on 11,875 kc., and 1330-1445 on 11,755 kc.; alternate channels are 9615, 9765, 11,745, 11,950 and 15,355 kc. Xmtr #2: 0815-0930 on 9645 kc., 1200-1215 on 9695 kc., and 1230-1415 on 9705 kc.; alternate are 9655, 9705 and 9755 kc.

Germany (East)—R. Berlin International has been logged on 9655 kc. at 2350 to N.A.: on 9600 kc. in Portugal at 1800; and on 9560 kc. with Eng., closing at 0010. A xmsn to S.E. Asia is given from 0700 to 0800 s/off on 11,765 kc. mostly news and music.

Guatemala—R. Nacional Tikal, Peten Flores, has moved from 6190 to 6205 kc. s/off is at 2330.

Honduras—Listed in the May column was HRRZ, R. Tecun Uman, 4960 kc. However, a recent QSL lists this station as HRTL on 4960 kc., noted well around 0600. They operate in Spanish in parallel to 9655 kc. Reports go to Apartado Postal #376, Tecun Uman.

India—All India Radio, Delhi, was observed on 11,940 kc. from 2230 in native language, and on 9530 kc. from 1815 s/off at good level, but QRMed by a VOA outlet.

Israel—Kol Zion, Tel Aviv, is noted on 9725 kc. daily with news in Eng. and Israeli music at 1515-1545, dual to 7180, 9008, and 9629 kc.

Luxembourg—A long-wave station recently noted is R. Luxembourg I on 233 kc. This station was heard in New England as early as 1820 with rock-and-roll music during a period when beacon SQT, Squat, Mass., was off the air for repairs.

Malaysia—R. Malaysia, Kuala Lumpur, has been heard on 7304 kc., dual to 4983 kc., in Eng. to 1130 kc. and on 1330-1415 kc. However, no other details were noted.

August, 1965
s/off. The Singapore outlet was heard at the same time on 11,940 kc. in English. These are West Coast loggings.

Maldive Islands — The Maldive Islands B/C Service gives news at 2200, 0400, and 1000 on 7450 kc. They are also testing on 9650 kc. and 9000 with Western and Oriental music; each selection is followed by short whistles, and there is an ID every half hour.

Mozambique — Station CR7RA, R. Paza, Beira, 5024 kc., opens at 2300 with clock chimes and an ID.

Netherlands — Hilversum was tuned with its Dutch service to Africa and Europe at 1300-1420, and Eng. to the same areas at 1500-1550 on 11,960 kc. The 9690-kc. outlet was heard closing in Eng. at 2115.

Netherlands Antilles — Trans World Radio, Bonaire, now has an official schedule for the short-wave outlets: 15.290 kc. at 1500-1550 in Eng. and at 1600-1720 in Dutch, both to W. Africa, and at 1720-1830 in Spanish to southern South America: 9690 kc. at 2030-2120 in Eng. and at 2130-2250 in Dutch, both to N.A., and at 2300-2350 in Spanish to Mexico.

New Zealand — Wellington was found on 11,850 kc. In Spanish with an Eng. ID at 2130-2220. This xmn does not appear in recent schedules.

Peru — A station announcing as R. Programas del Peru has been heard on 9640 kc. after 2000 with dramatic presentations. This may be a new station or it could possibly be a program service of Radio La Hora.

Station OA2XP, R. Tingo Maria, Departamento de Huanuco, is a new outlet on 3235 kc. that has been noted after 2200 with Latin American vocals and commercials. They verify by card and pennant.

Somali Republic — R. Moadisteec is definitely being heard in midwestern areas on 7160 kc. at 2330 with Arabic news and from 2245 in English.

South Africa — Paradyx is noted on a new frequency of 3285 kc. In the Eng. Service with setting-up exercises at 2345, a chime time signal and news at 0000, and talks from 0010.

Sudan — Omdurman, 9480 kc., is readable at 2330-0000 with talks in Arabic and some Arabic music. You'll have to dig for it, though, for there are teletype and other stations on top of it.

Sweden — Stockholm, 9705 kc., is strong around 2045 to N.A. They are asking for support of their new feature, "Record Request," which is aired on the last Thursday of each month. The station is heard around 0625 with a DX bulletin, and Eng. to N.A. is given on 15,195 kc. at 0900-0930.

DX States Awards Presented

To be eligible for one of the DX States Awards designed for WPE Monitor Certificate holders, you must have verified stations (any frequency or service) in 20, 30, 40, or 50 different states in the U. S. The following DX'ers have qualified for and received the 20 States Verified Award.

