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Great for home or workshop! Pin jacks for all 5 ranges; 2-color 1¾" meter scale. DC Current 0-150 ma. Resistance: 0-100,000 ohms. Accuracy is ±3% of full scale value on DC ranges, ±4% of full scale on AC ranges. A rugged black bakelite case. Comes with pair of color-coded test leads, instructions, battery.

22-4027, Ship. Wt. 1 lb. Net 3.95

30,000 Ω/V 26-RANGE MULTITESTER

16.95 Factory Wired

- 30,000 Ohms/VDC!
- 15,000 Ohms/VAC!
- Single Knob Selector!
- Easy-to-Read Meter!

Makes easy work of the big jobs with precision 1% resistors and recessed zero ohm adjustment! DC volts: 0-0.6/3/15/60/300/600/1200/3000; AC volts: 0-6/30/120/600/1200. Resistance: R x 1/100/1000/10,000. Current (ma): 0-0.05/60/600. -2 to +63db in 5 ranges. With leads, instructions, battery.

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50,000 OHMS/VOLT MULTITESTER

27.95 Factory Wired

- 4" Full View Meter with Mirrored Scale!
- Meter Protection Circuit!
- 1% Precision Resistors!
- 26-Ranges!

Only 7 x 5½ x 5½¼!

Great for technicians, mechanics and hobbyists. Spec’s: DC volts: 0-0.5-2.5-10-50-250-500-1000V @ 50,000 0/volts. AC volts: 0-2.5-10-50-250-1000V @ 12,500 0/volts. DC current: 0-25ma-2.5ma-250ma-1 amp-10 amps. DC Resistance: 0-10,000/100,000/1 meg./10 meg-ohms. Center scale: 90/900/9000/900,000 ohms. Decibels: -20 to +62 (5 Ranges).

22-4050, Ship. Wt. 5½ lbs. Net 27.95

For Store Addresses, Order Form, See Page 20.

- Precision Resistors!
- Measures Peak-to-Peak and RMS (7 Ranges on Each Function)!
- Frequency Response: 30 cps to 10 mcl!

Features a zero-center scale for alignment of FM-TV detector circuits. Spec’s: AC volts: RMS 0.1 to 1500 V. (7 ranges); DC volts: 0.1 to 1500 V. (7 ranges). Peak-to-peak 4-4000 V. (7 ranges). Output -20 db to +65 db (7 ranges). Resistance: 0.2 to 1000 meg-ohms (7 ranges). Tubes: 12AU7, 6AC5 and SR1A. Power: 117 VAC, 50/60 cycles.

22-049, Ship. Wt. 7 lbs. Net 39.95

For Store Addresses, Order Form, See Page 20.

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Integrated Circuit Specials!

Actual Size 198 • Ideal for the Hobbyist, Builder, Experimenter! Up • Fantastic Savings!

New from Radio Shack! Resistor-Transistor Logic type ICs are ideal for builders, hobbyists, labs, industry, etc. Guaranteed to be 100% perfect electronically and mechanically. Each comes complete with diagram and lead locations. Power requirements: 3 volts. Flat Pak type. Size 1/4 x 1/16.

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DUAL JK FLIP-FLOP. Construct your own binary computers, digital adding machines, etc. Contains up to 8 transistors and 32 resistors per pak. 276-431. Wt. 3 oz. Net 2.29

For store addresses, Order Form, see Page 20

August-September, 1968

198 Pak of 50

NEW! Twin-Pak
Transistor Kit

198 • 25 NPN • 25 PNP
• Silicon & Planars Included

A sensational value! Full-length leads; ideal for RF applications, switching and general-purpose audio use. Silicon and planar types included to provide replacements for many popular numbers without circuit change. Think of it—less than 4c per transistor! 276-616. Wt. 2 lbs. Net 1.98

100-Pc. Jumbo Pak
Assorted Transistors

398

Includes
Germanium & Silicon

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Silicon Field-Effect Transistors

198

• High Impedance Input
• Low Noise! High Gain!
• Characteristics Similar to Pentode Vacuum Tubes

1000's of applications where pentode tubes are used in low, level circuits; field strength meters; 'gate dippers'; receivers, floa power transmitters, etc. TO-5 case. Includes specifications. 276-644. 50. Wt. 2 oz. Net 1.98

Hard-to-Find IBM
Component Boards

8 For

100

All quality American made parts. Each board contains at least two transistors, plus loads of other components: resistors, capacitors, coils, diodes, modules, chokes, and heat sinks. Size 2 3/4 x 3 1/2. 276-617. 8 for 1.00

—-
PHOTO-ELECTRIC RELAY SYSTEM

- Ready to Operate — Not a Kit!
- Complete with Exciter Lamp and Photo-Cell Receiver!
- Effective Range: up to 50 Feet!
- Each Unit Is Separately Powered!

ONLY $19.95

The ideal multi-purpose photo-relay for business, retail store, home or warehouse use! System consists of an exciter lamp and photo-cell receiver, each housed in a rugged metal case. Both plug into standard 117 VAC house current. The system can be used (with bell or buzzer) to signal when someone enters a room and "breaks" the beam; to count people or objects; or to trigger an alarm to deter intruders. A variable sensitivity control adjusts for ambient light level, or can be used to inactivate the system temporarily. Each unit is 5 1/2 x 4 x 2 1/4". 275-489, Sh. wt. 6 lbs. ...... Net $19.95

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- 50% Longer Life! • Higher Lumen Output! • Higher MNO Content! • Steel Encased with Anti-Corrosive Caps!

Radio Shack's new 50% Extra Life cells yield fresher, longer life without sacrificing "shelf life" or adding weight. Ideal for radios, recorders, flashlights, etc. Designed to exceed U.S. Government standards! Buy 'em by the box — save more!

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AMAZING HOME BATTERY CHARGER $4.95

Don't Discard Your "Dead" Batteries! Accepts All These Types:

- 1 1/2" "AA" Cells • "D" and "C" Cells
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Count the number of batteries you use around the house right now — then count how much you'd save by recharging them over and over again. End replacement costs! Get the handy battery charger that plugs into any 117 VAC house outlet and recharges batteries overnight! Accepts up to 4 batteries at a time. Cannot overcharge or burn out. Start saving money today! 270-1526, Sh. wt. 1 1/2 lbs. .................................................. Net $4.95
20 Power Resistors
Package consists of high-quality vitreous, cand-ohm and wire-wound types. Includes 5 to 25-watt power resistors; individual catalog net — $10!
271-1202, 2 lbs...... Net 1.00

35 Precision 1% Resistors
Large assortment of popular 1/2, 1 and 2-watt values; includes encapsulated, including NPO’s, carbon film, etc. Made by Aerovox, Shellcross, IRC, and other famous names.
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50 Tubular Capacitors
An assortment of quality tubular capacitors, 100 mmf to 1 mf to 600 WVDC. Includes molded, paper and porcelain types. $10 if purchased individually from catalog!
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Slug tuned, made for printed circuitry types, shielded. Size: 3/8 x 3/8 x 1/2”.
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40 Coils and Chokes
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8 Volume Controls
Most Popular Values
Contains 8 assorted values including long and short shaft types. A tremendous bargain for servicemen!
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Special! 50 Capacitors
Assortment of many types including disc, ceramic, mylar, temperature coefficients, molded, paper, oil, Vic-Q. You save $9 over industrial net catalog prices!
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50 Ceramic Capacitors
Wide variety of popular values by Centralab and other famous-name makers. 10 mmf to .04 mf to KV. Assortment includes tubulars, discs, NPO’s, temp. coefficients, etc.
272-1566, 1 lb. ..... Net 1.00

40 Terminal Strips
You get a wide variety of screw and solder lug type terminal strips with 1 to 6 lugs. Outstanding value at this low price! 101 uses for the builder and experimenter.
274-1555, 1 lb. ..... Net 1.00

150' of Hook-Up Wire
Assortment consists of 6 V rolls of 25' each of solid and stranded wire. #18 through #22. Necessary for multitude of jobs and always useful!
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40 Disc Type Capacitors
A varied assortment of types, including NPO’s, Hi-Q, N-750’s, mylar and ceramic. 10 mmf to .01 mf to 6 KV. A $10 catalog net value!
272-1547, 1/4 lb. ..... Net 1.00

40 One-Watt Resistors
Here are resistors for hundreds of uses! Assortment has Allen Bradley and IRC carbon, with 5% values included. This pack is a regular $8.00 catalog net!
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4 Transistor Transformers
Made by UTC and Remington Rand. Famous miniatures. Includes sub- pouncer, mike, input types. Color coded leads.
273-1581, 1 lb. ..... Net 1.00

50 Plugs and Sockets
Ideal bench assortment for servicemen, hams, etc. Subminiature and printed circuit types included! This assortment saves you $10 over individual catalog prices!
274-1562, 1 lb. ..... Net 1.00

30 2-Watt Resitors
These quality 2-watt resistors are non-inductive, magnetic film, carbon types. Many with 5% values. Made by famous-name manufacturers.
271-1211, 1/2 lb. ..... Net 1.00

For Store Addresses, Order Form, See Page 20
AUGUST-SEPTEMBER, 1968
RADIO SHACK EXCLUSIVE! ADD A SLAVE "WALKIE" TO YOUR BASE, MOBILE, OR WALKIE TALKIES!

Actual Size!

Crystal-controlled superhet receiver ONLY! Add as many ears to your network as you want. Fits in a shirt pocket — an excellent paging or guided tour device!

This unusual Radio Shack product, called the Realistic Microsonic 27MC Receiver, comes complete with a Ch. 11 CB crystal — and because it's a plug-in, it can be changed to any of the 23 channels. It's a teeny 3½ x 2½ x 1¾". It includes an earphone with clip, and the phone's lead acts as the antenna. So if you want to hide it away as a pager, there's nothing showing. For DX we've included a 16" telescopic whip to be used only if necessary. Let your imagination run wild with this novel device!

21-109 Microsonic 27MC Receiver ........................ Only 7.95

NEW IDEA #2 — as a companion to the above, or a wireless CB microphone (1), there's also the Realistic Microsonic CB transmitter. Same size, color, everything. But transmit only, 100mw of course, with plug-in crystal for Ch. 11. Uses? For example: one of these plus x-number of receivers and you have a guided tour technique that'll never quit!

21-110 Microsonic CB Transmitter ........................ Only 7.95

FREE ACCESSORIES:
- Receiver — earphone and whip antenna
- Transmitter — 35" telescopic antenna

Note: both units include crystals but require a 9V transistor battery to operate. 23-464, 29¢ each.

100 MW TRANSMITTER AND REMOTE CONTROL

399 Perfect as a CW Transmitter or Wireless Mike!

Range to ¼ mile, uses plug-in crystal (not supplied). Get yours now at Radio Shack's low price!

21-1166, Sh. wt. ½ lb. ..................................... Net 3.99

MINIATURE 6V SYNCHROS

For All Remote Control Applications

444 Ideal for:
- Amateur & CB Beam Antennas
- Weathervanes and Other Indicating Uses
- Radio Transmitters, Tripod Mounts

Pair Used originally in aircraft. Equipment. Compact, ruggedly built. Operate on 26 VAC @ 400 cycles. Guaranteed to operate efficiently at 6 VAC @ 50 cycles. With wiring diagram. Size 1¾ x 1¾"; shaft ½ x ¾".

273-206, Ship. wt. 1 lb. ..................................... Pair 4.44
273-050, 6.3 VAC Transformers ........................ Net 1.19

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Now Everyone Can Own a Second Telephone!

Standard Desk Telephone
Ready to Install 895

Enjoy the extra convenience of an extra phone! Our most popular style; it's modern, low-cost, and easy to install. Each phone is factory reconditioned to give trouble-free service. Bakelite body and handset; metal base. Dial, bell, and coil included. (Note: use of telephone equipment not installed by a telephone company may be subject to local tariff.)

279-371, Sh. wt. 10 lbs. Net 8.95

For Private Phone and Intercom Systems.

- Save Time!
- Save Steps!
- Save Money!

30 Ft. Telephone Extension Cord
Move your phone from room to room! Highest-quality 4-conductor flexible cord plus standard telephone jack and plug. Ideal for intercom. Use 2 or more for extra length.
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Ideal for making extensions, these plugs and jacks each weigh approximately 1/4 pound.
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Stretches up to six feet. 3-conductor.
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Four conductor extends up to fifteen feet.
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Shoulder Rest
Frees both hands! Spring mechanism enables arm to be folded out of sight when not in use. Easy to attach to any phone. Long lasting metal construction. Manufactured in the United States.
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Telephone Wall Jack
For 2, 3, 4-wire systems. Fits standard wall conduit boxes. 1 lb.
279-1597 Net 1.99

Carbon Type Handset
For Mobile and Replacement Use!
Great for use with mobiles & intercoms, or as outdoor mike for camps and construction sites. Withstands extreme temperatures. High output mike can be used with low gain circuits. Adapt to your CB transceiver or radio. Includes earpiece and 3-conductor cord.
279-1351, Sh. wt. 1 lb. Net 2.99

Sound-Powered Elements
Kit of two! Talk without electricity - your voice powers these devices. Hook them up and talk up to 300 feet. Shipping weight: 1/2 pound.
279-1353 Net .99

100 Ft. 3-Conductor Telephone Wire
Multi-use 100' 3-conductor wire for telephone work. Ideal for linking temporary phones for field uses.
278-370, Sh. wt. 2 lbs. Net 3.49

Handset Hanger
Hang up your phone without cutting off party on other end. Ideal for wall telephones. Anodized black aluminum.
279-1528, Sh. wt. 3/4 lb. Net 1.25

Telephone Dials
Standard Western Electric unit. Can be used with automatic control circuits, & electronic combination lock circuits.
279-359, Sh. wt. 1/4 lbs. Net 2.99

Store Addresses, Order Form, See Page 20

AUGUST-SEPTEMBER, 1968

www.americanradiohistory.com
Man, oh, man—talk about winners, we've got one in the new 1968 CB BUYER'S GUIDE, now on your newsstand. It's our third edition and our best. Yep, the Editors of RADIO-TV EXPERIMENTER had a finger in the preparation of this fine CB annual, and we'd like all our readers to thumb through a copy at their favorite newsstand. Why not! We're sure you'll depart with the mag in your clutches—after you have paid for it!

To make this CB mag really great, we started with the cover and went wild from there on in. For example, take a look at pretty Pamela putting out plenty of flower power with an E. F. Johnson 323 CB rig and portable power pack. (The bikini isn't much to look at, but that's the way it should be!)

You may see Pamela on the beach this summer with her CB rig. If you do, take a snapshot of her and send it to me. Be sure to identify the CB gear in the photo and identify the lass if she

This is she—Pamela, the cover girl on the 1968 CB BUYER'S GUIDE. If you want to see Pam in full color, get a copy today!

**how often could you have used...**

**a Seizer?**

Handy as an
extra hand or helper.
Clamps lightly or tightly...
for moments or minutes.


4 MODELS: 6" (serrated jaws) Nos. 42H straight and 43H curved nose; 5" Jr. (smooth, slim jaws) Nos. 32H straight and 33H curved nose.

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August-September, 1968
I Got The Fever. Editors like to talk to editors from other magazines, and last Friday found me chatting with Joe Gutts of SCIENCE & MECHANICS magazine. Joe's their Auto Editor and a monster of a man, so when he started to criticize my magazine, I listened. Joe complained about our Lab Checks. In his own words, "All youse guys report on is electronic junk filled with wires. What gives with the nice things in life—like wheels, man?"

Well, Joe had more than a point on his head this time. We're all consumers and we're all interested in consumer products. Therefore, I'm going to make it a practice to report on non-electronic consumer products in this column that I have a chance to test. Whenever a non-electronic item comes along that I think you'd like to hear about, you'll find news of it here—as long as I can use the item long enough to become acquainted with it and make some meaningful comments.

To get the ball rolling, I would like to report on the 1968 Dodge Hemi-Charger Joe Gutts loaned me for the weekend. Joe mentioned something about a 425-horsepower engine, but I figured he was giving me the mileage (no car has that much power!) So off, I go with this 4-speed, stick-shift, bright-red thunderstick through New York City streets. I had trouble with the shift only because I am shiftless in my habits—I kept the Charger in second all the way home. Believe it or not, the tach never entered the red zone even when I was doing 60 (New York City cops do not read!)

Once home I practiced shifting for 15 minutes and was able to drag with the best. It all comes back quickly if you learned to drive on a shift car. Now, off to a weekend of fun with the

POSITIVE FEEDBACK

happens to look like your favorite playmate. Do this and we may publish your snap this winter when the frost is on the pumpkin. In fact, we may even send you a little something or other in the event we publish the photo. Please—we cannot return photos, so send us an extra copy only. And while you’re waiting for the snap to be published, spend the days reading the 1968 CB BUYERS’ GUIDE—or looking at Pam.

Next Fall. Gravity is the most taken-for-granted force on earth. The youngest child soon learns that if he trips, he will fall, and he eventually begins to take precautions. As the child grows up he eventually learns that all material objects fall toward each other simply because they are material.

Scientists have been explaining why things fall for a long time. Isaac Newton gave one explanation that satisfied thinkers for more than 200 years. Difficulties with some of Newton’s predictions led Albert Einstein to formulate a new theory in 1916. One of the unexpected things about this new theory—as Einstein pointed out—was that it predicted that bodies could exchange energy with each other by means of gravitational waves in a manner similar to electromagnetic waves such as light and radio.

But nobody has yet seen a gravitational wave. And it has only been a short while that anyone has been steadily looking. Most physicists believed that gravity waves could not be detected, and so far only two small groups have been willing to expend the effort to hunt for them. Such waves are extremely difficult to find because gravitational forces are very weak. Gravity maintains the stars and planets in their courses, but the large forces involved result from the huge masses of the bodies concerned. Given comparable charges, gravitational forces are a hundred billion billion billion billion times weaker than electromagnetic forces.

Only in the last eight years have a few physicists been willing to develop the fantastically precise technology required for even a hope of detecting gravitational waves. The first to begin was a group led by Prof. Joseph Weber of the

(Continued on page 111)
Here's a new, complete ICS course in TV Servicing that costs less than $100.

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

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

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

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

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

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

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

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

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

August-September, 1968
BOOKMARK
BY BOOKWORM

Wanna Be a Ham? There’s no doubt that the new FCC/ARRL incentive licensing will mean many changes in the hobby of amateur radio. What these changes are is discussed in the new fourth edition of So You Want to Be a Ham, by Robert Hertzberg, W2DJJ. Everything the would-be radio amateur needs or wants to know about the hobby of amateur radio is contained in this old favorite. It’s a must for those going for their ham ticket.

Chapters are devoted to the code, kits, the receiver, getting the ticket, going on the air, the antenna, going mobile, how to be a good operator, test equipment and safety measures, the organization of amateur radio, electronics as a career, the ham in military service, and the radio market place.

The book contains profuse illustrations and descriptions of modern equipment to aid the reader in making a selection. It also describes operating procedures, and gives helpful guidance on passing the FCC exam.

Copies of So You Want to Be a Ham are available from electronics parts distributors and bookstores throughout the country, or direct from the publisher Howard W. Sams & Co., Inc., 4300 West 62nd Street, Indianapolis, Indiana 46268.

Switch Craft! The simple, but talented switch—the Silicon Controlled Rectifier—has quickly assumed a top position among highpower devices employed for rectifying, switching, and regulation. Heavy industry, transportation, construction, aerospace, communication—these are areas where the SCR is now used, and will be used in constantly increasing number. It is essential that today’s
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A selection of products available by mail for readers of Radio-TV Experimenter. All merchandise sold on a money-back guarantee. Order Direct by Stock No. Send check or M.O.

23 ELECTRONIC PROJECTS in 1 KIT
New easily build 23 fascinating electronic projects that really work including transistor radio receivers, phone-amplifier, electronic organ, burglar alarm. Complete, foolproof individual template for each model, list of new parts to be used. Pegboard assembly. Fully illustrated step by step procedures. No soldering or tools required. Put it together - work it - take it apart quickly and easily, absolutely safe — uses inexpensive 6-V battery. Great fun — educational too. Stock STARTER Kit parts for 23 Projects)

70,007 HP $79.95 FAS-COMP
70,006 HP 10" 13 1/2" 34.25 F.S.
70,004 HP 6" 1" 12.95 F.S.
70,003 HP Stock No. instrument valued from mirror and mounted for powerful viewing. You can make it yourself for powerful viewing.

TOP-QUALITY LOW-COST STROBE
Create spectacular psychological lighting effects with this genuine electronic strobe. Terrific for parties, special effects, experiments, illustrating transitions from 1 to 10 seconds. Switches per second — up to a make-shift strobe. Tension friends with old-time movie effects. Best party novelties ever! Strobe action and "strobe" your guests. Practical too-check section of modern mystery/monster movies. Xenon lamp gives one million flashes. 6/8" diameter, reflector. Uses regular 110 volt A.C. current. Handsome solid walnut cabinet, 9 1/8" x 6 1/8" x 7". Send for Bulletin 275, description other startlingly new unique lighting effects. Stock No. 70,389 HP $79.95 F.S.

FLY 9-FT. HOT AIR BALLOON
9 ft. tall. Rises to amazing heights on hot air supplied. Supplied with tethered, so can be used over and over. Easy to make, launch, fly. Loads of fun. Great for celebrations, science fairs, picnic fun. Will lift model gliders, parachutes, airplanes, instruments, etc. anything up to 4 lb. Approx. 5 ft. diam. when fully inflated. Kit contains 10 pre-cut red & white gosses. (No. 1 model paper), 6 ft. 14-gage wire for bottom ring. Cuts "off" cord, complete instructions. Stock No. 60,691 HP $7.00 F.S.

WORKING MODEL DIGITAL COMPUTER

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

LONG-WAVE BLACK LIGHT FIXTURE
Extremely versatile, compactly designed, long wave (3,200-4,000 angstroms) black light (ultraviolet) fixture. Has A.C., 110-V lamp with built-in filter—eliminates harmful ultraviolet. One size fits all — wave ultraviolet rays. Use for smells, fungi, bacteria—clean for surface scours, oil and gas spills. New tricks for displays with fluorescent poster paints, chalk, crayons, tissue paper, etc. Uses 100's of charts, illustrations. Many hard-to-get surplus bargains! Enormous variety of telescopes, microscopes, binoculars, magnets, magnifying lenses, photo components, etc. For hobbyists, experimenters, workshops, factories. Shop by mail. No salesman will call. Simply check coupon or write for Catalog "HP" to Edmund Scientific Co., Barrington, N.J. 08007.

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1968 EDITION

www.americanradiohistory.com
technicians and engineers become familiar with this important device via a concise treatment of the SCR—*Understanding Silicon Controlled Rectifiers*, by Saul Heller.

This fully illustrated guide introduces the reader to the SCR, familiarizes him with its theory of operation, acquaints him with the circuits in which it has been used, and provides a practical understanding of this solid-state device. Beginning with a review of semiconductor fundamentals, the text goes on to present a detailed run-down on how the SCR is constructed, how it operates, and what its capabilities are. Triggering circuits associated with the various SCRs are also covered.

The book considers each member of the SCR family individually. It describes their characteristics and applications as static switches, phase-control switches, inverters, choppers, and cyclo converters. Focusing on the problem of selecting the proper SCR for a given task, the book discusses a number of factors that influence SCR performance.

Author Saul Heller brings to this book his considerable experience as writer, editor, teacher and technician. He has written three other books and over 200 articles in the electronics field. To get your copy of *Understanding Silicon Controlled Rectifiers*, write directly to Hayden Book Company, Inc., 116 West 14th Street, New York, N. Y. 10011.

**Lot of Light.** To the non-scientific mind, all things dealing with lasers seem utterly beyond comprehension. For these readers a new, simple and clear book opens up the fascinating world of lasers. This volume, called *Atomic Light: Lasers*, by Richard B. Nehrich, Jr., Glenn I. Voran and Norman F. Dessel, is written in everyday language and terms and uses a multitude of pictures to help reveal the facts about the startling laser beam, the most powerful light ever dreamed possible. For the laser is simply a beam created from coherent light waves locked in step instead of the ordinary dispersed or incoherent waves. The increase in power is tremendous.

The authors, all from San Diego, California, who have themselves been involved in research and invention of the gas laser, show how some lasers can break through the strongest substances known to man, yet other lasers can be used to transmit 3-dimensional pictures or destroy a single chromosome in a human cell! Six short years ago, the laser was discovered. Today, after much experimentation, progress in atomic light has been so stupendous that one can easily see many applications in everyday life.

This book gives you an insight into what lies ahead with this new type of coherent light in the fields of medicine, communication, optics, travel, business and industry. If you can't resist peeking into a crystal ball (and who can?), this is a rare opportunity to see your future! If your local bookstore doesn't have a copy, write to Sterling Publishing Co., Inc., 419 Park Avenue South, New York, N. Y. 10016.

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**Mr. RCA!** "I have in mind a plan..." These words written in 1915 signalled the beginning of a lifetime of prophecy by a man who has exercised a great influence over modern day living.

The writer was David Sarnoff and his plan was a "Radio Music Box" to bring news and music into the home by wireless. Over the next fifty-three years, Sarnoff first dreamed and then fulfilled. As the head of the world's foremost electronics company, the Radio Corporation of America, he became the driving force behind such developments as network broadcasting, black-and-white television and color TV.

*(Continued on page 110)*
• Invaders from Space. It has outer space styling and they decided to call it The Invader. Actually it will invade all 23 CB channels with its high level 5-watt signal (runs about 3½ watts output—that's good!)

The "they" involved in the design of the Invader is none other than Mark Products, 5439 West Fargo Ave., Skokie, Ill. 60076. Mark Products has long been known as one of the more advanced companies in CB, what with their Sidewinder SSB rig which we covered here a few issues back. The Invader uses conventional AM modulation.

Mark Products 23-Channel Invader Rig

Some of the jazzy features of this rig include ½-microvolt receiver sensitivity, 29 solid-state devices in the circuit, mechanical filter for sharp tuning, light weight (6 lbs), full-size calibrated S-meter and RF output meter, built-in PA system. The rig sells for $169.95 and an optional 110 volt AC power supply is available.

• They've Got Connections. What a perplexing problem when you've either got two CB rigs and one antenna, or two antennas for one CB rig. Each time you want to switch over to the (Continued on page 30)

Euphonic Intrusion Alarm

This new, simplified Intrusion Alarm System projects an invisible ultrasonic beam which will cover and protect any desired area. Any person moving within its range will trigger it immediately.

The Euphonic A-1 Intrusion Alarm is the ideal, low cost protector of homes, apartments, offices, stores and thousands of commercial / industrial establishments. Write for details and prices. Also available: AN-1 Annunciator; MA-2 (12 VDC) marine model.
NEW HEATHKIT In-Circuit Transistor Tester

At last, a realistic price for in-circuit testing of transistors! The new Heathkit IT-18 Tester has the facilities you need and it costs a lot less. It measures DC Beta in-or-out-of-circuit in 2 ranges from 2 to 1000 (the spec. commonly used by mfrrs. and schematics to determine transistor gain). It tests diodes in in-or-out-of-circuit for forward and reverse current to indicate opens or shorts. Measures transistors out-of-circuit for ICCEO and ICBO leakage on leakage current scale of 0 to 5,000 μA. Identifies NPN or PNP devices, anode and cathode of unmarked diodes; matches transistors of the same type or opposite type. Cannot damage device or circuit even if connected incorrectly. Big 4½* 200 μA meter. 10-turn calibrate control. Completely portable, powered by "D" cell (long battery life). Front panel socket for lower power devices. Attached 3' test leads. Rugged polypropylene case with attached cover. Build in 2 hours. 4 lbs.

NEW HEATHKIT 1-15 VDC Regulated Power Supply

Labs, service shops, hams, home experimenters... anybody working with transistor circuitry can use this handy new Heathkit All-Silicon Transistor Power Supply. Voltage regulated (less than 40 mV variation no-load to full-load; less than 0.05% change in output with input change from 105-125 VAC). Current limiting; adjustable from 10-500 mA. Ripple and noise less than 0.1 mV. Transient response 25 us. Output impedance 0.5 ohm or less to 100 kHz. AC or DC programming (3 mA driving current on DC). Circuit board construction. Operates 105-125 or 210-250 VAC, 50/60 Hz. 6 lbs.

NEW HEATHKIT Low-Cost 5 MHz 3" 'Scope

Here is the wideband response, extra sensitivity and utility you need, all at low cost. The Heathkit IO-17 features vertical response of 5 Hz to 5 MHz; 30 mv Peak-to-Peak sensitivity; vertical gain control with pull-out X50 attenuator; front panel 1 volt Peak-to-Peak reference voltage; horizontal sweep from internal generator, 50 Hz line, or external source; wide range automatic sync; plastic gralite with 4 major vertical divisions & 6 major horizontal; front mounted controls; completely nickel-alloy shielded 3" CRT; solid-state high & low voltage power supplies for 115/230 VAC, 50-60 Hz; Zener diode regulators minimize trace bounce from line voltage variations; new professional Heath instrument styling with removable cabinet shells; beige & black color; just 9½" H x 5½" W x 14½" L; circuit board construction; shipping wt. 17 lbs.

NEW HEATHKIT Solid-State Portable Volt-Ohm Meter

There's never been a better buy in meters. Solid-state circuit has FET input, 4 silicon transistors (2 used as diodes), and 1 silicon diode. 11 megohm input on DC, 1 megohm on AC. 4 DC volt ranges, 0-1000 v. with ±3% accuracy; 4 AC volt ranges, 0-1000 v. with ±3% accuracy; 4 resistance ranges, 10 ohms center scale x1, x100, x10K, x1M, measures from 0.1 ohm to 1000 megohms. 4½", 200 mA meter with multicolored scales. Operates on "C" cell and 8.4 v. mercury cell (not included). Housed in rugged black polypropylene case with molded-in cover and handle and plenty of space for the three built-in test leads. An extra jack is provided for connecting accessory probes to extend basic ranges. Controls include zero-adjust, ohms-adjust, DC polarity reversing switch, continuous rotation 12-position function switch. Easy-to-build circuit board construction completes in 3-4 hours. 4 lbs.

NEW HEATHKIT/Kraft 5-Channel Digital

Proportional System with Variable Capacitor Servos

This Heathkit version of the internationally famous Kraft system saves you over $200. The system includes solid-state transmitter with built-in charger and rechargeable battery, solid-state receiver, receiver rechargeable battery, four variable capacitor servos, and all cables. Servos feature sealed variable capacitor feedback to eliminate failure due to dirty contacts, vibration, etc.; three outputs; two linear shafts travel 1/8" in simultaneous opposite directions plus rotary wheel. Specify freq.: 26.995, 27.045, 27.095, 27.145, 27.195 MHz.
From Heath

NEW HEATHKIT AJ-15 Deluxe Stereo Tuner

For the man who already owns a fine stereo amplifier, and in response to many requests, Heath now offers the superb FM stereo tuner section of the renowned AR-15 receiver as a separate unit. The new AJ-15 FM Stereo Tuner has the exclusive design FET FM tuner for remarkable sensitivity, the exclusive Crystal Filters in the IF strip for perfect response curve and no alignment; Integrated Circuits in the IF for high gain, best limiting; elaborate Noise-Operated Squelch; Stereo-Threshold Switch; Stereo-Only Switch; Adjustable Multiplex Phase, two Tuning Meters; two variable output Stereo Phone jacks; one pair variable outputs plus two fixed outputs for amps., recorders, etc.; front panel mounted controls; "Black Magic" panel lighting; 120/240 VAC operation. 18 lbs. *Walnut cabinet AE-18, $199.95.

NEW HEATHKIT AA-15 Deluxe Stereo Amplifier

For the man who already owns a fine stereo tuner, Heath now offers the famous amplifier section of the AR-15 receiver as a separate unit. The new AA-15 Stereo Amplifier has the same superb features: 150 watts Music Power; Ultra-Low Harmonic & IM Distortion (less than 0.5% at full output); Ultra-Wide Frequency Response (± 1 dB, 8 to 40,000 Hz at 1 watt); Ultra-Wide Dynamic Range Preamplifier (98 dB); Tone-Filt Switch, Front Panel Input Level Controls; Transformerless Amplifier; Capacitor Coupled Outputs; Massive Power Supply; All-Silicon Transistor Circuit; Passive Circuit Protection; "Black Magic" Panel Lighting; new second system Remote Speaker Switch; 120/240 VAC. 26 lbs. *Walnut cabinet AE-18, $199.95.