Twenty States Verified

Kenneth Coyne (WPE2L5J), Long Beach, N. Y.
J. Sidney Downey (WPE9PCP), Anderson, Ind.
Paul Meyers (WPE1HV), Bethel, Ohio
Gordon Arany, Jr. (WPE3UP), Baltimore, Md.
John B. Preston (WPE9ESH), Spencer, Iowa
John Thompson (WPE9HMM), Wilmette, Ill.
Jeffrey R. Cobb (WPE2CRS), Westboro, Mass.
Robert Beaudoin (WPE1GGC), New Bedford, Mass.
Thomas M. Barker (WPE2MMK), Yorkers, N. Y.
Dan Nepper (WPE8HGR), Toledo, Ohio
Bob Dubuisson (WPE1GL), Longmeadow, Mass.
Alvan E. Fisher (WPE1GHE), Newton, Mass.
Gary Davis (WPE5ECC), Jennings, La.
Robert S. Fleming (WPE3GFC), Havertown, Pa.
Greg Witt (WPE3GOW), Hollidaysburg, Pa.
John C. Peterman (WPE9HRY), Kenosha, Wis.
Cliff Goodlett (WPE4EXH), Chattanooga, Tenn.
Phillip Swingley (WPE9HLM), Munich, Ind.
Victor Reindl (WPE2MNX), Brooklyn, N. Y.
Tom Weiss (WPE8BGN), Cuyahoga Falls, Ohio
Larry Zigzag (WPE9HLM), South Bend, Ind.
Thomas Winfield (WPE9GMB), Bristol, Wis.
Bill Block (WPE7BZ), Portland, Ore.
Joe Wade (WPE6FXY), Northridge, Calif.
Charles Keller (WPE8BUH), Port Huron, Mich.
Chuck Johnson (WPE9G5Y), Chicago, Ill.
Ray Drosz (WPE8EYU), Chicago, Ill.
Lawrence W. Whitehead (WPESEEI), Wewoka, Okla.
Walter L. Palmer (WPE0EIN), Webster Groves, Mo.
Kenneth M. Schableski (WPE9HPV), Chicago, Ill.
Joel Frensdorf (WPE8HJR), Cleveland, Ohio
Jim F. Cooperstein (WPE9HOW), Hales Corners, Wis.
Sammy Saracino (WPE0EJK), Denver, Colo.
Bill Marple (WPE6FVU), Los Angeles, Calif.
James B. Pesek (WPE9ENO), N. Riverside, Ill.
Richard Earl Smith (WPE9HJM), Calumet City, Ill.
Bill Naranjo (WPE1EIP), Lebanon, N. Y.
Craig A. Huey (WPE6FBN), El Segundo, Calif.
Gordon Ernest Randall (WPE1GJJ), New Bedford, Mass.
Silvio A. Marin, Jr. (WPE4IQ), East Point, Ga.
Alan R. Mote (WPE1GAC), New Bedford, Mass.
Jim Milligan (WPE81BGE), Cambridge, Ohio
Bill Caffyn (WPE7CER), Great Falls, Mont.
Norman Lederman (WPE1EJB), Boston, Mass.
Gale Shafer (WPE7CGB), Deming, Wash.
Dennis Ashworth (WPE7JK), Corvallis, Ore.
Steve Kunkel (WPE3G1M), Randallstown, Md.
Kenneth Rosen (WPE8HSZ), Detroit, Mich.
George W. Thompson, Jr. (WPE9HQA), Orland Park, Ill.
Edward Kalin (WPE1GEL), West Hartford, Conn.
Thomas A. Solomon (WPE1GCO), Methuen, Mass.
George Masny (WPE2JPN), New York, N. Y.
Darrell Anderson (WPE7CEA), Seattle, Wash.
Joseph V. Liberatori (VPE7EPR), Victoria, B. C., Canada.
Paul R. Schildgen (WPE5B2U), Tacoma, Wash.
Edward J. Szymski (WPE8B1G), Strettsboro, Ohio
C. H. Andrews, Jr. (WPE4IHK), Rocky Mount, N. C.
Albert Krizan (WPE1GZ), Bridgeport, Conn.
Ronald A. Dohmen (WPE8EGB), New Prague, Minn.
Vincent Anzyski (WPE1GFH), East Haven, Conn.
Robert Johnson (WPE3E1DX), Oswego, Ont., Canada
Terry Morton (WPE3E2DY), London, Ont., Canada
Steve Schneider (WPE6EER), Fresno, Calif.
David Smith (WPE1GBE), Everett, Mass.
Robert M. O'Dell (WPE81EZ), Lansing, Mich.
William Franke (WPE6D0V), La Puente, Calif.
John F. Condron (WPE1KX), Pittsfield, Mass.
Martin E. Robbins (WPE8EWW), Bloomfield, Colo.
Robert Wechsler (WPE2GE), Brooklyn, N. Y.
Harold Forman (WPE2NGF), Margate, N. J.
Bruce Harrison (WPE6FFZ), Long Beach, Calif.
Theodore Templeton (WPE5DUL), Sagerton, Pa.
Doug Storey (WPE6EP), Leon, Iowa
Wm. Windscheif (WPE8HSL), Walled Lake, Mich.
Arman Dolikian (WPE8IO), Detroit, Mich.
Phil Marx (WPE6GQ), Costa Mesa, Calif.
Richard F. Jemison (WPE9HLZ), Des Plaines, Ill.
John Hubbell (WPE3E2EU), Port Credit, Ont., Canada
Alan Raylesberg (WPE2MKW), Bayside, N. Y.
David Thompson (WPE6FHP), Suissun, Calif.
David Nagel (WPE2NLK), Bronx, N. Y.
Charles Husinsky (WPE2NVJ), New York, N. Y.
Thomas Frame (WPE8UCE), Bethel, Ohio
Lawrence J. Bennett (WPE2NEU), Forest Hills, N. Y.
SHORT-WAVE CONTRIBUTORS

George Hemingway (WPE1DV), Taftville, Conn.
Henry Brown, Jr. (WPE1EXY), Falmouth, Mass.
Bill Smith (WPE1FZ), Exbride, Mass.
David Smith (WPE2BC), Exbride, Mass.
Perry Braen (WPE2JKY), Bronx, N. Y.
William Graham (WPE2L4V), Binghamton, N. Y.
Stephen Diemne (WPE2LOU), Binghamton, N. Y.
Marvin Jacobson (WPE2MAO), Brooklyn, N. Y.
Jim Matis, Jr. (WPE2WHL), Ford, N. Y.
Robert Kaplan (WPE2ZVH), Bronx, N. Y.
Bernard Greene (WPE3MV), Brooklyn, N. Y.
Paul Mayo (WPE3NHG), Brooklyn, N. Y.
Grady Ferguson (WPE4BC), Charlotte, N. C.
Kenneth Aylta, Jr. (WPE4FWY), Charlotte, N. C.
Bobby Conder (WPE4JOT), Winston-Salem, N. C.
Dan Knison (WPE4XNC), Dade City, Fla.
John Davie (WPE4DA), Key West, Fla.
Bruce Wildstein (WPE4ED), Jacksonville, Fla.
Joseph Aalya (WPE4N1U), Key West, Fla.
Minion Elly (WPE4YLO), Delray Beach, Fla.
Edward Bowerman (WPE5B1U), Rogers, Ark.
Jack Keene (WPE5BMP), Houston, Texas.
Del Hirt (WPE5CFU), Snyder, Texas.
Gerald Clough (WPE5EFC), Galveston, Texas.
Ernest Armstrong (WPE50L), Gwinn, Mich.
Shaler Hansen (WPE6B6), Pasadena, Calif.
Robert Sabin (WPE6D8), Wilmington, Ohio.
Paul Meyers (WPE6HHV), Bethel, Ohio.
Steve Morgan (WPE6IKU), Dayton, Ohio.
Larry Balzer (WPE6IRM), Cinnadum, Ohio.
R. D. Palmer (WPE6MST), Decatur, Ill.
Dennis Eksten (WPE6NT), Loves Park, Ill.
Robert Lambke (WPE6O4K), Forest Park, Ill.
Bruce Johnson (WPE6HSI), Elk Grove Village, Ill.
Doug McKarhan (WPE6PSZ), Oak Park, Ill.
A. H. McKee (WPE6HI), Winchester, Ind.
John Beaver, Sr. (WPE6HAE), Pueblo, Colo.
Joe Finley (WPE6EPF), Excelsior, Minn.
Jack Perlo (WPE7PEC), Sao Paulo, Brazil.
Greg Smith (WPE7EST), Frederick, N. B., Canada.
Richard Langley (WPE7ECA), Scarborough, Ont., Canada.
Hector Davilla, Bayamon, P. R.
Lyle Galloway, Vineland, N. J.
Bert Pryor, Athens, Ga.
Bob Ulmer, Vancouver, B. C.
Brad Wall, San Bernardino, Calif.
Station ETLF, Addis Ababa, Ethiopia.
R. Nederland, Hilversum, Netherlands.
Switzerland—The complete Eng. schedule from Berne is as follows: To Eastern N.A. at 2015-2115 on 9665, 9535, and 6120 kc.; to Western N.A. at 2115-0015 on 9665 and 9535 kc.; to United Kingdom and Ireland at 0700-0800 on 9665 and 7110 kc., and at 1345-1445 on 9665 and 6055 kc.; to Africa at 0945-1045 on 17,830, 15,305, and 15,225 kc.; to Japan, S. E. Asia, China, India, and Pakistan at 0815-0915 on 17,830, 15,305, and 15,225 kc.; to the Near and Middle East at 1000-1100 on 17,830, 15,305, 15,255, and 11,865; and to Australia and New Zealand at 1600-1700 on 11,865 and 9545 kc. Except for the xmsns to western N.A. and to the United Kingdom and Ireland (at 2315 and 0700), all xmsns are 30 minutes longer on Sunday.
U.S.S.R.—R. Bakun, Azerbaijan SSR, is heard on 9490 kc. at 2000-2200; a drama is given to 2100, then news, symphonic music, and some talks. Clock strikes eight hours ahead of EST on the hour.
Ulan Bator, Mongolia, is being heard in some areas of the U.S. around 1700 on 11,850 kc. in English. R. Minsk, Belorussian SSR, is heard on 5940 kc. at 1640-1740 with operatic and classical music; no 1D is given at 1700 but a Moscow 1S is given at 1730. A Russian speaker was noted on 4930 kc. at 2150-2200. At 2200 there were clock chimes, an anthem, time check, and an ID which was not that of Moscow.
Venice City—Radio Vatican's latest schedule reads: Portuguese to Brazil at 1800 on 9645 and...
**POPULAR ELECTRONICS**  
*August 1965*