NEW HEATHKIT 2-Meter AM Amateur Transceiver

2-Meters at low cost. And the HW-17 Transceiver has 143.2 to 148.2 MHz extended coverage to include MARS, CAP, and Coast Guard Auxiliary operation. Output power of tube-type transmitter is 8 to 10 watts, AM. 4 crystal sockets plus VFO input. Relayless PTT operation. Double conversion solid-state superhet. Receiver has 1 uV sensitivity with prebuilt, aligned FET tuner, ANL, Squelch, "Spot" function, and lighted dial. Signal-strength/relative power-output meter, Battery saver Switch for low current drain during receiving only. 15 transistor, 18 diode, 3 tube circuit on two boards builds in about 20 hours. Built-in 120/240 VAC, 50-60 Hz power supply and 3" x 5" speaker; low profile aluminum cabinet in Heath gray-green, ceramic mic. and gimbal mount included. 17 lbs. *Optional DC mobile supply, HWA-17-1, $24.95.

NEW HEATHKIT Home Protection System

Customize your own system with these new Heathkit units to guard the safety of your home and family. Warnings of smoke, fire, intruders, freezing, cooling, thawing, pressure, water, almost any change you want to be warned about. Your house is already wired for this system, just plug units into AC outlets. Exclusive "loading" design of transmitters generates unusual signal which is detected by the Receiver/Alarm. Solid-state circuitry with fail-safe features warns if components of system have failed. Any number of units may be used in system. Receiver/Alarm has built-in 2800 Hz alarm and rechargeable battery to signal if power line fails (built-in charger keeps battery in peak condition). Receiver accepts external 117 VAC bells or horns. Smoke/Heat Detector-Transmitter senses smoke and 133°F. heat (extra heat sensors may be added to it). Utility Transmitter has several contacts to accept any type switch or thermostat to guard against any hazard except smoke. All units feature circuit board construction and each builds in 3-4 hours. All are small and finished in beige and brown velvet finish. Operating cost similar to that of electric clocks. Invest in safety now with this unique new low-cost Heathkit system.

NEW

FREE 1968 CATALOG!

Now with more kits, more color. Fully describes those along with over 100 kits for Stereo/Hi-Fi, color TV, electronic organs, electric guitar & amplifier; amateur radio, marine, educational, CB, home & hobby, VHS camera or video Heath Company, Benton Harbor, Michigan 49022.

HEATH COMPANY, Dept. 19-6
Benton Harbor, Michigan 49022
In Canada: Quinte Ltd.

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Please send FREE Heathkit Catalog.
Please send Credit Application.

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City ______________________
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Prices & specifications subject to change without notice. CL-3286

August-September, 1968

29

www.americanradiohistory.com
World Famed BREVETTATA TEAR GAS PISTOL

Appearance of this fine tear gas weapon is similar to real gun. It is ideal for people who work in lonely, dark locations and require protection. Men give this gun to wives and daughters for night security. Many industrial applications. Shooting of gun stops aggressor without permanently injur- ing him. Neither permit nor license is needed, but it is not sold to minors. It fires six cartridges without reloading. Each gun comes with six tear gas shells and six blanks for practice and is shipped prepaid. Gun prices include: 12 shells and all shipping costs.

| 1 Gun-unit at | $13.07      |
| 2 Gun-units at $22.85 | ($11.43 ea.) |
| 3 Gun-units at $29.94 | ($9.98 ea.) |
| 4 Gun-units at $35.16 | ($8.79 ea.) |

Extra boxes of ten tear gas shells at $1.00 per box (prepaid with gun orders). Extra boxes of blanks at $1.25 per box.

UNITED SAFETY SUPPLY CO.
310 West 8th Street
Kansas City 6 RT, Missouri 64105

VHF RECEIVER
AM/FM—MULTI-BAND
HIGH SENSITIVITY—SELF CONTAINED

Hear police, fire, aircraft, amateur CB, etc. signals. Covers 26 to 54 and 88 to 174 mc in eight calibrated bands. Plus a ninth adjustable band for 15 or 20 meter SW BC listening. Five tubes AC power supply with silicon rectifier.

Write for catalogue of complete line of converters, receivers and radio equipment for recording.

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TRANSISTORIZED CONVERTER KITS $5.00 EACH

Three kits available. Marine 2-3 mc, police & fire, high band 100-200 mc, low band 26-60 mc. 1 mc tuning on car radio. Full instructions.

ANY KIT $5.00 pp. WIRED $15.00 pp.
FRED MESHNA, NO. READING, MASS. 01864

CB RIGS & RIGMAROLE
Continued from page 27

second rig or antenna you've got to pull apart your operating table and grope around the rear of the rig for the antenna connector, unscrew it, locate the other connector—oh well, you get the picture! Pity is the word which was in the hearts of the people at Gold Line, Muller Ave., Norwalk, Conn. 06852. They felt genuine pity for CBers and designed a single pole two position switch for coaxial cables. Rated at 1000 watts (even though they know that no self respecting CBer would dare run more than 750 watts!), the Model 2P may be left in the antenna line without any measurable signal loss because of its special design, brass fittings, phenolic insulating.

Marty Miller at Gold Line will be happy to send you additional details if you drop him a card. Tell him the boys at RADIO-TV EXPERIMENTER sent you.

• Johnson Rides Again (E. F., not L. B.). Yes, not satisfied with producing some of the most popular deluxe sets in CB-land, Johnson has shook up a lot of people with a set which sells for $99.95 and still maintains the high Johnson quality.

The new baby in the Johnson family has been dubbed the Messenger 110. It's a 5-channel rig with a built-in speech compression circuit, bet-

E.F. Johnson 5-Channel Messenger 110

ter than ½-microvolt sensitivity, and tiny (2½H x 6 3/16W x 8¾D) construction for inconspicuous mobile mounting. The set is FCC and Canadian DOT approved. E. F. Johnson Co. holes up at Wasca, Minn. 56093. Want to know more about the new Messenger? Then why not get the straight dope from them?

• Rectifying Your Rig. It's now possible to replace the rectifier tube in your CB rig with a transistorized gizmo which does not drain filament current and generates no heat, and generally increases the B-plus (high voltage) of your set.

These replacements meet Mil Specs and can be directly substituted for the following tubes: 6X4, 12X4, 6BW4, 12BW4. Price is $6.95 each from Specialty Engineering and Sales Co., 600 San Mateo Blvd., S.E., Albuquerque, N. M. 87108.

Seen any flying saucers lately?

Thousands claim they have and hundreds of eye-witness reports, plus the most complete directory of sightings ever published, appear in the fascinating pages of this Official Guide to UFOs. Pick up a copy at your newsstand or send $1 to include postage and handling to Official Guide to UFOs, Dept. RTV-8, 505 Park Ave., N. Y., N. Y. 10022.

Radio-TV-EXPERIMENTER
NEW PRODUCTS
HIGH-FIDELITY
AMATEUR RADIO
SHORT WAVE
RECORDER
GIMMICKS
GADGETS
TOOLS
ETC.

Crazy Unmixed-Up Mixer

The latest in the series of microphone mixers from American Geloso is the G1/501/U. It's portable, mounted in an attractive case with handle and built-in power supply. Geloso says the G1/501/U meets all professional, commercial and industrial sound application requirements, like: 8 low- and high-impedance channels with individual volume control and on/off switch; high level auxiliary inputs; two outputs for high and low impedance amplifiers, tape recorders, and guitar amplifiers; monitor earphone output with separate level control and monitor control for each channel or output; master volume control that simultaneously adjusts gain of all output; and individual preamplifier for each channel. The G1/501/U has a

Geloso Electronics G1/501/U Microphone Mixer
NEW PRODUCTS

In their expanding Brach line of auto antennas, JFD Electronics have come out with two new electric models—a front-mount and a rear-mount—along with a rear-mount extension kit. The front-mount job, Model 86-6753 ($43.40), has a 5-section mast that extends to 46 in. The motor develops 18 to 20 lb. of thrust to raise or lower the antenna, even in sub-zero weather. This model includes 56 in. of cable, and a 6-ft. electric harness with an up-and-down control switch and bracket. The rear-mount antenna, 86-6756 ($48.00), has the same dimensions and power output, 180 in. of shielded cable, and a 180-in. electric harness extension with up-and-down control switch and bracket, and a rear-mount adapter pad. Then there is the rear-mount extension kit, 86-6755 ($7.50), optional with 86-6753, consisting of 180-in. cable extension, 180-in. electric harness extension, and a rear-mount adapter pad. Each model comes with complete assembly hardware including perforated steel anchor brackets, metal screws, washers and instruction sheet. For further information write to Brach Div., JFD Electronics Co., 15th Ave. at 62nd St., Brooklyn, N. Y. 11219.

Electric Auto Antennas

How to Write a Classified Ad That Pulls

Deluxe 48 page booklet—only $1 per copy. And, with the booklet, you get a $2 credit towards your payment of your classified ad in Radio-TV EXPERIMENTER. Send $1 now to RADIO-TV EXPERIMENTER, 305 Park Avenue, New York, New York 10022.
high frequency IF for optimum selectivity. Frequency stability, less than 100 Hz drift after turn-on; frequency accuracy, 1 kHz throughout frequency coverage, making the R-530 particularly suited for communications applications where pre-assigned frequencies are to be received. R-530 offers reception of selectable upper and lower sideband, AM, CW, and RTTY signals. Rear panel outputs of the PTO, high frequency IF, AVC, RF gain control and balanced 600-ohm audio permit dual and space diversity utilization with minimum accessories. Power requirements: 115/230 VAC, 50/60 Hz, or 12 VDC @ 1 amp. An optional standard rack mounting is available. Total weight 23 lb. For further info, contact Galaxy Electronics, 10 S. 34th St., Council Bluffs, Iowa 51501.

Let the Burglar Beware

Affix one of these decals to your apartment door or your car window (whether you have an alarm or not) and it’s sure to have a psychological effect on any would-be burglar. The chances are that thieves and vandals won’t take the chance. The cost is $1.00 for a set of two electronic alarm decals, and you may order them from J. Ross, 80-34 Kent St., Jamaica, N.Y. 11432.

WARNING!
Protected by
ROSS
ELECTRONIC SENTRY
ALARM

Ross Electronic Sentry Decal

Please Don’t Hit the Deck!

Here, for serious tape recording buffs, is a new deck from Uher, the 7000. But for this one, you don’t have to be rich. In a hand-rubbed walnut base, the Deck 7000 has two speeds—7½ and 3½ ips—and allows for sound-on-sound recordings for multiple effects. Precise balancing of each channel of stereo recording is possible through the individual level control and VU meter. Some other features are: proven transport system, positive track selection and indication for monophonic recording, automatic shut-off with metallic leader, full fingertip control, 4-digit index counter with push-button reset, frequency response of 40-18,000 Hz ± 2.5 dB @ 7½ ips; 40-15,000 Hz.

(Continued on page 109)
Electronics comes alive with NRI Training Kits
DISCOVER THE EASE AND EXCITEMENT OF TRAINING AT HOME THE NRI WAY

New Achievement Kit—Custom Training Kits—"Bite Size" Texts

Only NRI offers you this pioneering method of simplified "3 Dimensional" home-study training in Electronics, TV/Radio and Broadcasting/Communications. It's a remarkable teaching idea unlike anything you have ever encountered, the result of more than half a century of simplifying, organizing and dramatizing learning-at-home techniques. If you are an ambitious man—regardless of your education—you can effectively learn the Electronics field of your choice the NRI way.

NRI has simplified Electronics by producing "bite size" lesson texts averaging only 40 pages each. Dozens of illustrations open wide a picture window through which you'll see and understand practical uses of Electronics. You start out with NRI's exclusive Achievement Kit, containing everything you need to get started fast. (Illustrated at right.)

NRI has organized Electronics training to take you step-by-step from the first stages into more intriguing areas. Once you know the fundamentals thoroughly, it's easy to grasp more advanced theory and techniques. You move with confidence and enthusiasm into a new adventure filled with the excitement of discovery.

NRI has dramatized Electronics through the careful development of special training equipment that is programmed into your training systematically ... beginning with your first group of lessons. Things you read about come alive in your hands as you build, experiment, purposely cause "problems" in circuits—and solve them. You learn to use test equipment, to build radios and TV sets, transmitter, or computer circuits. It's the priceless "third dimension" in NRI training ... practical experience.

More than 50 years of leadership in Electronics Training


1. TELEVISION-RADIO SERVICING—Learn to fix all TV sets, including Color. Includes your choice of NRI Color Kit or 19" black-white TV Kit. Also covers radios, stereo hi-fi, etc. Profitable field spare or full-time.

2. INDUSTRIAL-MILITARY ELECTRONICS—Basics to computers. Starts with fundamentals, covers servos, telemetry, multiplexing, phase circuitry, other subjects.

3. COMPLETE COMMUNICATIONS—Operation, service, maintenance of AM, FM and TV broadcasting stations. Also covers marine, aviation, mobile radio, facsimile, radar, microwave.

4. FCC LICENSE—Prepares you for 1st Class FCC License exams. Begin with fundamentals, advance to required subjects in equipment and procedures.

5. MATH FOR ELECTRONICS—Brief course for engineers, technicians seeking quick review of essential math: basic arithmetic, short-cut formulas, digital systems, etc.

6. BASIC ELECTRONICS—For anyone wanting a basic understanding of Radio-TV Electronics terminology and components, and a better understanding of the field.

7. ELECTRONICS FOR AUTOMATION—Not for beginners. Covers process control, electronics, telemetering and remote control, electromechanical measurements, other subjects.

8. AVIATION COMMUNICATIONS—Prepares you to install, maintain, service aircraft in-flight and landing systems. Earn your FCC License with Radar Endorsement.


10. MOBILE COMMUNICATIONS—Learn to install, maintain mobile transmitters and receivers. Prepares for FCC License exams.

11. ELECTRICAL APPLIANCE REPAIR—Learn to repair all appliances, including air conditioning, refrigeration, small gas engines. Leads to profitable part or full-time business.

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* You must pass your FCC License exams (any Communications course) or NRI refunds in full the tuition you have paid.

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If you served since January 31, 1955, or are in service, check GI line in postage-free card.

YOU GET MORE FOR YOUR MONEY FROM NRI
102. No never mind what brand your CB set is. Sentry has the crystal you need. Same goes for ham rigs. Seeing is believing, so get Sentry's catalog today. Circle 102.

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

107. Want a deluxe CB base station? Then get the specs on "Tramp's all new "Tin Star." A the SSB/AM rig you've been waiting for!

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

96. If a rugged low-cost business/industrial two-way radio is what you've been looking for, be sure to send for the brochure on E. F. Johnson Co.'s brand new Messenger "202."

129. Boy, oh boy—if you want to read about a flock of CB winners, get your hands on Lafayette's new 1968 catalog. Lafayette has CB sets for all pocketbooks.

103. Squires-Sanders would like you to know about their CB transceivers, the "23'er" and the new "SS5." Also, CB accessories that add versatility to their 5-watters.

46. A long-time builder of ham equipment, Hollidays will send you lots of info on ham, CB and components. Ask for their catalogue.

122. Discover the most inexpensive CB mobile, Citi-Fone II by Multi-Elmac Company. Get the facts plus other CB product data before you buy.

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

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

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

45. Hams, CBers, experimenters! World Radio Labs 1968 catalog is a bargain hunter's delight. Get your copy—it's free.

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

115. Get the full story on Polytronics Laboratories' latest CB entry Poly-Pup. Full 5-watts, great for mobile, base or portable use. Works on 12 VDC or 117 VAC.

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

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

135. Get with ICs! RCA's new integrated Circuit Experimenter's Kit K2212 is the first of its kind and should be a part of your next project. Get all the facts direct from RCA.

132. Discover 18 new and different professional-quality amplifiers, tuners, and preamps completely assembled on PC-boards now offered by Amperex. Prices will amaze you!

1. Allied's catalog is so widely used as a reference book, that it's regarded as a standard by people in the electronics industry. Don't you have the 1968 Allied Radio catalog? The surprising thing is that it's free!


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

23. No electronics bargain hunter should be caught without the 1968 copy of Radio Shack's catalog. Some equipment and kit offers are so low, they look like misprints. Buying is believing.

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

106. With 70 million TV and 240 million radios somebody somewhere will need a vacuum tube replacement rate of one a second! Get Universal Tube Co.'s Troubleshooting Chart and facts on their $1 flat rate tube.

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

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

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

10. Burstein-Applebee offers a new giant catalog containing 1000's of big pages crammed with savings including hundreds of bargains on hi-fi kits, power tools, tubes, and parts.

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

12. Tab's new electronics parts catalog is now off the press and you're welcome to have a copy. Some of Tab's bargains and odd-ball items are unbelievable offers.

117. Harried by the high cost of parts for projects? Examine Bigelow's 13th Anniversary catalog packed with "Lucky 13" specials.

42. Here's colorful 108-page catalog containing a wide assortment of electronic kits. You'll find something for any interest, any budget. And Heath Co. will happily send you a copy.

44. Kit Builder? Like wired products? EICO's 1968 catalog takes care of both breeds of buyers. 32 pages full of hi-fi, test, CB, ham, SWL, automotive and hobby kits and products—do you have a copy?

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

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

66. Try instant lettering to mark control panels and component parts. Don't let the price of Dotak's booklets and sample show this easy dry transfer method.

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

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HI-FI/AUDIO

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

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TELEVISION

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

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

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

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

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

HI-FI ACCESSORIES

112. Telex would like you to know about their improved Seneta Headset—and their entire line of quality stereo headsets.

104. You can't hear FM stereo unless your FM antenna can pull 'em in. Learn more and discover what's available from Feno's 8-pager "Third Dimensional Sound."

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Six and Twelve

W. D., Belleville, Ill.

I want to build a battery eliminator with a 6- and 12-volt output, 110-VAC input, and giving up to 3 amps. Can you give me a schematic or tell me where to get one?

The circuit shown employs a bridge rectifier for 12 volts and a full-wave rectifier for 6 volts. The diodes should be able to handle at least 2 amperes, preferably more to allow a margin of safety.

Calling All Cars

J. R. M., Morton, Pa.

Can you tell me where KEX-460 is located? I hear it near 168 MHz on my FM receiver. I think the station is a police unit near me.

Regarding police units, it's unlawful for anyone to divulge what was transmitted, or that a transmission took place. Amateur or broadcast stations are an exception. The operators of KEX-460 would undoubtedly take a dim view of your listening to their transmissions. They're supposed to be as private as your telephone calls.

All Charged Up

I have an outboard motorboat with transistorized ignition and an alternator for charging the 12-volt storage battery. Also, a depth finder which now runs on a separate 12-volt dry-cell battery. The depth finder produces stray flashes when I hook it up to the boat wiring system because...

(Continued on page 116)
Gold Grabber

By Charles Green, W6FFQ

There may be ore on that shore, so build our treasure tracker and take a sec to know for sure.

Has your girl ever complained about a lost earring just as you're about to leave the beach and make your way home? Have the kids ever buried their favorite pail under inches of what looks like a murky quicksand?

Well, now for the first time, RADIO-TV EXPERIMENTER has come up with a metal locator that'll help you solve problems like these. And it'll throw some fun and fortune into the bargain as well. For (Continued overleaf)
Gold Grabber

whether it's minor disasters like the ones mentioned, or just a natural just to go out adventuring. Gold Grabber will keep you busy like nothing you've ever seen.

Pieces of Eight. Lucky folks down in the Caribbean or in the California and Central America areas can go looking for the gold coins and relics which abound on some of the exotic beaches and landscapes. And the battlefields of Civil War fame are hunting grounds that should keep any buff busy for days on end.

You can also use Gold Grabber to find buried cables and conduits; to make up games for the youngsters so they can have fun looking for hidden objects; or just to help out a friend in need of a metal locator. In fact, every reader will be able to come up with countless ideas that'll increase the value of his instrument a thousandfold.

Easy Operation. Gold Grabber consists of a search loop and locator unit mounted on a wooden handle. Since the locator unit is all-solid-state and powered by a mercury battery, it is light enough to permit easy operation as a search tool. (As you can see from the photos, there are two versions of Gold Grabber—one jazzed up by the editors, and one constructed by the author. You choose the one best for you. But stay away from ferrous material! Brass screws will do, but epoxy glue would be best.)

Most metal locators are complex to build, but Gold Grabber has a simplified circuit that makes for easy construction. The simplified circuit, of course, is not designed for great depth penetration in the earth. But metallic objects lying close to the surface should be no problem.

Two FETs (field-effect transistors) and a conventional transistor are used in an RF beat-frequency, metal-detector circuit which does not require any complex test equipment for initial adjustment.

The Circuit. Q1 (an n-type FET) is connected to L1 and C1 in a Hartley oscillator circuit operating at a frequency of approximately 500 kHz. The source electrode of Q1 is connected to a tap on L1 to obtain the RF feedback needed in this circuit. The C2/R1 combo form the gate-leak self-bias for Q1.

Layout shown below allows plenty of space for components. Check clearance of pot R6, and make sure that green index dot of L2 shows on top of coil. Parts must be anchored securely.

B1—8.4-V mercury battery (Mallory TR-286 or equiv.)
C1—220-pF mica capacitor
C2, C5, C7—470-pF, 50-V disc ceramic capacitor
C3—.001 uf, 50-V disc ceramic capacitor
C4—10-pF, 50-V tubular ceramic capacitor
C6—470-pF mica capacitor
C8, C10, C12—5-uf, 15-V electrolytic capacitor
C9, C11—.005-uf, 50-V disc ceramic capacitor
C13—10-uf, 15-V electrolytic capacitor
J1—Phone pin jack
L1 is an external loop which radiates the oscillator RF energy. A small portion of this RF is coupled via C4 to the oscillating detector circuit of Q2. Note that Q2 is connected in a Hartley circuit similar to Q1, except that the gate leak is much larger, and the detected output is taken from the drain electrode.

Resonant circuit L2/C6 is tuned to a frequency very close to the operating frequency of the Q1 oscillator, thereby producing an audio beat-note signal from detector Q1. This audio signal is coupled through C8 and low-pass filter R5/C9 to volume control R6. The audio signal from R6 is amplified by the circuit of Q3 and direct-coupled to J3, and a pair of external 2000-ohm earphones.

When RF energy radiated from external loop L1 is absorbed by a nearby metallic conducting surface, the Q1 oscillator circuit changes its frequency. This change in frequency also changes the beat-note frequency of the Q2 detector circuit, thereby changing the frequency of the audio signal heard in the earphones.

On Your Way. The Gold Grabber has two major assemblies: the external loop, and the oscillator/amplifier mounted in a 5¼ x 3x2¼-in. aluminum box. We’ll start with the locator unit in the box.

Best way to begin construction is to install two 1¼-in. machine screws spaced two inches apart and centered on the long side of the box. The screws extend out from the bottom of the box and are used to mount the box to the loop assembly. Use serrated washers with the nuts to prevent any movement.

Cut a section of perforated wiring board to approximately 2½ x 4 in, and mount it as shown in the photo with machine screws and nuts. Position it ¾ in. above the box bottom. Install two ground lugs as shown in the photo, and use serrated washers as required.

Mount the components on the sides of the box as shown, using washers to prevent movement. Position R6 to stay clear of the top cover and mounting screws. Battery B1 is fastened to the side of the box with a tape-covered aluminum strap. Position L2 so that its green index dot is on top of the coil.

Insert the push-in terminals, and mount the parts on the wiring board as shown in the photo. Make your connections with short, stiff leads to prevent movement. There

---

**PARTS LIST FOR GOLD GRABBER**

J2—Phone jack
J3—Phone jack
L1—Loop (see text)
L2—Tapped oscillator coil (Miller X-5496-C or equiv.)
P1—Phone tip plug
P2—Phone plug
Q1, Q2—HEP-801 FET (Motorola)
Q3—Pnp-HEP-51 pnp transistor (Motorola)
R1—33,000-ohm, ½-watt resistor
R2, R8—320-ohm, ½-watt resistor
R3—2,200,000-ohm, ½-watt resistor
R4—2200-ohm, ½-watt resistor
R5—1000-ohm, ½-watt resistor
R6—10,000-ohm, audio taper potentiometer (with S1)
R7—1,000,000-ohm, ½-watt resistor
S1—5st switch (part of R6)
1—½ x 3x2 ½-in. aluminum box (LMB-780 or equiv.)
Misc.—¼-in. masonite, ½-in. OD aluminum tubing, ½-in. wooden dowel, #22 plastic-insulated hook-up wire, hardware, perf board and push-in terminals, knob to fit L2 tuning screw (optional) and knob for R6, 2000-ohm earphones, wire, solder, etc.
Gold Grabber

is no electrical connection to the case leads of Q1 or Q2, but the leads should be connected to push-in terminals to help support the FETs. Make sure that all parts and wiring are anchored down, or performance of the Gold Grabber will be affected. Use spaghetti over the leads of Q1, Q2, and Q3 to prevent shorts.

Looping The Loop. Fasten four nails in a 6-in. square of a piece of scrap wood. The nails should protrude approximately 1 in. Wind 10 turns of #22 plastic-covered wire (Belden 8530 or equiv.) around the square, and connect a length of wire at this point for the tap. Continue winding until there are 25 turns forming the square loop.

Carefully remove the nails and wire loop from the scrap, tape the corners of the loop with plastic tape, and connect a length of wire for the tap. Continue winding until there are 25 turns forming the square loop.

Inch apart on both sides of the loop. Drill the holes and lace the loop onto the board with insulated tubing or fish line. Make sure the loop is tightly secured.

Hold On Tight. Cut one end of a 15-in. length of 3/4-in. wood dowel at a 45-deg angle and fasten it to the end of the loop board with two machine screws and nuts (brass screws are a must).

Mount the aluminum box on the wood dowel approximately 3 in. up from the loop board. You can use a 44-in. length of 3/8-in. OD aluminum tubing for a handle, and fasten it to the dowel approximately 3 in. behind the box with two machine screws. (Since the tubing can be of any convenient length, you can make it as long as desired.)

Plug It In. To test the Gold Grabber, connect the loop to J1 and J2, plug a pair of 2000-ohm earphones into J3, and turn R6 full clockwise for maximum volume. Adjust

(Continued on page 111)
About 500,000 years ago, Homo Sapiens first turned his uncomprehending, bedazzled eyes toward the sun. Yet almost everything he now knows about this star has been learned in the last 350 years. With the aid of electronics, man will learn more about this seething, life-supporting furnace during the next decade than he has ever been able to grasp in the preceding half million years of sun-watching!

Until now, our astronomers have been trapped...

(Continued overleaf)
WHAT GIVES WITH OLD SOL?

Aimed behind an imprisoning barrier of air that permits only a partial glimpse of outer space. Like a prisoner peering through the iron bars in the window of his cell, the astronomer has had only a limited view of what exists in the outer world. He has been forced to deduce the nature of that world mainly on the basis of brief, often distorted glimpses of passing events.

The advent of the space age has changed all that. For the first time, man has placed an astronomical observatory outside of the earth’s atmospheric mantle where he now has an unobstructed view of the sun, and of the universe as a whole.

Unquestionably, electronics provided the vital key to this liberation. The spectacle of a huge rocket leaving its launch pad is manifest in the thunderous roar of burning fuel. But only a complex system of electronics can start this relatively simple combustion process. Electronic systems guide the space vehicle to its proper orbit, stabilize it there, manipulate the payload instruments that gather information from outer space, and communicate by telemetry the acquired data back to men on the ground.

Orbiting Observatory. On October 18, 1967, a three-stage Delta launch vehicle roared off the pad at Complex 17 at Cape Kennedy. It pushed a 599-lb. solar observatory into a 350-mile circular orbit around the earth. Its mission was to obtain new information about the nature of the sun by measuring ultraviolet, X-ray, and other radiations that cannot penetrate the earth’s atmosphere and therefore cannot be studied at ground level.

This latest Orbiting Solar Observatory (OSO-IV) is the fourth such space laboratory to be sent aloft and the first to concentrate entirely on the sun. During its planned tour of duty of about six months, OSO-IV will aim nine different pieces of astronomical equipment at the sun with awesome accuracy and efficiency.

And this is only the beginning. Other observatories will follow OSO-IV into space to continue observation of the sun for most of an eleven-year period—a full solar cycle during which the sun will pass through its characteristic quiet and active phases.

The OSO program is one of the National Aeronautics and Space Administration’s major efforts in solar physics. But NASA alone cannot handle a project as complex as this; many other groups having specialized experience must participate. Organizations cooperating in the OSO-IV experimental pro-

Above, photo of sun taken by Air Weather Service personnel using only light emitted by hydrogen gas. Such specialized pictures tell much about sun’s chemical composition and nature of different types of solar radiation. At right, photo of sun taken during total eclipse. Whereas previously the corona could only be studied in profile—during an eclipse—now earth-orbiting observatories probe all of it except for small portion behind solar disk. Below, solar flares resulting from sunspot activity create lethal clouds of radiation. These deadly blasts can kill space travelers, throw orbiting satellites off course, and disturb vital radio communications systems.

gram include: Harvard College Observatory, U.S. Naval Research Laboratory, American Science and Engineering, Inc., University College and the University of Leicester (England), and the University of California.

Electronic Pilot. All of the sophisticated
observational equipment contained in OSO-IV would be useless unless the spacecraft is aimed accurately at the sun and stabilized during its orbital travels. After three months in orbit, it is obvious that the ingenious electronic pilot inside OSO-IV is doing its job magnificently.

It is not an easy job. The sun, some 94 million miles away, appears as a small target. To draw an accurate bead on this target from a laboratory zipping around the earth at great speed, the OSO-IV system must have a pretty steady eye. In fact, as we shall see, it requires several pairs of eyes to perform the feat.

The OSO-IV system has two main sections: 1) a spinning wheel, which is surmounted by 2) a sail that can be tacked into the direction of the solar wind. To stabilize the spacecraft properly, the wheel section must spin within a fairly narrow rpm range.

A set of silicon photodetector eyes on the rim of the wheel count the frequency at which they see the sun as the wheel spins. If the frequency exceeds 41 spotings per minute, nitrogen gas is released through tiny jets on the gas storage bottles to slow down the wheel. If the spin rate drops below 26 rpm, jets on the opposite sides of the bottles operate to speed up the wheel.

The semicircular sail atop the wheel is about 44 in. wide, and is covered with 2016 solar cells. Inside the sail are the electronic and mechanical components used to operate it. While the ship is in the dark stage of orbital flight, the sail rotates along with the supporting wheel. But each time the craft comes back into the sunlight, the sail locks onto the sun.

Two pairs of silicon photodetector eyes— a pair on each side of the sail—control a servo motor that drives the sail in a direction opposite to the spinning wheel. Together, the four eyes have a 360-deg. field of view. When the pair of eyes on the side facing the sun sense the morning sunlight, the servo motor is activated to hold the sun within 3 deg. of perfect alignment with the instruments contained in the sail. Other eyes mounted near the viewing ends of the observatory instruments provide additional corrections for an aiming within one minute of arc in azimuth and elevation.

No Rock 'n Roll. Rolling and pitching of the spacecraft must be kept at a minimum. An aspect-monitoring system measures the craft's roll position in relation to the sun by means of a magnetometer that senses the craft's position relative to a plane in the earth's magnetic field. Simultaneously, the system produces a time pulse which indicates points along the magnetic plane at which the spacecraft sights on the sun. Information obtained from the aspects-monitoring system, along with data on the craft's pitch angle, is compared to known values of the earth's magnetic field using a ground-based computer. The calculated roll angle will then serve to indicate what corrective measures are needed.

Any backward or forward pitching motion is controlled by an automatic system that maintains the spacecraft spin axis within 3.5 deg. of the perpendicular to the direction of the sun. A pair of photoelectric eyes on the sun side of the sail and their associated electronic circuits activate pitch-control gas jets mounted inside the top edge of the sail. This pitch-control system can also be worked by command control from the ground.

A magnetic torque coil wound around the inside hub of the wheel section also helps minimize pitching. The coil can be energized in three basic modes by ground command. Power can be adjusted to full, half, or off levels. The polarity of the coil can even be reversed. When energized, the coil produces a torquing force perpendicular to the coil which tends to line up perpendicular with the earth's magnetic field. Since the force also coincides with the spin axis of the spacecraft, it helps to minimize any pitching action.

Communications Complex. The OSO-IV communications system must perform three basic chores: 1) receive and process command signals, 2) record experimental data, 3) transmit experimental and spacecraft operational data to the ground.
WHAT GIVES WITH OLD SOL?

The system accepts 140 different commands in digital form, using two on-board command receivers that operate continually to protect against possible failure of a single receiver. The outputs from the command receivers are fed into three decoders for command execution. Output commands from the decoders actuate latching relays and transistor switches to execute the commands.

The system transmits data to earth in real time while simultaneously recording the same scientific data with an on-board tape recorder. This recorder operates throughout the craft’s orbital period, recording data at the rate of 400 bits of digital information per second.

Once during each orbit the system is commanded to play back the information at 18 times the recording speed—at 7200 bits per second. A complete transmission takes only about five minutes. After playback, the tape recorder automatically reverts back to the record mode and the craft resumes transmitting real-time data.