**ADVERTISERS INDEX**

<table>
<thead>
<tr>
<th>READER SERVICE NO.</th>
<th>ADVERTISER</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alliance Mfg., Inc., The</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Allied Radio</td>
<td>84, 85, 86, 87</td>
</tr>
<tr>
<td>3</td>
<td>American Institute of Engineering &amp; Technology</td>
<td>98</td>
</tr>
<tr>
<td>4</td>
<td>Amphenol Distributor Division, Amphenol-Borg Electronics</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>Antenna Specialists Co., The</td>
<td>31</td>
</tr>
<tr>
<td>6</td>
<td>B &amp; K Manufacturing Co</td>
<td>13</td>
</tr>
<tr>
<td>7</td>
<td>Browning Laboratories, Inc</td>
<td>109</td>
</tr>
<tr>
<td>8</td>
<td>Business Radio, Inc</td>
<td>106</td>
</tr>
<tr>
<td>9</td>
<td>Capitol Radio Engineering Institute</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td>Central Technical Institute</td>
<td>104</td>
</tr>
<tr>
<td>11</td>
<td>Christy Trades School</td>
<td>106</td>
</tr>
<tr>
<td>12</td>
<td>Cleveland Institute of Electronics</td>
<td>16, 17, 18, 19</td>
</tr>
<tr>
<td>13</td>
<td>Cleveland Institute of Electronics</td>
<td>109</td>
</tr>
<tr>
<td>14</td>
<td>Delta Products</td>
<td>102</td>
</tr>
<tr>
<td>15</td>
<td>DeVry Technical Institute</td>
<td>3</td>
</tr>
<tr>
<td>16</td>
<td>Eastman Kodak Company</td>
<td>83</td>
</tr>
<tr>
<td>17</td>
<td>Editors and Engineers</td>
<td>96</td>
</tr>
<tr>
<td>18</td>
<td>Electro Products Laboratories, Inc</td>
<td>101</td>
</tr>
<tr>
<td>19</td>
<td>Electro-Voice, Inc</td>
<td>34, 48, 49, 20, 52, 15</td>
</tr>
<tr>
<td>20</td>
<td>Finney Engineering, The</td>
<td>170</td>
</tr>
<tr>
<td>21</td>
<td>Fisher Radio Corporation</td>
<td>23</td>
</tr>
<tr>
<td>22</td>
<td>General Radiotelephone Company</td>
<td>29</td>
</tr>
<tr>
<td>23</td>
<td>Gilfer Associates</td>
<td>104</td>
</tr>
<tr>
<td>24</td>
<td>Gotham Electronics</td>
<td>94</td>
</tr>
<tr>
<td>25</td>
<td>Hallcrafters</td>
<td>46</td>
</tr>
<tr>
<td>26</td>
<td>Heath Company</td>
<td>85</td>
</tr>
<tr>
<td>27</td>
<td>Hitchings</td>
<td>107</td>
</tr>
<tr>
<td>28</td>
<td>Hy-Gain Electronics Corporation</td>
<td>14</td>
</tr>
<tr>
<td>29</td>
<td>I.E.H. Mfg. Co., Inc</td>
<td>105</td>
</tr>
<tr>
<td>30</td>
<td>International Crystal Mfg. Co., Inc</td>
<td>25</td>
</tr>
<tr>
<td>31</td>
<td>Jerrold Electronics</td>
<td>29</td>
</tr>
<tr>
<td>32</td>
<td>Johnson Company, E.F.</td>
<td>THIRD COVER</td>
</tr>
<tr>
<td>33</td>
<td>Kaar Engineering Corporation</td>
<td>39</td>
</tr>
<tr>
<td>34</td>
<td>Kuhl Electronics Inc</td>
<td>93</td>
</tr>
<tr>
<td>35</td>
<td>LTV University</td>
<td>91</td>
</tr>
<tr>
<td>36</td>
<td>Lafayette Radio Electronics</td>
<td>21</td>
</tr>
<tr>
<td>37</td>
<td>Mark Products</td>
<td>38</td>
</tr>
<tr>
<td>38</td>
<td>Metrotek Electronics, Inc</td>
<td>1</td>
</tr>
<tr>
<td>39</td>
<td>Mlde Electronic Corp</td>
<td>92</td>
</tr>
<tr>
<td>40</td>
<td>Milwaukee School of Engineering</td>
<td>103</td>
</tr>
<tr>
<td>41</td>
<td>Mosley Electronics Inc</td>
<td>29</td>
</tr>
<tr>
<td>42</td>
<td>Multi-Elmac Company</td>
<td>32</td>
</tr>
<tr>
<td>43</td>
<td>Nation-Wide Tube Co</td>
<td>115</td>
</tr>
<tr>
<td>44</td>
<td>National Radio Institute</td>
<td>SECOND COVER</td>
</tr>
<tr>
<td>45</td>
<td>National Technical Schools</td>
<td>7</td>
</tr>
<tr>
<td>46</td>
<td>New-Tronics Corp</td>
<td>111</td>
</tr>
<tr>
<td>47</td>
<td>Olson Electronics Incorporated</td>
<td>102</td>
</tr>
<tr>
<td>48</td>
<td>Pace Communications Corp</td>
<td>106</td>
</tr>
<tr>
<td>49</td>
<td>Pearce-Simpson, Inc</td>
<td>26</td>
</tr>
<tr>
<td>50</td>
<td>Precise Electronics &amp; Development</td>
<td>111</td>
</tr>
<tr>
<td>51</td>
<td>Progressive &quot;Edu-Kits&quot; Inc</td>
<td>93</td>
</tr>
<tr>
<td>52</td>
<td>RCA Electronics Components and Devices</td>
<td>11</td>
</tr>
<tr>
<td>53</td>
<td>RCA Institutes, Inc</td>
<td>9</td>
</tr>
<tr>
<td>54</td>
<td>Radio Shack</td>
<td>34, 35, 36, 37</td>
</tr>
<tr>
<td>55</td>
<td>Regency Electronics, Inc</td>
<td>30</td>
</tr>
<tr>
<td>56</td>
<td>SSBCO</td>
<td>98</td>
</tr>
<tr>
<td>57</td>
<td>Scott, Inc., H.H.</td>
<td>108</td>
</tr>
<tr>
<td>58</td>
<td>Shure Brothers, Inc</td>
<td>14</td>
</tr>
<tr>
<td>59</td>
<td>Sonar Radio Corp</td>
<td>97</td>
</tr>
<tr>
<td>60</td>
<td>Sotanche Corp</td>
<td>94</td>
</tr>
<tr>
<td>61</td>
<td>Squires-Sanders, Inc</td>
<td>95</td>
</tr>
<tr>
<td>62</td>
<td>Telex/Acoustic Products</td>
<td>28</td>
</tr>
<tr>
<td>63</td>
<td>Texas Crystals</td>
<td>94</td>
</tr>
<tr>
<td>64</td>
<td>Turner Microphone Company, The</td>
<td>18</td>
</tr>
<tr>
<td>65</td>
<td>Valparaiso Technical Institute</td>
<td>104</td>
</tr>
<tr>
<td>66</td>
<td>Weller Electric Corp</td>
<td>105</td>
</tr>
<tr>
<td>67</td>
<td>Xcelite Inc</td>
<td>12</td>
</tr>
</tbody>
</table>

**CLASSIFIED ADVERTISING 113, 114, 115, 116, 117, 118**

---

"Good morning, dear. How did you like your eggs?"

11,740 kc.; Spanish to southern Latin America at 1830 on 9645 and 11,740 kc.; Eng. to U.S.A. at 1950.
French to Canada at 2010; Spanish to central Latin America at 1900 and at 1950 to northern Latin America, and Eng. to Europe. United Kingdom, and Ireland at 1000, all on 5985, 7250, and 9645 kc. (also on 11,740 for the last xmsn), and at 1315 on 6190, 7250 and 9645 kc.; French to France, Switzerland, Belgium, and Luxembourg at 0645 and 0930 on 7250, 9645, and 11,740 kc., and at 1415 on 6190, 7250, and 9645 kc.; Eng. to Australia and New Zealand at 0630 on 11,770 and 15,156 kc. and at 1700 on 7250 and 9630 kc.

**Venezuela**—To clarify the call-sign situation for Escuelas Radiofónicas, its YVPM on 2430 kc. and YVPN on 6110 kc. At press time, only the 6110-kc. outlet was in operation; an announcement will be made in due time if they decide to reopen 2430 kc.

**Windward Islands**—St. Georges, Grenada, is heard on 11,950 kc. around 1200; they seem to have stabilized on this channel. On 15,100 kc. the station is noted from 1446 to 1730 s/off with local news being given just prior to s/off.

**DISTRIBUTION** of electricity for the past 60 years has been almost entirely with alternating current. Prior to the adoption of Tesla's a.c., Thomas Edison had proclaimed that d.c. was the best method of electrical distribution. In what might appear to be a step backwards, the U. S. Air Force, Booneville Power Administration, and Geoscience, Inc., are experimenting with d.c. transmission lines. Tests with currents of 90 to 400 amperes over distances up to 240 miles are being conducted. An advantage of d.c. is that one-half the rated power of a line can be transmitted with one conductor out of service, allowing the current of the remaining conductor to return through the earth. As the ghost of Edison says "I told you so," tests must prove that no bad effects result from passing huge currents through the earth.
COMMERCIAL RATE: For firms or individuals offering commercial products or services. 75c per word (including name and address). Minimum order $7.50. Payment must accompany copy except when ads are placed by accredited advertising agencies. Frequency discount: 5% for 6 months; 10% for 12 months paid in advance.

READER RATE: For individuals with a personal item to buy or sell. 45c per word (including name and address). No Minimum! Payment must accompany copy.

FOR SALE

FREE GIANT BARGAIN CATALOG! silicon mesas, planars, duals, darlingsons, medium and high power transistors; integrated circuits; 250mw to 10W zeners, reference; top hit testers, epoxy, stock. Smaller control rectifiers, switches; prepacked "POLY Pak" $1 parts specials. Poly Packs, Inc. P.O. Box 942, Lynnfield, Mass.


CB WPE QSL Cards, Samples Free. Radio Press, Box 24, Pittstown, New Jersey.

"SPECIAL WPE-SWL-DB-QSL cards, 3 colors, $2.50 per 100-Free Samples, Garth, Jutland, New Jersey."

CANADIAN GIANT Surplus Background Packed Catalogs. Electronics, Hi-Fi, Shortwave, Amateur, Citizens Radio. Rush $1.00 (Refunded). ETCO, Dept Z, Box 741, Montreal, Canada.

TV CAMERAS, transmitters, converters, etc. Lowest factory prices. Catalog 10c. Vanguard, 190-48 99th Ave., Hollis, N.Y. 11423.

WEBBER Labs. Transistorized converter kit $5.00. Two models using car radio 30-50Mc or 100-200Mc, one Mc spread. Easily constructed. Webber, 40 Morris, Lynn, Mass.

JAPAN & Hong Kong Electronics Directory. Products, components, supplies. 50 firms-just $1.00. Ipanno Kaisha Ltd., Box 6266, Spokane, Washington 99207.


ELECTRONIC "GOODIES"—Bonanza surprise package, $1.00 p.p.d. Guaranteed satisfaction. DART ELECTRONICS, Box 214, Jericho, N.Y.

TRANSISTORIZED CONVERTER 26-200 MC. Receive signal from 26 to 200 MC (1 MC spread), on broadcast band using car radio, crystal control or tunable (1 MC spread). Kit $11.00 pp. Wired $20.00 pp. Webber Labs, 40 E Morris St., Lynn, Mass.

BUILD TV CAMERA Cheaper Than Ever! Send 10g for Details. ATV Research, Box 396, South Sioux City, Nebr. 68776.


GENERAL INFORMATION: First word in all ads set in bold caps at no extra charge. Additional words may be set in bold caps at 10c extra per word. All copy subject to publisher’s approval. Closing Date: 1st of the 2nd preceding month (for example, March issue closes January 1st). Send order and remittance to: Hal Cymes, POPULAR ELECTRONICS. One Park Avenue, New York, New York 10016.


INVESTIGATORS, FREE BROCHURE, LATEST SUBMINIATURE ELECTRONIC SURVEILLANCE EQUIPMENT. ACE ELECTRONICS, 11500-L NW 7TH AVE., MIAMI 50, FLA.

CITIZEN BANDERS! Get base station Performance with your mobile units. No modifications or soldering necessary. Proven performance. Send for free details or send ($15.00) to: T. Francis, 15 Park Row, N.Y. 38, N.Y.