Power Package. The spacecraft requires about 26 watts of electric power (13 watts each for spacecraft systems and for experiments) while travelling in sunlight. The power requirement drops to seven watts during the orbital night.

The 2016 solar cells on the sail section are arranged in 36 parallel strings of 56 cells each. The total cell surface area of 4 sq. ft. can produce a maximum power output of 38 watts. These cells provide electrical energy to power the craft during sunlight hours and to charge batteries used during nighttime operations.

The prime battery pack consists of 42 re-

(Continued on page 114)
By Elmer Carlson

Socket-2-me, CB baby, with a whip that rises in seconds and stays up for months

A low-cost, center-loaded R/C antenna makes a good CB skyhook for cliff dwellers and temporary installations anywhere. Field-tested on the outskirts of a big city's concrete jungle, this convenient whip belts out good signals from a near ground-level base station to any mobile unit over a four-mile area.

Whether you're just anxious to get some use out of your newly-arrived license, or Mother Nature has leveled your roof-mount in one blustery blast, you'll find this whip can fill in better than you ever expected. There are no coax losses, mismatches, etc. All five watts (or whatever) pour right into the ol' radiator.

R/C or CB? The beauty of this project is the convenience of a ready-to-go, center-loading coil antenna available from Lafayette Radio for $2.99, plus postage (by mail: 111 Jericho Tpke., Syosset, N.Y. 11791). Though advertised for R/C (radio control), it's good for frequencies in the CB band and will work fine. And those five watts certainly won't melt a tubular antenna; you need much more power for that. Even the center-loading coil will

(Continued overleaf)
CB SKYHOOK

stand up under the strain of CB transceiver power and will match all CB rigs.

Center-loading whip extends to 54 in. Use length of stranded hookup wire for lead.

**PARTS LIST FOR CB SKYHOOK**

1—Center-loaded R/C antenna (Lafayette 99H9098 or equiv.)
1—1 3/8 x 1 3/4-in. piece of perforated phenolic
1—Banana plug
1—Solder lug
2—1/2 x 6 Parker-Kalon binderhead sheetmetal screws
1—12-in. length of AWG-18 plastic-covered hookup wire
1—1/2-in. 6-36 roundhead machine screw (if not supplied with antenna)
Misc.—Solder, wire, 1/4-in. spacers (if needed), etc.

**Three Plus Two.** Believe it or not, you don't have to build anything. All you do is drill five holes—three in a scrap of phenolic (or any insulating material), and two in the rear edge of the top of the CB transceiver cabinet. This set-up allows the antenna to be mounted just behind the cabinet rim. (The author attached his unit to the rear of an Olson "Sidebander.")

The holes drilled into the cabinet should be smaller than those drilled through the perforated phenolic. As shown in our photo, the perforated phenolic is attached to the cabinet of transceiver with self-tapping screws. This eliminates the need for opening the cabinet. Sheet-metal screws have deeper threads and will hold better in the thin metal.

When drilling those two screw holes be careful that you don't spray metal chips over the inside of the transceiver. Drill at a low speed—even if you have to use the ol' eggbeater. The use of a slow drilling speed is especially important with tube-type transceivers. High-speed drilling will cause more vibration, and there's a better chance of damaging delicate vacuum tubes. A little oil on the self-tapping screws will make it easier to set them in their holes.

**In the Middle.** Alternatively, you can mount the whip right in the center of the transceiver cabinet. Doing so might give you a little better ground-plane effect, but you probably won't be able to notice the difference. Then, too, it would also mean extra hardware.

Solder lug and wire are attached to whip from underside of phenolic. Phenolic is then screwed down on top of cabinet at rear.

If you do decide to mount the antenna in the center of the cabinet, you'll need a set of four 1/4-in. spacers to raise the phenolic above the cabinet surface. Then the lug and the screw at the bottom end of the antenna will clear the cabinet.

To connect the antenna to your rig, strip the ends of an 8- to 12-in. length of hookup wire. Solder one end to a solder lug and the other to a banana plug. You don't need an insulator on the shank end of the plug.

That's just about it. How much quicker can you get? All that's left is to mount the whip on the cabinet of the CB transceiver, and get on the air.

So go to it, and don't be shy about using this CB skyhook to get on the air—fast!
On a warm May morning two years ago, a truckload of police constables forded a muddy river, seized a partially-built shortwave station, and claimed the tiny island on which it stood—Shasiland. But where is Shasiland?

Ask that question of almost any DXer, and chances are you'll get only a shrug and a blank stare in return. For Shasiland, a tiny, would-be country in southern Africa, is almost totally unknown. And this despite the fact that it came within a hairs-breadth of becoming the rarest DX target in the world!

But for the vagaries of African politics, Shasiland today would be the home of a small but thriving missionary radio station. And it would be operated by a South African religious group called Christian Action by Rádio in Africa, or CARA for short.

CARA's adventures in Shasiland are really two tales in one—the story of how this strange little country came to be, and the story of a fledgling missionary society that nearly overcame overwhelming odds to establish a Christian radio voice in southern Africa. (Continued overleaf)
Claiming The Unclaimed. The Shasiland story begins many years ago, when W. B. Coetzer, a prosperous businessman who owned a farm on the border of the British protectorate of Bechuanaland (now Botswana), made an interesting discovery. He learned that uninhabited Shasi Island, located at the confluence of the Shasi and Limpopo Rivers where Bechuanaland, Rhodesia, and South Africa meet, was unclaimed territory.

So, on July 1, 1952, Coetzer nailed a sign to a big tree on the 215-acre island, proclaiming it a sovereign, independent state. As far as Coetzer was concerned, Shasiland was his. No one else seemed the least bit interested in his little island. All it had to offer was a jungle of huge twisted trees, monkey ropes, Malela palms, and undergrowth. Its only residents were the hundreds of different birds that chirped and shrieked cacophonously. For years his claim went unnoticed and unchallenged.

CARA Calling? Then CARA entered the picture. In 1961, five students and a Dutch Reformed Church minister had founded Christian Action by Radio in Africa. Their goal was to bring a Gospel message to Africa by radio.

In time, the society established recording studios in four nations. The stumbling block, however, was the lack of transmitting facilities. A weekly half-hour broadcast over the commercial Radio Clube de Mozambique...
Shasiland was born when Coetzer posted this sign, proclaiming it an independent state.

proved inadequate. CARA wanted its own shortwave station, but permission to operate could not be obtained from any country in southern Africa. So Shasiland seemed to offer the missionary group its best opportunity.

With the assistance of Coetzer's son, a medical missionary, an interview was arranged with the island's owner at the Mt. Nelson Hotel in Cape Town. The Reverend Steyn Fourie explained CARA's needs, Coetzer, in turn, listened carefully, then agreed to the proposal to establish a station on Shasiland. His sign, he said, had been posted on the island for ten years, the time necessary, according to international law, to proclaim it a separate, independent state.

The first meeting was held in April, 1962, but it took CARA four years to raise the funds needed for the project. Using the framework of an old transmitter, John Graham, a missionary-engineer, built the 1000-watt shortwave station in the workshop of South Africa's Stellenbosch University. And on May 5, 1966, Graham and his wife, Lorraine, left Cape Town for Shasiland, the transmitter and other vital parts loaded into a 1 1/2-ton truck and a station wagon.

After a 1300-mile trip, the Grahams joined another missionary couple, Mr. and Mrs. J. Foster, already on the island. A mud-brick transmitter building had been partially completed. Work was progressing rapidly, and it looked as though CARA's long-awaited station would soon be on the air.

CARA Going? Then the Bechuana-land authorities stepped in. On May 18, police constables crossed the shallow Shasi River and seized the transmitter. By their action, they claimed Shasi Island as part of

In this rare photo, Shasiland's only (and one of the world's rarest) radio stations is shown under construction on Shasi Island. But as later events show, it was never to be completed.
Shasiland...

Bechuanaland. And thereby ended the country that might have been, the DXer’s dream that almost was. (Can you imagine tuning in sometime during the wee hours and picking up a transmission from an independent, 215-acre island called Shasiland?) And thereby also ended Shasiland’s very claim to be, Coetzer’s 1952 notice that “Trespassers will be prosecuted. This island named Shasiland is a sovereign, independent state, not part of the Union of South Africa, Bechuanaland, or Southern Rhodesia, and has been occupied by me since 1st July, 1952.”

The whole operation was friendly enough. The police cordially issued a receipt for the transmitter, loaded it on their van, and hauled it away. Not wishing to create a major incident, the organization admitted guilt and the case was soon settled. The government promised to return the transmitter should CARA obtain permission to establish a legal station.

Two years later, however, Shasiland’s status is still unresolved. Coetzer has indicated he will take the matter to court. The Botswana and South African governments are now discussing boundary questions and upon the outcome of these talks will depend the future of the island.

CARA applied to the new Botswana government for a station license, but after a year of waiting, the answer was a firm no. Discouraged, CARA’s governing board last fall dissolved the group, turning its activities to MEMA, the audio-visual branch of the Dutch Reformed Church. MEMA maintains the original recording studios, producing religious programs for the national Botswana Radio and South Africa’s Radio Bantu FM network.

Graham now heads the MEMA team in Botswana’s capital of Gaberones. And while religious broadcasts make up on 3½ percent of the R. Bantu schedule, surveys show them to be the second most popular feature, reaching an audience of three million daily.

Though its work continues, CARA’s dream of its own shortwave station in Shasiland is over. And with it went DX listener’s chances to log the country that almost was. ■
Housed in the sleeve of a ballpoint pen, this light-activated device stacks up as one of the simplest projects ever. It's so simple, in fact, that we call it our . . .

By Ronald G. Hilke

Many's the time when an amateur photographer needs additional lighting for flash photography. Thing is, large additional expenditures plus the complexity of interconnecting multiple electronic flash units discourage most laymen. Fortunately, however, there is an easy way out.

The ready availability of low-cost electronic flash units is one happy side to the picture. This, plus development of a new semiconductor device called the LASC (light activated silicon controlled rectifier) means that new avenues of multiple electronic flash photography are now open to most every one. One such route is the photoelectric slave flash we're about to describe. It's so simple we call it our "No-Parts" Slave Flash.

Three And A Lens. Fig. 1 shows the LASC with its three electrical connections—the anode, cathode, and gate. Smack on top of the unit is the lens, which focuses the impinging light energy onto the semiconductor junction. If the light energy is of sufficient intensity, the switch junction conducts.

Once an SCR is in the conducting state, it will continue to conduct until the anode voltage is removed. In an electronic flash, this is accomplished automatically by the flash tube discharging the main storage ca-

Fig. 1. Looking for all the world like an ordinary, everyday transistor, the LASC differs in that it contains a lens on top.
SLAVE FLASH

The LASCR used for this project was obtained from Poly-Paks, Inc., Box 942, Lynnfield, Mass. 01940. The device, called a Photran, is available in voltage ratings from 50 to 300 volts. Most electronic flash triggering levels are in the 200-volt range, so to provide a healthy safety factor a 300-volt device was selected; price is $2.95.

Fig. 2. Schematic of "No-Parts" Slave Flash. Author used LASCR supplied by Poly-Paks, Inc.; see text above for additional information.

Simplicity Plus. Fig. 2 is a schematic of the electrical hookup and a drawing showing the relative placement of the LASCR anode, cathode, and gate leads. Since gate current is extremely small, the wattage rating of the 56k gate resistor is noncritical and can be any value from 1/8 watt on up.

Fig. 3 shows the wiring of the slave trigger unit prior to insertion into the plastic end of a ballpoint pen. The plastic tube has been halved by means of a hacksaw to aid in assembly. If the end of the plastic tube is large enough to accommodate the body of the LASCR, this step won't be necessary.

A length of spaghetti has been placed over the LASCR anode and cathode leads to preclude shorting. However, if spaghetti isn't available, electrical tape or even masking tape will suffice. All leads are soldered at joints; care should be taken to not overheat the LASCR by conduction of heat up through the leads. Overheating may be prevented by clamping the jaws of a needle-nose plier on the LASCR lead between the soldered connection and the LASCR during the soldering operation.

Positive Anode. The electrical hookup to the flash unit requires that a positive voltage exist on the anode of the LASCR. This can be verified with a voltmeter, or by hooking up the trigger unit and attempting to trigger the flash by beaming light from a flashlight into the LASCR lens. If the flash doesn't trigger, reverse the interconnecting cord connections. (No damage to the LASCR will occur because of the reversed polarity.)

Once the unit is operating properly you can complete assembly. Simply insert the works into the plastic tube and cement the case of the LASCR to the front of the tube. The output cable should be cemented to the rear of the tube to prevent twisting the cable and possibly damaging the internal assembly. The finished unit is shown in Fig 4.

Add A Plug. Several types of connectors can be used at the end of the output cable. A standard female P-C type connector mates (Continued on page 109)
WANNA JOIN A DX CLUB?

Most every DXer does. Question is, why do they wait so long?

By the Editors of RADIO-TV EXPERIMENTER

There's no doubt about it, hams seem to have more fun. They're constantly talking about their equipment, problems, and families in a never-ending world of chit-chat and fellowship—a far cry, indeed, from the SWL condemned to a lonely existence behind the controls, with only a log book for company.

But all this needn't be so. Whether your main interest is SWLing, BCB, or ham-band operations, the following radio clubs offer everyone a chance to get in on the DX action.

The mainstay of each organization is a club bulletin. Here the enthusiast will find gobs of information and news put together by people who really know their field. And featured columns offer members an opportunity to contribute material based on their major interests. These bulletins are obviously one of the best ways to stay up-to-date on latest happenings in the BC bands.

No Long Shots. Before joining a club, every SWL wants to know which one gives more for the money, and how the various clubs differ in what they offer.

There are many clubs in the U.S. and Canada—both large and small—and each must be judged on its own merits. The longer a club has been in existence, the more believable is its promotion material.

The following groups are all affiliates of the Association of North American Radio Clubs (ANARC is a super-organization of DX clubs dedicated to maintaining standards among members and furthering DX activities). These clubs have members spread far and wide throughout the Western Hemisphere. Though there are certainly other clubs for the DXer, the eleven listed here are known to have a wide range of activities and proven reliability over past years.

Whatever your interest, you should find the one just right for you—there are no boundaries with regard to nationality, age, or occupation. So good luck, and good hunting.

- **AMERICAN SWL CLUB (ASWLC)**, 16182 Ballad La., Huntington, Beach, Calif. 92647. SWBC Editor, C.M. Stanbury II. This club specializes in SWBC coverage and foreign BCB DX. Its monthly publication SWL averages 25 pages and has a Utility and Cardswap column. Dues are $4.00 yearly.

- **CANADIAN DX CLUB (CDXC)**, 311 W. 14th St., Riviera Beach, Fla. 33404. President, Ralph J. Irace, Jr. Club's monthly publication called Cadex, and it (Continued on page 113)
Paul Kilborn looked up from his latest copy of *Playboy* and out through the screen of his porch, 300 feet up the side of a West Virginia mountain. In the valley, lights were flashing on, first in the office building, then in the equipment sheds of the big Green Bank observatory. Paul stepped quickly inside and dialed the main office.

“What’s going on down there?”

“We’re not sure, sir.” It was one of the new technicians assigned to the National Observatory since its 1967 expansion. “We don’t know what it is, but we’re getting a signal. A pattern.”

The *Playboy* still in his hand, Paul headed for the station wagon standing in the driveway, its engine still warm. Project Sensor was less than twenty hours old, and already the false alarms were starting. What would it be this time: a ham operator, trespassing on the radio-restricted zone? A distant thunderstorm? A stray transmission from an airline flight?

Theoretically, the antenna was tracking the star Tau Ceti, eleven light years from Earth. But Paul knew to expect surprises. He had helped to redesign the big radio telescope with a new narrow beam antenna and low noise receivers that might pick up almost anything. He found Dr. Gerard in the computer analysis room, wrist deep in readout sheets and frowning.

By Alan C. Van Dine
"Any inkling, Jake?"

"None," said the project director, "except that it's too good to be true."

Paul looked at the pulse pattern, traced out on long grid sheets. "Much too good," he agreed. "It looks almost like a musical score."

"Right," Gerard said. "The Tau Ceti Toccata and Fugue. Only it will turn out to be a jamboree from some jerkwater radio station with a faulty transmitter. Wouldn't that look good in the newspapers? Scientists find intelligent life in West Virginia?"

Paul glanced at another sheet, then another. More of the same. "When did it start, Jake?"