NEW Supersensitive transistor locators detect buried gold, silver, coins. Kits, assembled models. $19.95 up. Free catalog. Relco-A33, Box 10563, Houston 21, Texas.

CONVERT any television to sensitive, big-screen oscilloscope. Only minor changes required. No electronic experience necessary. Illustrated plans. $2.00. Relco Industries, Box 10563, Houston 18, Texas.

AMAZING NEW electronic miracle transforms your TV room into a Stereophonic Theatre! Free details and Free Gift! Consolidated Acoustics, 1302C Washington, Hoboken, N.J.

110VAC 60Gy from car generator. Powers lights, refrigerator, transmitter, receiver, etc. Simple, easy to convert. Plans $2.00. Tedco, P.O. Box 12098, Houston, Texas 77017.

ACHTUNG! Das machine is not for Gerfingerpoken und mittendrangen. Is easy schnappen der Springenwerk, blowenfusen und poppencorken mit spitzensparken. 1st nicht fur gewerken by das Dummkopfen. Das rubber-naben sighseren keepen hands in das pockets. Relaxen und watch das Blinkenlights. This attractive, brass metal plaque only $2.00 each. p.p.d. Southwest Agents, Dept. P, 8331 Hwy. 80 West, Fort Worth, Texas 76116.

LASER: Hobbyists, experimenters, amateur scientists, Build your own coherent-light optical laser. Complete instructions, schematic diagrams and parts list. $6.00. Same as above, diode laser. $3.00. Technical Writers Group, Box 5501, State College Station, Raleigh, N.C.

WALKIE-TALKIE. Construct 2"x1"x1/2" transistorized, long range, 100 milliwatt marvel for $10. Plans, FREE GIFT, $2.00. Baker Electronics, R.R. 1, Greenacres, Ind.

REVERBERATOR (Echo) UNIT—Build your own. Complete plans, schematic parts list—$3.00. Use with automatic mobile radio, home radio, or record player. Y. B. Technical Writers Group, Box 5501, State College Station, Raleigh, N.C.

"GREAT BUYS" Catalog 10c, 12VDC 4PDT Sealed Relays, 20,000 OHMS per Volt multimeter new with test leads, battery, leather case $10.95, wire /4 ft. Fertik's, 9180 S. Chicago, Phila., Pa. 18140.

FLASHLIGHT AND RECHARGING UNIT. Plugs into flashlight and into 12 volt car cigarette lighter. Uses standard batteries. $5.50. Hall Electronics, 3950 E. Washington, Phoenix, Arizona.
QSL’s BROWNIE W3CJI 3111A Lehigh, Allentown, Pa. 18103. Samples 10¢ with catalogue 25¢.

- CONTROL TV AUDIO REMOTELY UNIT. Attach to speaker. $5.50. Hall Electronics, 3950 E. Washington, Phoenix, Ariz.

NEED RESISTORS? Factory fresh, NAME BRAND, ½ watt, 10% standard carbon resistors. Any regular value from 10 ohms to 2.2 megohms, $0.05 each. Postpaid. Any quantity assorted. Minimum order $1.00 TEPCO, Box 508, Tulaloma, Tenn.

HUGE excess inventory of new electronic components. $1.00 buys $10.00 worth of top quality resistors, capacitors, transistors, contactors, etc. Don't miss this fabulous bargain, send $1.00 per box to Baker Electronics, R.R. 1, Greencastle, Indiana, for prompt, postpaid delivery. Satisfaction guaranteed.

TRANSISTORS—Miniature Electronic Parts. Send for free Catalog. Electronic Design Control Company, P. O. Box 1432K, Plainfield, N.J.

DETECTIVES! Free brochures! Electronic intelligence devices for your needs and budget. SILMAR ELECTRONICS, 3476 N.W. 7th Street, Miami, Fla. 33125.

WJS ELECTRONICS, 1525 NORTH HUDSON, HOLLYWOOD FLA. WILLIAMSPORT, PA. Send $1.00 Bug Detector: WILL DETECT AND LOCATE SURREPTITIOUS TRANSMITTING DEVICES IN CONFERENCE ROOMS, HOME AND OFFICES, ETC. WRITE FOR DETAILS. WJS ELECTRONICS, 1525 NORTH HUDSON, HOLLYWOOD, CALIF. 90028.

PLANS ONE TUBE DX Shortwave kit (12,000 record) 24 page—$50¢. Experimenter’s catalog 25 exclusive items—$2.50, refundable. Laboratories, 1131-L Valota, Redwood City, Calif.

BARGAINS! Surplus telephone relays—capacitors—200 contact steppers. For prices—self addressed envelope to Howard Lawrence, Tuckahoe, New Jersey 08250.

DIAGRAMS—SENT AIRMAIL—TELEVISION $3.00 RA-8000, $2.00 GIVE MODEL. DIAGRAMS, BOX 55, WILLIAMSPORT, PA. 17704.

SAFEGUARD PRIVACY! New instrument detects electronic 'bugs', wire-tapping and snooping devices. Free information. Dee Equipment, Box 7263-E7, Houston 8, Texas.

COMPUTER MODULES: FLEX FLOPS $3.00, TWO GATES $1.75. EQUIPMENT FOR BUILDING DECIMAL COUNTERS AND COMPUTER CIRCUITS. DICTORAN, BOX 112, SOMERVILLE, MA. 02145.


QSL-CB-SWL—(LETTERS) Cards, Samples 10¢. MARTIN, 828 E. Schuykill Avenue, Reading, Penna.

NEW—PAPER TAPE READER—115VAC motor only $14.95. Applications include: computers, TEACHING MACHINES, household automation systems, digital logic experiments, games, toys. FREE instructions and accessories. Research Engineering, Essex Fells, N.J.


PHONE PATCH—A complete sealed-circuit module which provides a means for connecting your telephone lines to your two-way radio, tape recorder or amplifier. So small that it can be built into a telephone. $9.95 Pd. Info Free. Eastern Electronics, Dept. PE-8, 708 E. Tremont Ave., Bronx, N.Y. 10457.

TREASURE FINDERS. Transistorized professional model. Assembled $35.00. Inquire. Cab Electronics, Box 3071, Chula Vista, Calif.

FREE Catalog: Wholesale Electronics. Hundreds of items. ROYAL, Box 2591, Ei Cajon, Calif.


HIGHEST Quality Silicon Inverter Power Supplies, Multiple Outputs, any Voltages, Less Than $999.00, Hi-tech Instruments, P. O. Box 113, Cranbury, New Jersey.

SURPLUS SQUARE WAVE GENERATORS Complete $7.95 Without Case. Raimondi, Box 906, Palo Alto, Calif.