Gerard checked the timing blips. "Zero one thirteen, and it's still repeating. I thought we might have some weird oscillation in the frequency analyzer, but all circuits check perfectly. The interference analysis crew can't find a thing that resembles this. We played it for the Navy hotshots at Sugar Grove, and they can't identify it either."

Paul squinted at the azimuth and elevation dials. "We can't have drifted off Tau Ceti."

"Not a chance. She's tracking that star steady as a rock. But this signal is much too strong to be coming from the star. Another thing—look at this frequency analysis. The rhythmic signal is superimposed over the random noise we were getting from Tau Ceti. Figure that out."

By 3:30 the Sensor team had exhausted every plausible radio source anyone could suggest. No malfunctions apparent. No stray transmissions from outside the valley. But the signal continued: a repeating pattern of four sequences that defied all attempts at decoding. Could it be coming from the Tau Ceti solar system after all? The first real sign of intelligence in deep space? Paul and Dr. Gerard decided to check it out. They steered the antenna off the star.

The signal stopped. For a full minute, not a word passed. Pointlessly, Gerard walked to the visual telescope and peered through, as if to look at the distant radio transmitter that had just materialized in the mind of everyone in the room.

"It can't be," he muttered. "It just can't be."

"Maybe not," Paul said, "but it's what we're here to find."

"It's too distinct," Gerard insisted. "The signal is simply too strong. Where would they get that kind of power?"

"And too complicated," Paul added. "Like a melody, or a series of equations. If they were putting out a beacon signal, it would be something simple and basic, like two plus two equals four." (Continued overleaf)
Hear That Star?

Gerard nodded. "Let's try it again."

"Wait a minute," Paul said. "Let's try another target instead." The vague beginnings of an idea were assembling in his mind, but it was too far fetched, and he was too tired. . . . He turned his attention back to the antenna controls.

When a second star was zeroed in, the signal resumed—the same pattern—and now all attempts at explanation were in ruins. How could two solar systems, light years apart, be beaming the same message? Gerard called a break for coffee and rest.

Paul, who had been awake for nearly 24 hours when the signal began, now found that he couldn't sleep. Lying on the couch in Gerard's office, he reopened his Playboy and thumbed through it.

Gerard, leaning far back in his swivel chair, reached for his cigarettes, started to offer one to Paul, then noticed the magazine.

"Tell me," he said. "Why is it that every time I'm up to my eyelashes in trouble, I find that my top assistant has buried himself in some girlie mag?"

"It's envy," Paul said. "A lover looks at a star, and it reminds him of peace, wisdom, and womanhood, which reminds him of his girl. So he tells the star how nice his girl is, and he tells the girl how nice the star is. We look at a star and promptly get hung up on electromagnetic frequency analysis. I'd rather be a lover."

"I may cry," Gerard said. "And you, if you happen to get around to it, might try saying something even half that smart about radio transmissions from the direction of Tau Ceti."

"Oh, that. Well you see, if we were lovers and poets, the whole thing would be quite simple. We would know immediately that our friend is writing poetry."

"Which friend? Tau Ceti?"

Paul hesitated. "No, not the star. The antenna. It has noticed its first celestial object and reacted like most of our new equipment reacts—temperamentally."

Gerard grunted.

"Think about it," Paul said. "We have put 203 million dollars worth of sharpened perception into this thing, haven't we? And we have it so cross-rigged with computers that we're not even sure we've isolated all of the functions. Right?"

"Right," said Gerard, "except that not even in our most imaginative blundering could we accidentally program our computers to write poetry."

"No, no . . . not program. But we have hooked the antenna into so much redundant circuitry that the damn thing could practically talk to itself. And the antenna can eavesdrop on stimuli that we haven't even discovered. That's what it's for, isn't it?"

"Okay, okay." Gerard was apparently tiring of the game. "Sensitivity, brains, and a celestial viewpoint. It all adds up to a poet. A 15-acre, 203 million dollar federal poet. Go to sleep!"

Paul shrugged. Sleep, to be sure, was the only solution, and he could finally feel it coming. But Gerard sat up suddenly, grinning.

"I just realized something," he said. "We have a whole roomful of eager young astronomers, physicists, and mathematicians downstairs without a thing to do. Paul, can you think of a more gullible group in all this world than astronomers, physicists, and mathematicians?"

"Not offhand."

Gerard reached for the phone. "Well, since you have come up with the original hypothesis of the night, I suggest we unleash all that Ivy League tuition on testing it. It might be just what we need to get some of those high-priced brains in motion."

A half-awake Princeton mathematician named Pitts was Gerard's choice as project chief for the exercise. The young man stared uncertainly through hanging strands of hair as his boss explained the assignment.

"This is right down your alley, Pitts. Besides, I've always admired your beard. I want you to have everyone who's awake take another crack at decoding the signal pattern, but with two arbitrary assumptions: first, that it translates to meaningful English; second, that it follows a regular meter, like poetry."

"Dr. Gerard, may I point out . . ."

"Pitts," Gerard interrupted, "you are far too bright to go walking around a place like this with a closed mind."

Pitts left. Paul finally slept, but Gerard shook him just before sunrise to say that he had called Pitts to come back and discuss his progress.

"You could have gone down to the control room, you know," Paul yawned. "Supplied some encouragement, a few suggestions."

(Continued on page 108)
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AUGUST-SEPTEMBER, 1968

www.americanradiohistory.com
Along comes a man called Peta with an ingenious utilization of the video tape recorder. He trains it on the ladies in his golden grotto of a beauty salon and lets them see themselves in action with different hair styles and hairpieces. Then, if they wish, the tape can be filed. And if, in a few months, a lady would like, say, an Anniversary hairdo, all the details are there to be replayed.

Peta visualizes chic ladies in the future using their home video tape recorders this way—so if you say to your wife "Why can't you do your hair the way you had it at the big dance?"—she can! Meanwhile, send your Fair One to Peta's (just off New York's 5th Avenue) for a multidimensional consultation (a mere $10) and a starring role in her own production—"Crowning Glory." —H. Arliss Bell
Roll 'em first, and rollers next is the order of the day in Peta's salon, where he is casting director, cameraman, coiffeur (and most likely confidant). The lady acts out a short, curly part.

Svengali and Trilby? Maybe, but updated with the electronic assistance of a video tape recorder.

If the FBI can keep your fingerprints and the hospital your X-rays, why not a file on Milady's hairdos in motion?

The name of Peta's shop is Special Occasions, but you don't need one to fall in and star in a production of yourself with ringlets, fall, postiche, frosting. The guys don't have to memorize all these terms, but they'll know what they like when they see the whole scene on camera.

Something to go with a frilly midi? Zee Great Peta will help you decide with his really mod, on-the-spot canned video.
instant me!

Continued from previous page

A long time ago, when a lady sat for her portrait, she wasn't allowed to move. Now she can really see herself as others see her with the video tape recorder.

Professor Peta points out how a hairpiece can make an instantly more appealing YOU. And if you forget the effect, you can play it back next year.

In the can with your low-budget, coiffing-by-video production—working title, "Instant Me!"
Pocket radios are everywhere. You get AM, FM, even SW coverage anywhere you wander. And the little box fits lickety-split into pocket, purse, beach bag, picnic basket, or what have you.

Trouble is, while transistor radios are getting smaller and smaller, the sound is often not what it should be. The mini levels provided by these transistor units are fine for small rooms and private listening. But try making the scene with the group, and you'll find they're just too pooped to pop.

Take on our Crowd Getter, however, and you can bet your surf parties will zoom like never before. This amplifier/speaker combo will raise any transistor's whisper to an ear-shattering blast that'll gather all the bees to the honey and make your party the success it should be.

**Only One IC.** The Crowd Getter is a complete booster amplifier housed in a commercially made remote-speaker cabinet (the speaker comes with the cabinet). The amplifier consists of a single IC (integrated circuit) which contains the preamp, driver, and power-output stages. The amplifier shown in our photos is powered by a 6-volt battery which provides about a ½-watt output—roughly equivalent to an old vacuum-tube table radio at full volume. If you substitute a 9-volt battery the sound will be substantially louder, though it might be difficult to fit the larger battery into the speaker cabinet.

Both the IC-amplifier and the battery mount on the back panel of the speaker cabinet, making the Crowd Getter as portable as your transistor radio. In fact, you might even consider attaching a handle to the cabinet.

To use the Crowd Getter, simply connect a cord from the radio's earphone jack—thereby disabling the speaker—to phono jack J1. Volume must be controlled by the radio's volume control, since no control has been included in the amplifier.

**Building The Bomb.** While connections, can be made directly to Q1's leads via flea-clip terminals, to avoid excessive heat from soldering, we suggest you use a transistor socket as shown. Note that though Q1 has 12 leads, a 10-pin socket is used. A 12-pin socket is not only difficult to obtain, it is also expensive. On the other hand, a low-cost 10-pin socket is available in Motorola's HEP line of components. And if you follow our layout, construction will actually be easier using the 10-pin socket.

First step is to remove the back cover of the speaker enclosure and unsolder the speaker wires connected to phono jack J1 on the cover. Next, assemble the amplifier on a section of perf-board measuring approximately 2 x 3 in. Flea-clips or push-in terminals are tie points.  

(Turn page)
Hi-Power Crowd. Getter

Drill a 5/16-in. hole for Q1’s socket about 1 1/4 in. from one end of the perf-board. Note that the socket is keyed with a small point; the key should face the closer end of the exactly one-half the total length of the remaining Q1 leads. Place the socket in the perf-board hole, then insert Q1 into the socket.

The Q1 lead directly opposite the case’s key is 12. Looking at the bottom of Q1, the lead next to 12 in a clockwise direction is 1. On the socket, the pin opposite the key is 10. The next pin in a clockwise direction is 1.

most components mount on top of perf-board and should be tack-soldered to Q1’s socket. Do not attempt to wrap the leads as a socket terminal might become shorted. Leads 1 to 10 of Q1 are cut to about half length.

This might sound somewhat complicated, but it’s not. When Q1’s 10 lead is lined up with the socket’s 10 pin, all of Q1’s leads will fall into line. Just take an extra moment or so

Radio-TV Experimenter
to check Q1’s installation, because you won’t get a second chance if you make an error.

Press Q1 down firmly into the socket, then cement the socket to the perf-board using ordinary hobby or household cement. Don’t cement the socket before Q1 is installed, for just a drop of cement in a pin will make the socket useless.

Mount transformer T1 on the socket terminal side of the board, as shown in photo. Position T1 about 1 to 1½ in. from Q1, then install the remaining components. All connections to Q1’s socket are tack-soldered; don’t try to wrap wires around the socket’s terminals.

Installation. Install the amplifier on the back cover so the input terminals are in line with phono jack J1. To avoid crushing Q1 on the underside of the perf-board, use a ½- or ¾-in. spacer between the amplifier and the cover at each mounting screw.

Install power switch S1 near the amplifier. It can be installed in any of the ¾-in. holes pre-drilled in the cover. Finally, install bat-

Connect shielded patch cord between transistor radio’s earphone jack and J1. S1 turns on power, but volume is controlled by radio.

A heat sink is not needed for a 6-volt power source.

To finish up, connect the speaker wires to T1’s secondary terminals, route the leads away from the amplifier’s input connections, then install the speaker enclosure’s back cover. Your Crowd Getter is now ready for use.

A Final Note. Make up a patch cord with a phono plug on one end and a plug on the other that matches the earphone jack of the transistor radio. Then connect the radio. Turn on the amplifier and turn on radio. Adjust the radio’s volume control for the desired level. Do not turn on the radio first and then patch it into the booster, as the Crowd Getter requires only a very minute input level (patching in the radio when the volume is up might damage Q1).

So there you are. Have fun, and good listening!

Battery holder for B1. Though B1 is a 6-volt battery, it will fit a standard D-cell holder such as the Keytone #175. For slightly higher power output a 9-volt battery can be substituted, though it must be rated for at least 100 mA. Don’t use a transistor radio 9-volt battery like the 2U6. The 2U6 won’t last more than a couple of hours.

Warning. Q1’s supply voltage must not exceed 9 volts. To avoid damage, mount a heat sink on Q1 when using a 9-volt battery.
GOING AROUND STEADY
- Next time a kit manual tells you to twist lengths of red and black wires into a twisted pair, here's what you do! Secure an eye hook or a hooked nail in your drill's chuck. Tie the wires to the hook, and clamp the other ends in a vise. Zap the drill's switch trigger for a short blast and watch the twisted pair form. Lengths up to 10 feet can be paired. —Al Wise

PLUG WITH FORKED TONGUE
- Polarize your hi-fi and test gear to be sure they're properly grounded. The ground slot on an AC outlet is wider than the other, so make the ground prong on the line cord plug wider, too! Just snip the ground prong with a heavy-duty cutter as shown—the prong will spread. But, be sure you have the ground prong before you snip! —L. Grant

COLOR CODE YOUR TRANSISTORS
- A few drops of dope will let you identify transistors as you do resistors—the color code is the same. Use hobby-type dope or quick-dry enamel on the transistor case. A red dot on top means "2N". The next 3 or 4 colors give the numbers that follow the 2N prefix, like 2N1177. —J. Lamb

DOWN WITH FINGER POKING
- One sure way to destroy a loudspeaker is to poke a hole through it. An easy way to prevent this type of cone damage is to place a metal screen between the speaker and grille cloth. Besides adding protection for the delicate speaker cone, the added steel or aluminum screen will prevent unsightly pushed-in or torn grille cloths. —Jack Kiser

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Send your Imagineering Design Tips with full details and a photo or drawing to Radio-TV Experimenter, 229 Park Ave. South, New York, N.Y. 10003. The top ideas selected by the editors will win $10.00. Entries become the property of Radio-TV Experimenter and can't be returned.

www.americanradiohistory.com
Build this take-command PA system and watch 'em sit up and listen

Here's a lunchbox public address system that takes the strain off your vocal cords. And it also makes for a radio Merit Badge project that'll help any junior leader be the envy of his troop.

This PA system has a self-contained battery for all-around use, but an AC power supply can be included to conserve or rejuvenate the battery. For occasional use you can get by with just the 6-volt lantern battery. But if you're planning a lot of work indoors, you'll save money if you get the power supply, too.

The Snack Pack Commander won't rattle windows a half-mile away, but you'll be able to talk to people 20 or 30 feet distant. If you want more volume you'll need a higher-

Snack Pack uses two Eicocraft kits. Both the EC-900 solid-state AC power supply and EC-300 solid-state audio power amplifier are available in blister packages from EICO (see Parts List) or from your local jobber.
output mike or a 1-transistor preamp.

A sturdy case can be made from a metal lunchbox, and the metal is thin enough to be worked with tin snips and an ice pick or awl.

Saving Space. To eliminate need for a matching transformer, a low-impedance mike is used. For a smaller package, you can use a mike cartridge without a case. Just wire leads to cartridge and mount it in a small plastic box. However, there's more than enough room for a full-sized unit.

Before mounting any parts on PC board, place it in its approximate position in the lunchbox and use the board's mounting holes as a template for marking mounting holes on the sides. When the amplifier kit (and power supply, if used) is completed, set it aside and complete work on the lunchbox.

Everything you need for construction is included in kits—PC boards, transistors, capacitors, resistors, and even hardware for mounting boards in lunchbox. Your work will go easier if you lay out components before assembly. But do only one kit at a time.

Above right, speaker template is first used to mark speaker opening in lunchbox bottom.

Scratch in outline with ice pick or awl, then punch in mounting holes by pressing point of tool through template and into metal.

At right, hole for speaker is started with heavy-bladed knife, then tin snips finish job. Watch out for sharp edges of metal cutout! Holes for mounting screws must be enlarged to accommodate machine screws furnished with speaker kit.

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**PARTS LIST FOR SNACK PACK**

B1—6-volt battery (Eveready 509 or equiv.)—see text

J1—Miniature microphone connector (Amphe- nol 75-PC1M or equiv.)

P1—AC line cord (with plug)

S1—Spst toggle switch

1—Eicocraft EC-300 amplifier kit

1—Eicocraft EC-900 power supply kit (optional)

1—Remote auto speaker kit (speaker, grille, and template)

Misc.—Metal lunchbox, low-impedance microphone and cable (Lafayette 99H4377 or equiv.), hardware, wire, solder, etc.

Eicocraft kits are available from EICO Electronic Instrument Co., 283 Malta St., Brooklyn, N.Y. 11207, or from your local dealer.
If you’re lucky, the remote speaker kit will have a template the same shape as the cone of the speaker. This can be used to mark the speaker cutout. The template can then be placed inside the box to reduce the tinny sound that often occurs when metal boxes are used for speaker enclosures.