WANTED


MOVIE FILMS

REAR-ENGINE TAKES All—Watch JIM CLARK in his Lotus-Ford battle PARNELLI JONES, A. J. FOYT and MARIO ANDRETTI in the '65 INDY 500! Record-breaking qualifications (161 MPH) plus action packed racing shot by Professional Cameramen on 180', 8mm Eastman Color. $12.95 ppd (add 50¢ for Air Mail). No auto race film collection complete without this latest INDY "500" FILM. SPORTLITE "500" FILMS, 20-PE North Wacker Drive, Chicago, Ill. 60606.

HIGH FIDELITY

"LOW, Low quotes: all components and recorders. HiFi, Roslyn 9, Penna."

HI-FI Components, Tape Recorders, at guaranteed "We Will Not Be Undersold" prices. 15-day money-back guarantee. Two-year warranty. No Catalog. Quotations Free. High Fidelity Center, 1797 (P) 1st Avenue, New York, N.Y. 10028.

114

POPULAR ELECTRONICS
FREE! Send for money saving stereo catalog #P8 and lowest quotations on your individual component, tape recorder, or system requirements. Electronic Values, Inc., 200 W. 20th St., New York, N.Y. 10011.

HAM EQUIPMENT


ANTENNAS

FAMOUS Channel Master antennas now available in kits. Do it yourself and save! Also rotators, UHF Convertennas, indoor TV, FM antennas. Free Catalog "E"; Jefferson-King, South Fallsburg, N.Y. 12779.

TUBES


RADIO & T.V. Tubes—33¢ each. Send for free list, Cornell, 4213 University, San Diego, California 92105.

TUBES "Oldies", listed. Lists free. Steinmetz, 7519 Maplewood, Hammond, Indiana 46324.

TAPE AND RECORDERS

TAPE Recorders, Hi-Fi, components, Sleep Learning Equipment, tapes, Unusual Values Free Catalog. Dressner, 1523PE, Jericho Turnpike, New Hyde Park 11, N. Y.

BEFORE Renting Stereo Tapes try us. Postpaid both ways—no deposit—immediate delivery. Quality—Dependability—Service—Satisfaction—prevail here. If you've been dissatisfied in the past, your initial order will prove this is no idle boast. Free Catalog. Gold Coast Tape Library, Box 2262, Palm Village Station, Hialeah, Fla 33012.

RENT Stereo Tapes—over 2,500 different—all major labels—free brochure. Stereo-Party, 1616-PE Terrace Way, Santa Rosa, California.

TAPE-MATES MAKES AVAILABLE TO YOU—ALL 4-TRACK STEREO TAPES—ALL LABELS—POSTPAID TO YOUR DOOR—AT TREMENDOUS SAVINGS. FOR FREE BROCHURE WRITE TAPE-MATES CLUB, 5280- P. W. PICO BLVD., LOS ANGELES, CALIF. 90019.

STEREO TAPE. Save up to 60% (no membership fees). We discount records, batteries, accessories. We mail prerecorded tape, prepaid, anywhere that United States rates prevail. Free 60 page catalog. Saxitone, 1776 Columbia Road, Washington, D. C. 20009.

RENT 4-TRACK STEREO TAPES—Narrow it down, it has to be TRIMOR—Goodbye to partial satisfaction—Service and Dependability our keynote—ALL LABELS and TITLES—No Deposit—Postpaid both ways (48 states)—FREE BROCHURE and TAPE CATALOG. TRIMOR COMPANY, P. O. Box 748, Flushing, N. Y. 11352.

TAPE RECORDER SALE. Brand new, latest models, $10.00 above cost. Arkay Sales, 1028-C Commonwealth Ave., Boston, Mass. 02215.

August, 1965

REPAIRS AND SERVICES

TV Tuners rebuilt and aligned per manufacturers specification. Only $9.50. Any make UHF or VHF. We ship COD. Ninety day written guarantee. Ship complete with tubes or write for free mailing kit and dealer brochure.

JEFFERSON-KING, South Fallsburg, N.Y. 12779.


ELECTRONIC Kits Wired and Tested. Electronic Fabrications, 1717 N. Ft. Harrison St., Clearwater, Florida.


ELECTRICAL SUPPLIES

DC POWER Components, Transformers, Meters, Voltage Controls, Selenium and Silicon Rectifiers, 100 Amp, $39.00 Assemble your own Plater and Save! Send $1.00 (refundable) for Parts list and Simplified Schematics. H. B. S. Equipment Division 3, 3543 East 16th Street, Los Angeles, Calif. 90023

DO-IT-YOURSELF

ALLWAVE Radio Kit, 12,000 Mile Range. Tube, Transistor Included $3.00. Phones $2.00. Box 131, Temple City, Calif.
HYPNOTISM

FREE Hypnotism, Self-Hypnosis, Sleep Learning Catalog! Drawer H400, Ruidoso, New Mexico 88345.

HYPNOTIZE UNNOTICED! PATENTED new hand device makes you a Hypnotist first day or refund! Hypnotist's Handbook included! $2.00. Hypnosis Foundation, Box 487, La Mesa 9, California.

INSTRUCTION

LEARN While Asleep, hypnotize with your recorder, phonograph. Astonishing details, sensational catalog free! Sleep-Learning Association, Box 24-ZD, Olympia, Wash.

FCC License in 6 weeks, First Class Radio telephone. Results Guaranteed. Elkins Radio School, 2603B Inwood, Dallas, Texas.

HIGHLY-effective home study review for FCC commercial phone exams. Free literature! Cook's School of Electronics, Craigmont, Idaho 83523.

REI First Class Radio Telephone License in (5) weeks Guaranteed. Tuition $295.00. Job placement free. Radio Engineering Institute, 1336 Main Street, Sarasota, Fla.

ELECTRONICS—F.C.C. License Training—Correspondence, or resident classes. Free details. Write: Dept. 3, Grantham Schools, 1505 N. Western, Hollywood, Calif, 90027.


HEALTH, Success, Self-Culture Courses, Homestudy, Psychology, Metaphysics, Bible, Philosophy, Write, INSTITUTE OF METAPHYSICS, 1250 Indiana Street, Birmingham, Alabama 35224.

LEARN ELECTRICITY—200 experiments, $1.00, Cutfizz, 7 Valley View Road, Orinda, Calif. 94563.

ELECTRONIC courses. Industrial training programs now released to the public. Low tuition. Fundamental and advanced correspondence courses. Free information. Huntington Institute, division of Lantec, Box 2244A, Huntington Park, Calif.

40 SHAVES, 5 cents, instructions one dollar. No extras. Caldwell, 32 York Rd., Dundas, Ont., Canada.

DIGITAL COMPUTER MATH. A new, self-teaching course covering the mathematics of digital computers. $5.95 each paidpost. Technibooks, Inc., 209 Stonecrest Drive, De Witt, N.Y. 13241.

PICTORIAL Study in Amateur Radio. Free Details, Dwight Cross, 1212 Lynch, St. Louis, Mo. 63118.

INVENTIONS WANTED


INVENTORS! Don't sell your invention, patented or unpatented, until you receive our offer. Eagle Development Company, Dept. P, 79 Wall Street, N.Y. 5, N.Y.