If the speaker kit doesn’t have a suitable template you can make one quite easily from a piece of soft corrugated cardboard. Just press the speaker face-down into the cardboard and run a pencil around the outline of the speaker. Also mark the positions of the mounting holes. A strip of masking tape will hold the template in place.

**Power to Spare.** If you can’t obtain the lantern battery, substitute four D-cells. The lantern battery, however, will give longer service. For an extended trip, try to get heavy-duty alkaline D-cells. They have more than four times the current rating of a similar-size cell.

Above, the 4 x 6-in. speaker, matching metal grille, and speaker template are part of kit for installing a remote speaker in car. Mounting hardware should be included. Low-priced kit will work fine, but make sure that speaker and grille are not too large for box.

Above left, use short wires to connect on/off switch and mike connector to PC boards. Add leads for battery and speaker (and power supply, if used) as shown. If possible, do all soldering before mounting boards.

At left, completely packed unit is ready to go. Lantern battery is held in place by speaker magnet and transformer; roll of packing material protects PC board and helps secure mike. For rough travel, battery can be mounted to case with strap and screws.
Propagation Forecast

With this issue we have added two new abbreviations to our forecast table—w (Western North America) and e (Eastern North America). If one of these letters follows a listing, it means the band is only good for that part of the continent. For example, under Asia at 1500-1800 listener’s time we have listed as a promising second choice “60w,” which means a DX opening may occur on this band to Asia, but west of the Mississippi only. Incidentally, this particular band opening may not occur more than three or four days out of the whole two month period. But when it does, the band produces spectacular results, so it’s worth while monitoring.

Turning our attention away from the very rarest of DX, conditions for the novice or those SWLs using very simple equipment will be excellent, generally speaking. Because of the high current sunspot count, those super powered transmitters beamed our way should provide consistent reception. This is especially true on 25 and 19 meters where static is seldom a problem. But when it does, the band produces spectacular results, so it’s worth while monitoring.

By C. M. Stanbury II

Aug./Sept. 1968

<table>
<thead>
<tr>
<th>LISTENER'S STANDARD TIME</th>
<th>ASIA (except Near East)</th>
<th>EUROPE, NEAR EAST &amp; AFRICA (N. of the Sahara)</th>
<th>AFRICA (S. of the Sahara)</th>
<th>SOUTH PACIFIC</th>
<th>LATIN AMERICA</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000-0300</td>
<td>25, 31</td>
<td>31, 41</td>
<td>41, 49, (60e)</td>
<td>41</td>
<td>49, 60</td>
</tr>
<tr>
<td>0300-0600</td>
<td>(25), 31, (41), 49</td>
<td>31</td>
<td>Nil, (19w)</td>
<td>41, 49, 60</td>
<td>49, 60</td>
</tr>
<tr>
<td>0600-0900</td>
<td>(16), 19, 25, (31)</td>
<td>16, 19</td>
<td>19, (60w)</td>
<td>31</td>
<td>31, 49</td>
</tr>
<tr>
<td>0900-1200</td>
<td>19, 25</td>
<td>16, 19</td>
<td>13, 16, 19</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>1200-1500</td>
<td>(16), 19</td>
<td>16, 19</td>
<td>13, 16, 19</td>
<td>19 (poor)</td>
<td>19 &amp; 25 (poor)</td>
</tr>
<tr>
<td>1500-1800</td>
<td>19, 31, (60w)</td>
<td>19, 25</td>
<td>19, 25, (60w)</td>
<td>19</td>
<td>31</td>
</tr>
<tr>
<td>1800-2100</td>
<td>16, 19</td>
<td>25, 31</td>
<td>25, 31, (90), (120)</td>
<td>16, 19</td>
<td>49, 60, 90</td>
</tr>
<tr>
<td>2100-2400</td>
<td>16, 19</td>
<td>25, 31</td>
<td>41, 60, (120e)</td>
<td>19, 25, (41w)</td>
<td>49, 60, 90</td>
</tr>
</tbody>
</table>

To use the table put your finger on the region you want to hear and log, move your finger down until it is alongside the local standard time at which you will be listening and lift your finger. Underneath your pointing digit will be the shortwave band or bands that will give the best DX results. The time in the above propagation prediction table is given in standard time at the listener’s location which effectively compensates for differences in propagation characteristics between the East and West Coasts of North America. However, Asia and the South Pacific stations will generally be received stronger in the West while Europe and Africa will be easier to tune on the East Coast. The shortwave bands in brackets are given as second choices. Refer to White’s Radio Log for World-Wide Shortwave Broadcast Stations’ list.

www.americanradiohistory.com
The real wonder of the transistor is that it gives us low-cost, consumer-grade equipment of the type once found only in high-priced industrial equipment. Take, for example, the Euphonic Intrusion Alarm, a device which floods an area with inaudible ultrasonic sound, then uses the reflected sound to determine if a trespasser is about.

Until recently, an ultrasonic silent watchman was built with tubes. Such units were expensive—upwards of $300, and they were large. And while many department stores still protect their camera departments with silent-watchman radiators or globes placed about 20 feet apart, they're far from ideal. Even the store watchman must keep away from the area, for if he enters the sound field, he'll likely end up looking for a new job.

Because of the silent watchman's high price, the home owner or small shopkeeper who wanted full protection was relegated to a wired burglar alarm. With this setup, windows and doors were protected by a string of series-connected wires. But now, thanks to transistorization, a silent watchman—the Euphonic Intrusion Alarm—is available at budget prices (under $100.00).

**Doppler Again.** In actual operation, the Intrusion Alarm works on the Doppler Effect, which is the same thing the fuzz uses to nail speeders with "radar." The Doppler Effect is a rather simple thing to understand if you can recall the last time you heard the horn from a speeding train or truck. Remember how the sound seemed to change in frequency—sort of like wooo-eее-ooo? Actually, the horn generated a constant-frequency sound. But since the train or truck was speeding as the horn sounded, the sound waves were stretched, or compressed by the simultaneous motion of the vehicle.

Let's imagine that the vehicle's horn is coming straight at you and that the horn normally produces imaginary sound waves two feet apart. Since the vehicle is moving right along with the sound waves, it compresses the waves so they are only one foot apart; this makes the effective pitch of the horn higher. But once the vehicle passes you, it stretches the sound waves away from you—and the imaginary waves are now four feet apart. The total effect at your location as the vehicle moves past is an increase and then a decrease in the pitch of the horn.

Got the picture? Okay, let's imagine a setup. On the left side is an oscillator/transducer which is emitting a steady 30-kHz tone. At the right is a receiver which is very sharply tuned to 29 kHz. Normally, the receiver cannot "hear" the 30-kHz tone, so it has no output (in our example, the receiver will activate an alarm bell when it "hears" a tone).

Now let's assume that someone moves into the sound field. The person's motion will compress and expand the reflected sound waves, and at some instant the receiver will sense a 29-kHz signal. The receiver is now activated and produces a DC output voltage, which in turn trips a latching relay that turns on the alarm.

In practice, commercial intrusion alarms use a more complicated circuit which ensures sensitive sensing without a tendency toward false tripping. Still, the arrangement just outlined works quite well.

**Bounce Pounce.** The Euphonics Intrusion Alarm operates on the same principle as our simplified alarm we discussed. Built into a small (1½ x 2½ x 10 in.) case is the transmitter (oscillator/transducer), the receiver, and time-delay control circuits. On one end of the cabinet is the transmitter's transducer, which beams the ultrasonic sound field into the room or area to be protected. On the other end of the cabinet is the receiving transducer, which picks up the ultrasonic...
sound that is bounced back from hard surfaces in the room or protected area.

Normally, the bounce-back signal is the same frequency as the transmitted sound, so the alarm doesn't trip. But as soon as someone enters the sound field, the frequency of the signals bouncing off the intruder is changed due to the Doppler Effect, and the receiver is tripped.

What happens in the receiver is the real difference between the simplified intrusion alarm and the Euphonics Unit. When the Euphonics receiver is tripped it just doesn't turn on an alarm. Instead, the receiver activates time-delay circuits which provide a variety of possible alarm combinations.

**Lights and Bells.** On the back of the Euphonics Intrusion Alarm are two 117-VAC outlet sockets, a slide switch, and a sensitivity control. The sensitivity control quite naturally determines the pickup range of the alarm. The two outlets are used for the alarm circuits: one outlet for lights, and one for a delayed sound alarm such as a bell.

The switch provides for alarm hold or auto reset. When the switch is set to alarm hold, the alarm's power outlets are locked on in the event the alarm is tripped. But when the switch is set to auto reset, the alarm will reset itself to standby after one minute and will then detect any subsequent motion.

Here's how the entire alarm system works from turn-on to sound-off. As soon as power is applied by turning the power switch on, a 20-second time delay is activated, which allows the user 20 seconds to get out of the area. After 20 seconds the alarm circuits are activated.

As soon as an intruder enters the area, the receiver trips the 117-VAC light outlet and the room lights or flood lamps are turned on. From the instant the lights go on a 20-second delay is activated, at the end of which time the 117-VAC alarm bell outlet is activated. The purpose of the delay is to allow the user to turn off the alarm before the bell sounds off, if so desired.

With the slide switch set to alarm hold, both the lights and the alarm bell are continuously on until the intrusion alarm’s power is disconnected. However, with the switch on the reset position, the alarm turns itself off after one minute and as already mentioned, is then ready to detect any subsequent motion in the area.

**Performance.** We tried the Euphonics Intrusion Alarm exactly as suggested in the instructions: i.e., we placed it at one end of a room at an approximate height of 4 ft. (concealed between books in a bookcase). By adjusting the sensitivity control we were able to detect just a slight wave of the hand 20 ft. away.

Hard-surfaced rooms with lots of uncovered wall space produced more sound reflections and the alarm's coverage was almost wall-to-wall. But soft rooms, rooms with poor sound reflections because of covered walls and upholstered furniture, reduced the alarm's sensitivity range to 10 to 15 ft., depending on the degree of room hardness. But even a 10-ft. range still gives coverage to the center of the room and will spot anyone walking around or through.

Though Euphonics claims the alarm can be used outdoors, we didn't have a chance to run an outdoor test. Nonetheless, we suspect that birds, cats, and dogs would be just as effective at tripping the alarm as a human intruder.

The unit is supplied complete, with a set of mounting brackets that permit the alarm to be mounted on a wall or under a shelf. The lights (up to 800 watts can be handled by the alarm) are supplied by the user, though dealers can provide alarm bells.

**Summing Up.** As far as we can tell, the Euphonics Intrusion Alarm is as effective a device for protecting the home as anyone could want. And because of its very small size it makes a highly attractive alarm system for travelers worried about leaving their valuables in an empty hotel or motel room (just the sudden flashing on of lights is generally enough to scare off a burglar).

The Euphonics Intrusion Alarm (type A-1) lists at $97.50; optional equipment includes indoor and outdoor bells and a key-lock power switch. For additional information write Euphonics Marketing, Dept. LE, 173 W. Madison St., Chicago, Ill. 60602.
Do you want to join the latest “in” crowd that’s invading amateur radio? If so, you’d better hurry. You’ve got to make your “rep” fast and develop habits to match.

First, you must prepare a long list of nasty four-letter words and keep this as a reference close beside your rig. Then you must build up a sizable collection of off-color stories. Better set up a file card system for these, so you can find the one you want quickly while on the air. Next, develop a knack for using these two operating aids on the air to ridicule other operators and to promote your own pet ideas on politics, religion, or what have you.

Finally, devote several hours each day developing an intense feeling of disrespect for your brother hams and an utter disregard for the effect of your actions on the future of amateur radio. Be ready, willing, able, and eager to deliberately interfere with any station on the air which you don’t like.

Now you are properly equipped to become a participating member of a growing and influential group in modern amateur radio. We’ll call this bunch of shortwave hooligans the *ham busters*. They’re the guys who are bringing pool-hall language and gutter attitudes to amateur radio. Their contemptible and irresponsible behavior will soon wreck our priceless hobby unless they are squelched.

**Loose Living.** Eyebrows are lifting all over the country at the senseless carryings-on of operators who seem to think the ham bands are nothing more than a nationwide stag party. The once proud traditions and shining accomplishments of amateur radio could go down the drain with a sick gurgle if these sick minds aren’t either cured or put off the air.

Though the number of operators engaged in these activities is still fairly small, it seems to be growing daily. Guttersnipe language, sneering remarks with a double meaning, and derogatory comments on a wide variety of subjects including politics, religion, and race are making some of the ham frequencies sound like rats’ alley.

Maybe the current tendency toward “anything goes” has spawned this recklessness in amateur radio. Perhaps the frequent contemptuous outbursts in our modern society where respect for the other person seems forgotten has also had its effect on today’s ham. Whatever the cause, this modern mania certainly is no good for ham radio. We’re...
already criticized for spawning too much idle talk and too few technical accomplishments. Now that some of this talk sounds like a barroom brawl, our respectability in the eyes of outsiders will drop several notches further.

To the Rescue. Vigilante groups are already springing up in radio clubs across the nation to deal with this menacing behavior on our ham bands. These groups, if well handled, can be the most effective force in dealing with the problem. This is because the FCC rules governing obscene and profane conduct on the air are quite vague and have been watered down even further by court decisions. Also, deliberate interference and harassment directed at other stations is extremely hard to prove. So, official enforcement is likely only in extremely bad cases.

In past years, hams have done a pretty good job of policing their own bands. With this new menace facing us, it's hoped we can still face up to the challenge.

What can an individual do? The most important thing which should be obvious to all operators is to behave yourself on the air. Make sure you don't fall into the bad habits of the ham buster crowd. Next, when you hear another ham abusing his operating privilege by causing interference or using improper language, don't lower yourself to his level by bawling him out on the air. This would just make matters worse.

One thing you should do is make a mental note to never, absolutely never talk to this guy on the air—not even in a casual signal report. Ignore him completely. If enough hams do this, the ham busters may get the idea that their presence on the bands isn't appreciated. Then they'll have to give up ham radio, or clean up their manners. In either case, ham radio—and all conscientious, respectable hams—will be the winners.

FCC Rule Change. This one is rather minor, and affects only some of the paper shuffling we all must do at times to stay legal. The new rule requires that when you move from one permanent address to another, you must submit the change of address (on a form 610) within four months after the move, and before any on-the-air operating at your new address.

Once this change of address has been submitted, you may operate as a portable station at the new address, just as before. However, now there is no time limit to this portable operation, and you need to send a notice of this portable operation only to the FCC office having jurisdiction over your new address.

Formerly, you were supposed to notify the FCC office with jurisdiction over your old address as well, though a lot of ops didn't bother to do this. Just like the changes in ham station identification requirements a few months back, these new changes make it legal to do approximately what many hams have been doing for years!

Birdies and Fuzz. Are your "birdies" bothering the iron birds? Or in plain language, do you have a transmitter emitting spurious radiation that can interfere with aircraft radios? If so, better clean up the trouble before you get an angry knock on the door in the middle of a QSO.

The Federal Aviation Administration says some electronic devices, including walkie-talkies and radio-controlled garage door openers, emit signals that interfere with aircraft communications. And an FCC official says these gadgets, plus such items as electronic heaters, wireless microphones, and welding tools have polluted the radio spectrum with noise. He reports the FCC received 40,000 interference complaints last year, with the most serious ones involving aviation communications.

Modern air transportation depends heavily on radio for navigation and air traffic control, as well as for routine communications. A few seconds of interference at a critical time during a flight could easily spell doom for over a hundred people. For these reasons, the FCC was recently given added authority to crack down on gadgets that interfere with legal communications. Got the message?

News for GIs. The FCC seems to be leaning over backwards to encourage folks of all ages to obtain Novice Class ham licenses and make use of them for their intended purpose—to learn about ham radio through on-the-air operation. A while back the Feds extended the Novice license term to two years. Now special provision has been made for Novices who go into military service overseas.

James E. Barr, chief of the FCC's safety and special radio services bureau, reports that if a serviceman has a Novice license (Continued on page 108)
Many times when I left my desk I had to leave a note for my secretary. Frequently these notes were lost in the pile of mail on her desk, and they finally got so cumbersome she suggested using a code of numbers—each having a different meaning. For example, the number 5 on a sheet of paper could mean "I have left the building for the morning."

After trying this for a while, the next step was to convert this random system of messages into an electronic device that met two criteria. First, it had to be pleasant to have on the desk. And second, it had to communicate the message efficiently.