INVENTORS. We will develop, help sell your idea or invention, patented or unpatented. Our national manufacturer clients are urgently seeking new items for outright cash sale or royalties. Financial assistance available, 10 years proven performance. For free information, write Dept. 41, Wall Street Invention Brokerage, 79 Wall Street, New York 5, N.Y.


EDUCATIONAL OPPORTUNITIES

FREE Education! Greater Success! Information Free! Cameo Enterprises, Carrolltown, Pa. 15722.

LEARN While Asleep. Remarkable, Scientific, 92% Effective. Details Free. ASR Foundation, Box 7021, Dept. e.g., Lexington, Kentucky.

IBM COMPUTER Programming. Home Study. UCI, POB 495, Freehold, N.J.

GOVERNMENT SURPLUS


"GOVERNMENT SELLS"—Surplus Electronics; Oscilloscopes; Transceivers; Test Equipment; Radar; Walkie-Talkies; Boats; Jeeps; Aircrafts; Misc.—Send For—"U.S. Dept Directory-Procedure"—$1.00—Service, Box 425 (ZE), Nanuet, N.Y.

GOVERNMENT Surplus. Complete Sales Directory $1.00. Surplus Publications, Box 45781E, Los Angeles 45, Calif.

BOOKS


AUTHORS' SERVICES

AUTHORS! Learn how to have your book published, promoted, distributed. FREE booklet "ZD," Vantage, 120 West 31 St., New York 1.

WANTED WRITERS! Short stories, articles, books, plays, poetry. Will help place, sell your work. Write today, free particulars! Literary Agent Mead, Dept. 37A, 915 Broadway, New York 10, N.Y.

HELP WANTED


REMAILING SERVICE


BOSTON, 25¢, Mokra, Box 211, Concord, Mass. 01742.

POPULAR ELECTRONICS
PATENTS


MAGAZINES

FASCINATING New Magazine For Book Collectors! Information Free, TBA, Webster 37, New York.

REAL ESTATE

FREE! SUMMER CATALOG. Thousands of new properties described, new photos too—Land, farms, homes, businesses.—Recreation, Retirement. 470 offices, 34 states coast to coast, “World’s Largest.” Mailed FREE! STROUT REALTY, 50-ZD East 42nd St., New York, N.Y. 10017

FLORIDA WATER WONDERLAND—Home, cottage Mobi-sites. Established area. $590 full price, $9.00 a month. Swimming, fishing, boating. Write: Lake Weir, Box KG38, Silver Springs, Fla. AD 6-1070 (F-1)

FREE Real Estate CATALOG! 152-page issue Over 1,700 pictures! Top values in 28 states coast to coast! Farms, Ranches, Homes, Businesses, Waterfront, Recreational, Retirement Properties. Our 40th year of dependable service. Over 100,000 sales! UNITED FARM AGENCY, 612-B West 47th St., Kansas City, Mo. 64112.

MUSIC


RECORDS

DISCOUNT Records, All Labels—Free List. Write Cliff House, Box 42-P, Utica, N.Y.

PLANS AND KITS


COINS


“S” MINT Lincolns! 25 different, $2.00. 30 different, $3.50. 35 different, $8.00 postpaid! John Finneran, 22166 North 6th St., Castro Valley, Calif.

STAMPS

500 FINE Mixed U.S. 15¢. Wright, Box 753-X, Hagerstown, Maryland.

August, 1965

MOVING?

ATTACH LABEL HERE

If you’ve recently changed your address or plan to in the near future, be sure to notify us at once. Affix address label showing old address here, and print new address below.

My New Address is:

name please print

address

city state

zip-code date at new address

Notify us of your address change as far in advance as possible—it takes about 2 months for a change to become effective. (Eg. A notice received in May becomes effective with the July issue.)

Mail to: POPULAR ELECTRONICS

1255 Portland Place, Boulder, Colorado 80311

HISTORY in The Making Issues! 65 different U.S. stamps, including Airmails, Special Delivery, Postage Dues, High Denominations, etc., some over 75 years old! Only 10¢ with approvals. Offer to adults only. Littleton Stamp Co., Littleton B12, N. H.

PHOTOGRAPHY—FILM, EQUIPMENT, SERVICES

MEDICAL Film—Adults Only—“Childbirth”—1 reel 8mm $7.50—16mm $14.95. International-E, Greenvale, L.I., New York.


PHOTOGRAPHS

PHOTOGRAPHS and transparencies wanted, to $500.00 each. Valuable information free—Write Intraphoto-PE, Box 74607, Hollywood 90004.

PERSONALS

INVESTIGATORS, FREE BROCHURE, LATEST SUBMINIA-TURE ELECTRONIC SURVEILLANCE EQUIPMENT. ACE ELECTRONICS, 11500-K NW 7TH AVE., MIAMI 50, FLA.

BUSINESS OPPORTUNITIES


VENDING Machines—No Selling. Operate a route of coin machines and earn amazing profits. 32-page catalog free. Parkway Machine Corporation, 715PE Esoor Street, Baltimore 2, Md.

ELECTROPLATING Equipment and supplies. All types for home workshops and industrial. Send $1.00 (refundable) for equipment guide, formulas, operating data, catalog. HBS Equipment Division 90, 3543 East 16th, Los Angeles, California. 90023.

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.

PIANO Tuning learned quickly at home. Tremendous field! Musical knowledge unnecessary. Information free. Empire School of Piano Tuning. Dept. PE, Box 327, Shenvood Station, Miami, Florida 33145. (Founded 1935.)

FREE BOOK: "Successful, little-known businesses." Work home! Plymouth-854H, Brooklyn 18, N.Y.

SELL CB EQUIPMENT—Dealerships available to aggressive people who can sell Citizens Band Radio full or part time. Knox Electronic, Dept 194, Galesburg, Ill. 61401.

PHOTOGRAPH accidents for Insurance Companies. $10.00 hour, spare time. Not a school. Free information. Underwriters ZDG, 7400 Pershing, St. Louis, Mo. 63130.

DISC-JOCKEY $20,000/year free details. Box 3364, Anaheim, Calif.

CITIZENS BAND DEALERS. If you sell CB equipment, or plan to do so, you should be on our mailing list. We have just the items you need to make your business more profitable. Write today on your business letterhead for complete information. ELECTRO SALES, Box 1046, Dun-can, Oklahoma 73553.

ATTENTION CLASSIFIED ADVERTISERS. 175,000 Active, Eager Electronics Hobbyists—who bought and thoroughly enjoyed the SPRING 1965 ELECTRONIC EXPERIMENTER'S HANDBOOK. If your Classified Advertising appeared in the Spring Edition you should receive even better response in the Fall Edition; but if your ad is not presently scheduled for this great Handbook, don't miss out—Act At Once! FALL 1965 ELECTRONIC EXPERIMENTER'S HANDBOOK—75¢ Word. CLOSING DATE: August 13, 1965, ON SALE DATE: September 30, 1965. Send Order and Payment Today to: Hal Cymes, Classified Advertising Manager, Electronic Experimenter's Handbook, One Park Avenue, New York, New York 10016.

EMPLOYMENT INFORMATION


EMPLOYMENT Resumes. Get a better job & earn more! Send only $2.00 for expert, complete Resume Writing Instructions. J. Ross, 80-34 Kent St., Jamaica 32, N.Y., Dept. PE.

CALIFORNIA employment. Names and addresses of 500 Southern California electronics firms $3. Air Mail $4. Spindler, P. O. Box 103, Canoga Park, Calif. 91305.

RESUMES, Reports, Information, Advice! Our readers are keenly interested in learning about the services YOU offer in the Employment Information field. Reach over 400,000 alert readers each month by advertising here for just 75¢ per word.

PRINTED IN U.S.A.

CLUBS

KIT OF THE MONTH CLUB, Novel, new projects each month. Low cost. Free Information, Leader Enterprises, Box 44718KA, Los Angeles, Calif. 90044.

MISCELLANEOUS

HYPNOTIZE secretly, cleverly, one glance . . . or money-back. $2. Elton's, Box 18223-PE2, Indianapolis, Indiana, 46218.

BEERS, PEACH BRANDY, WINES—Strongest Formulas, $2.00. (Complete beer, wine, spirits supplies—hydrometers catalog 10¢)—Research Enterprises, 29-D Samoset Rd., Woburn, Mass.


STAMMER—Stutter—No More. (Dr. Young). Write: Gaucho, Box 9309-E6, Chicago 90,


FOREIGN CAR SEAT COVERS. Prices, Samples: 25¢. Box 385, Arvada, Colorado 80002.


ANNOUNCING FOR CLASSIFIED ADVERTISERS—ANOTHER EXCLUSIVE THE 1966 TAPE RECORDER ANNUAL Here's your chance to place a low cost Classified Ad in the ONLY complete Buyer's Guide available in the tape recording field. This outstanding publication gives the tape enthusiast ALL the information he needs . . . information such as: How to Record . . . How to Record Better . . . How to Buy . . . What to Buy! If your product or service falls into the field of Tape Recording, the 1966 TAPE RECORDER ANNUAL is a natural medium for your Classified Advertising. Remember, exposure for a full year to 150,000 prime buyers guarantees superior results.

RATE PER WORD: 50¢ ($5.00 Minimum) CLOSING: Sept. 1, 1965 ON SALE: October 21, 1965 To Reserve Space, Send Your Advertising Copy and Payment Today to: Hal Cymes, Classified Advertising Manager TAPE RECORDER ANNUAL One Park Avenue New York, New York 10016

CLASSIFIED ADVERTISERS ARE INVITED . . . to join in another Publishing First—the 1966 ELECTRONICS INSTALLATION & SERVICING HANDBOOK. Here, in the pages of this unique and complete servicing manual, Electronics Servicemen will find information available to them nowhere else. This means the Handbook will be a constant source of reference—it will be kept and consulted endlessly. Isn't this a natural place for your Classified Ad? Is it if you offer for sale by mail today any of the multitude of products and services needed by today's Serviceman? RATE: 50¢ per word (Minimum $5.00) CLOSING: Aug. 31, 1965 ON SALE: October 21, 1965 DISTRIBUTION: 150,000 To Be Certain of Space, Send Your Ad Copy and Payment Now! Hal Cymes, Classified Advertising Manager ELECTRONICS INSTALLATION & SERVICING HANDBOOK One Park Avenue New York, New York 10016

POPULAR ELECTRONICS
“MESSENGER III”
11-channels — use it mobile, base station, portable or for public address! Compact, delivers a husky signal... extreme sensitivity, razor-sharp selectivity! 12 Volts DC — accessory 115 VAC power supply available.

$189.95 NET

MESSENGER TWO
Ten channels and tuneable receiver. Excellent receiver sensitivity and selectivity — delivers a solid, penetrating signal! 115 Volts AC and either 6 or 12 Volts DC.

$169.95 NET

E. F. JOHNSON COMPANY
2478 10TH AVE. S.W. • WASECA, MINNESOTA
Please rush me complete information on Johnson “Messenger” Citizens Radio Equipment

Name
Address
City State

JOHNSON... Rated Best by Distributor Salesmen in National Survey
THE **BIG** DIFFERENCE IN CB UNITS...
High Circuit Efficiency!

Best Dollar Value!

Wide Line!

PLUS Unmatched Reliability!

...is the QUALITY, PERFORMANCE AND DEPENDABILITY OF JOHNSON "MESSENGERS"!

Compare them feature-for-feature with other units at any price — or talk to a present Johnson owner!

"PERSONAL MESSENGERS"

100 milliwatt and 1½ watt hand-held units. Twice the sensitivity and 40% more range than similar units with conventional circuitry!

100 Milliwatts
$109.50
NET

1½ Watts
$129.50
NET

MESSENGER

One of the biggest sellers in the Citizens Band field! Five crystal-controlled channels—long on performance, short on cost! For 115 Volts AC and either 6 or 12 Volts DC.

$114.95
NET

TONE ALERT

SELECTIVE CALLING SYSTEM

• Dramatically extends contact range!
• Provides silent "stand by" operation!

"Tone Alert" keeps your system quiet until one unit calls another. Receivers operate at maximum sensitivity.

WRITE TODAY for details!
See your Dealer / Distributor for demonstration

CIRCLE NO. 11 ON READER SERVICE PAGE
New Low Cost! E-V SONOCASTER™
Indoor/Outdoor
High Fidelity Speaker
Just $25.00!

Electro-Voice slashes the cost of outdoor fun with the new Sonocaster I. Full-Sized sound, yet so small and light it goes anywhere — plays anything: AM, FM, TV sound, tape or records!

Use the Sonocaster I at your next outdoor party, or year-round in your recreation room. Place it anywhere, or hang it from its wall bracket, as you wish.

The Sonocaster I boasts such true component-quality features as an 8" Radax dual-cone speaker, high compliance cone suspension, long-throw voice coil and acoustically damped enclosure.

The Sonocaster is completely weatherproof—even the finish. No rusting, peeling, or cracking—and the attractive Steel Gray color is molded into the unbreakable plastic housing forever!

Add the new Sonocaster I to your outdoor living. Or choose the original Sonocaster, now improved with a heavier 8" speaker for extended range. $36.00. Pick up a Sonocaster (or a pair for stereo) at your E-V hi-fi showroom today!

SPECIFICATIONS Sonocaster:
70-15,000 cps Frequency Response;
8 Ohms Impedance; 30 Watts Peak Power Handling; 100° Dispersion;
16-3/4" H x 17" W x 5-7/8" D; Net Weight 7 lbs.; Dune Beige color.

Sonocaster I: Identical except 70-
13,000 cps Frequency Response; Net Weight 6-3/4 lbs.; Steel Gray color.

Prices include all applicable Federal taxes.

ELECTRO-VOICE, INC.
Dept. 854P, 630 Cecil Street
Buchanan, Michigan 49107

CIRCLE NO. 9 ON READER SERVICE PAGE