Secretaries, bless them, love flowers. And flowers are a natural way to effectively conceal a message indicator. So I purchased a bouquet of artificial flowers and hid a neon Nixie tube amid the colorful posies. With these digits coming through nicely, the Flower Power Signalite later took on many of the duties of an intercom—often too expensive and too noisy for many offices and homes.

Digital Design. To illustrate how the Signalite worked, my code for "Don't bother me no matter what" was the number 0. The number 1 soon came to mean "Please come in for dictation"—and so on through the ten digits. /With continued use, other features
FLOWER POWER

proved helpful and they were added. For instance, a remote switch was provided for my secretary so that when she had understood the message, she could turn off the indicator. The sharp click of the relay in the control unit on my desk was a clear indication that the message had been read AOK.

Whatever applications you discover, the numerals lend themselves to any sort of code you wish to devise. Simplicity, however, should be the key factor in your system.

Off and Running. A tilted, cowl-type chassis/cabinet was selected to give a pleasant appearance on the desk. The parts will fit into any small cabinet of at least \( \frac{3}{4} \times \frac{3}{4} \times 3 \frac{1}{2} \) in. with room to spare. (A cabinet measuring \( 5 \times 5 \times 5 \) in. is given in Parts List.)

First remove the cover, then tape white paper firmly over the faces of the cabinet. Using the pictorial diagram, lay out the drill centers on the front, bottom, and rear of the control box.

The two rocker-switch holes are best cut by constantly comparing the rocker arm and the rectangular hole as you shape and file. A little care will provide a neat, rectangular cutout. Black paint along the edges of the holes improves their appearance. Drill the other holes in the bottom and rear of the chassis according to the diagram.

Install the power cord using a strain-relief plug, and leave about six inches extending into the box for wiring purposes. Two terminal strips, an eight-pin and a three-pin, come next. You can use round-head screws,

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**PARTS LIST FOR FLOWER POWER SIGNALITE**

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1, C2</td>
<td>30-uf, 250-VDC electrolytic capacitor</td>
</tr>
<tr>
<td>CB1</td>
<td>Circuit breaker (Sylvania MB-315 or equiv.)</td>
</tr>
<tr>
<td>D1, D2</td>
<td>1N4365 silicon rectifier (Texas Instruments)</td>
</tr>
<tr>
<td>I1</td>
<td>Snap-in neon panel light, 1-in. dia. (Burstein-Applebee 17C312 or equiv.)</td>
</tr>
<tr>
<td>I2</td>
<td>Neon-glow readout tube (National Electronics NL840 or equiv.)</td>
</tr>
<tr>
<td>K1</td>
<td>115-V, 10-A, 3PDT enclosed relay (Guardian IR 1220-3C-115A or equiv.)</td>
</tr>
<tr>
<td>K2</td>
<td>115-V, 45-sec. spst thermal delay relay, 9-pin min., normally closed (Amperite 115-C45T or equiv.)</td>
</tr>
<tr>
<td>P1</td>
<td>Power cord and plug, grey, 7 1/2 ft. (Burstein-Applebee 198800 or equiv.)</td>
</tr>
<tr>
<td>R1</td>
<td>1,000-ohm, 20-watt resistor</td>
</tr>
<tr>
<td>R2</td>
<td>15,000-ohm, 1/2-watt resistor</td>
</tr>
<tr>
<td>S1, S5</td>
<td>Spst rocker switch (Burstein-Applebee 18D510 or equiv.)</td>
</tr>
<tr>
<td>S2, S3</td>
<td>Spst, red pushbutton switch, normally open</td>
</tr>
<tr>
<td>S4</td>
<td>Spst, black pushbutton switch, normally closed</td>
</tr>
<tr>
<td>S4</td>
<td>1-pole, 12-position, non-shorting rotary switch (Mallory 32112J or equiv.)</td>
</tr>
<tr>
<td>I-Box</td>
<td>Box for black remote control (see text)</td>
</tr>
<tr>
<td>I-Unshielded intercom cable</td>
<td>(Allied 55E8552 or equiv.—see text)</td>
</tr>
</tbody>
</table>

Misc. | Miniature 9-pin socket, terminal strips (see text), fuse clip, \( \frac{3}{8} \)-in. standoffs, strain-relief plug, artificial flowers, decals, grommets, hardware, wire, solder, etc. |

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Circuit below comes to life when superimposed numerals in neon Nixie tube (I2) start to light up. Note voltage doubler (D1 and D2) which powers this fantastic tube. Since line voltage (117 VAC) is used throughout, watch your own digits while wiring for those of neon variety.
but it would be better to use countersunk flats if they are available. Two Cinch-Jones terminal strips and the fuse clip for the Sylvania circuit breaker are now mounted as shown in photo.

Before mounting the nine-pin socket for the Amperite miniature delay tube, wire pins 1, 3, 6, and 9 of the socket with a 6-in. length of #20 wire. Then mount the socket using 3/4-in. standoffs. Be careful not to short the metal pins to any surrounding metal.

**Cord to Cable.** The two 30-μF capacitors are dressed along the floor of the chassis with the plus ends facing the Amperite tube. This way, the positive ends use the three-pin terminal strip and the negative ends connect to the eight-pin strip.

The mounting plate provided with the relay is snapped on to the unit, and the assembly is then mounted to the rear wall of the box.

It is helpful to start wiring at the power cord and work through the schematic towards the output cable going to the Nixie.
FLOWER POWER

tube. When hooking up the relay, check your work against the schematic provided with it. Then, before you turn the unit on, assure yourself that R1 (the 20-watt, 1000-ohm power resistor) is mounted clear of other wires and circuitry. This resistor will get very hot, so adding some ventilation holes near it might not be a bad idea.

Diodes D1, D2, and resistor R2 are mounted on the eight-pin terminal strip. The remote-cutoff button (this is switch S3 on the schematic diagram) must be mounted in a chassis so that its terminals cannot be touched. You can use any sort of box or cover that is appropriate.

Control box has symmetrical layout and will have attractive appearance on any desk. Power cord and intercom cable can be hidden.

The eleven leads from I2 (the Nixie tube) and two leads from the remote button are now wired into the box. (Note—since there are no unshielded intercom cables having just 13 leads, a cable with 18 leads is given in Parts List. Many of the parts for your Flower Signalite may be difficult to obtain locally. Consult catalogs of Burstein-Applebee, 1012 McGee St., Kansas City, Mo. 64106, and Allied Radio, 100 N. Western Ave., Chicago, Ill. 60680, for the components listed.)

When all wiring is completed, it should be checked thoroughly. Line voltage (117 VAC) is used throughout, so the circuit can be dangerous if connected improperly. Circuit breaker CB1 will open at about 1.5 A. However, it closes again when cool, even though the short still remains. It is best to unplug the cord as soon as possible after a short is noticed.

Neon Glow. There are at least two neon numerical-indicator tubes available on the market. Burroughs Corp. and National Electronics both sell indicators using the neon glow principle (a National Electronics model is given in the Parts List). The Nixie tube was used with a cut-down socket.

One artificial flower was disassembled and strung around the tube wires. The petals and leaves were added to give a natural look and to make it look as though the tube were the natural center of the flower. The wired flower was then clustered amid the others in a colorful bouquet. It is a good idea to weigh down the base with BBs to prevent it from being top-heavy.

Turning on power switch S1 energizes panel light I1 only. The relay is wired as a latching device and is activated only by pressing S2 (red button). Operation may be continuous, or timed to switch off in 45 seconds. The timed sequence is initiated by switching on S5.

The relay may be unlatched by either the remote button, the internal timer, or the power switch. The timer circuit opens the relay after 45 seconds, assuming a message has not been sent during the previous minute. If messages are sent (using timer cutoff) in intervals of less than two minutes, relay shut-off times will be less than 45 seconds. The sound of the clicking relay is enough to tell you when the indicator switches off.

The message indicator can be energized for longer times by switching off the timer control. In this position the relay can only be turned off by the remote button or the main power switch. However, it is best not to leave the message on for too long, as R1 will eventually heat up excessively. The unit is designed for message-on times of three minutes or less.

The twelve-position selector switch S4 is used to select any one of ten digits from 0 to 9. Note that there are two off positions on S4 which are adjacent.

Your Flower Power Signalite will find use in the office, between den and kitchen or workshop and kitchen, and especially in the sick room. It is particularly useful when voice transmission is either impossible or impractical. In machine shops, for example, a voice intercom between foreman and front office would be of very little help to either party.

But gal Friday should be the principal beneficiary. You know a fellow can never go wrong if he gives his girl flowers—especially if there's a message for her.
You never realize just how much space a little speaker eats up till you see a solid-state transceiver without a speaker inside. A case in point is Amphenol’s latest entry in the CB field, the model 750 5-watt transceiver. Yes, that little package shown in the photo is just about the size of a walkie-talkie and less than a hand’s span wide.

And now hear this: it’s also a full 5-watt transceiver. Fact is, the photos don’t show how small it really is, because the unit can actually be tucked into a coat pocket!

Measuring just 2 x 4¼ x 5½ in., the 750 gets its small size by eliminating the speaker from the case (the rest of the circuitry common to a 5-watt transceiver is all there). And where’s the speaker? In the microphone case—as you may have already guessed. Depress the PTT (push-to-talk) button and you switch the speaker into the modulator circuit to make like a microphone. Yet it looks for all the world like a standard hand-held mike.

CC On Six. The remainder of the transceiver is more or less standard for the low-priced group. Both the transmitter and receiver are crystal-controlled on any of six channels. Separate crystals are used for both transmit and receive. The transmitter is a 3-stage affair with a triple L-section tuned output circuit. The receiver is single-conversion with a stage of RF amplification, a mixer, an oscillator, two stages of IF amplification, a noise limiter, and AF output.

An external jack on the rear apron allows connection of a standard remote speaker. The external speaker jack automatically disconnects the “mike” speaker during receive when the remote speaker is plugged in. Yet the mike functions normally in the transmit mode even with a remote speaker connected.

To obtain greater selectivity (or adjacent-channel rejection) than is common with two stages of IF amplification, a ceramic filter is used in the first IF amplifier.

The transceiver is supplied complete with one set of crystals, the mobile mount, and a plug-jack connected microphone. The DC power leads are permanently connected for 12-V negative-ground operation. The channel-selector window is illuminated, and a set of numerals is provided so the user can slip in the appropriate channel markers.

Two Brackets. Two microphone brackets are provided. One is the standard clip-type which can be mounted just about anywhere on the dashboard. The second bracket is somewhat unusual—it’s a grooved plastic
LAB CHECK

block permanently mounted on the bottom of the transceiver case.

The top of the “mike” speaker has a mating plastic block that slides into the grooved bracket. When the “mike” speaker is slipped into the groove it becomes part of the transceiver, and the sound radiates forward just as though the speaker were built into the front of the transceiver case. Yet when a call is received, the user simply slips the “mike” speaker out of the grooved holder and brings it toward his face.

Performance. Since gimmicks are worthless if performance isn’t up to par, we tested the Amphenol 750 just as we would any other 5-watt transceiver. The transmitter’s performance was typical of most other solid-state transceivers. Power output with a 13.8-V power supply (simulating battery charging voltage in a moving auto) checked out at 3.1 watts into a 50-ohm load. The modulation sensitivity (the signal into the microphone) at 1000 Hz was exactly average for 85% modulation. (The 85% figure is the standard measurement value and is essentially equal to 100%.)

Negative modulation was limited to 100%, and test signals into the microphone equal to a very loud shout did not cause overmodulation. Due to use of a speaker-type microphone, modulation quality resulted in a sound very much like that from a standard intercom.

Receiver section sensitivity checked out at 0.8 µV for a 10 dB S+N/N (signal plus noise to noise) ratio, somewhat better than the claimed specs. Adjacent-channel rejection measured 31 dB, considerably better than claimed by the manufacturer. Image rejection, the ability of the receiver to reject signals appearing at twice the IF frequency, measured but 4 dB (poor). Still, this is typical of nearly all single-conversion solid-state transceivers. Further, normally there are no signals on the image frequency, so the user will seldom be bothered by image-frequency interference.

AGC action for a 1 to 1000 microvolt test signal range was 4 dB (good). By way of explanation, AGC (automatic gain control) is provided in a receiver to avoid overload on strong signals, and to prevent strong signals from blasting from the speaker when the volume control has been cranked wide open to pick up a weak station. The effect of AGC is to automatically reduce the receiver’s gain on strong signals.

Between the input signal test values of 1 µV (to simulate a weak signal), and 1000 µV (to simulate a very strong signal), the 750’s AGC reduced the 60-dB signal spread to a mere 4 dB variation in speaker output level. So good was the AGC action, in fact, that the change in sound volume between the two stations was barely noticeable.

About the size of a walkietalkie, the 750 accepts six transmit, six receive crystals.

Low-Power Drain. Besides its very small size the Amphenol 750 features a very low current drain. The total consumption is only 170 mA in receive/standby, and 1.2 A during transmit. Because of this low current drain a set of 6-V lantern batteries used as a portable power supply will provide several hours of operation. The batteries can even be tied to the top of the transceiver, and the addition of a book strap would complete a very portable, full 5-watt station.

Summing Up. Where size is of first importance the Amphenol 750 is the first choice. The unit goes for a mere $79.95.

For additional information write to the Amphenol Corp., Dept. DF, 2875 S. 25th Ave., Broadview, Ill. 60153.
THE HOOFIN' HEART

In the beautiful rolling hills of New Jersey, a young veterinarian is using aerospace technology to write a new chapter in man's scientific efforts to learn more about the horse.

Dr. G. Frederick Fregin is pioneering in the field of radioelectrocardiography in veterinary medicine. Specifically, he's studying race horses to find out what constitutes their normal heart activity under varying conditions, so that later he will be able to discover abnormalities.

Radioelectrocardiography is the use of radio telemetry for heart study. The telemetry equipment measures the activity of the heart and transmits the results to a distant receiving device.

With techniques of modern medicine it is relatively easy to record the electrocardiogram (ECG) of a human. A doctor merely tapes electrodes to the patient's skin, attaches them to a small transmitter which can be carried in the patient's pocket, and studies the results on a nearby recording device.

Humans vs. Horses. Significant work has been done in human electrocardiography, but there hasn't been much done with horses," Dr. Fregin observes. Though the first normal ECG of a horse was published in 1910, little has been done in the field since, and nothing with radioelectrocardiography until recently."

Dr. Fregin became interested in radio telemetry as a post-doctoral student at the University of Pennsylvania's School of Veterinary Medicine, where he is now a fellow in cardiology. A guest lecturer, Dr. T. Senta, described how he and his associates in Japan, using radio telemetry, had been able to take a horse's ECG while the horse was running. Intrigued by the Japanese experiments, Dr. Fregin borrowed some radio telemetry equipment from Dr. Samuel Bellet, a widely known cardiologist who had studied...
The Hoofin' Heart

the heart reactions of automobile drivers to various situations behind the wheel.

But Dr. Fregin had difficulty adapting the technique: “When the horses stood still, the ECG trackings were good. But during exercise, the horses sweated so profusely and moved so violently that the electrodes kept pulling loose.”

Dr. Fregin experimented with various combinations of electrodes, electrode housings, jellies, and glues, and finally found a combination that worked. But a more serious problem arose: his borrowed equipment was not powerful enough. If a horse moved more than a few feet away, the signal would not reach the receiver.

Longer Range. He procured even more powerful equipment from a United Aircraft medical telemetry group based in the corporation's Hamilton Standard Division in Windsor Locks, Conn. The new equipment suited Dr. Fregin's work perfectly. A more powerful transmitter and the use of a special antenna on the receiver increased the range to about a half-mile.

The doctor began further testing on race horses in Hydes, Md. He even devised a special saddle to carry the transmitter so as not to encumber the highly excitable thoroughbreds. He was encouraged by the way the equipment worked, so he extended his testing to the more docile American standardbreds, the breed normally associated with harness racing.

Still, the doctor was working in virtually uncharted waters. With standard equipment, it had been possible to take a horse's ECG before radio telemetry, MDs only guessed at horse's maximum heart rate—about 260 beats.
Doctor Fregin secures saddle before test run. He designed special saddle so as not to disturb and encumber highly excitable thoroughbreds. Here, transmitter goes into empty pouch. But for work with trotters, transmitter is strapped on to back of sulky driver by means of a special harness.

within a minute or two after exercise—the time it took to bring the horse from the track and attach it to the device. But the heartbeat of a horse slows quickly during the first minute after such exercise, sometimes as much as 100 beats a minute.

With radio telemetry, the ECG can be taken either while the horse is on the dead run or while it is standing quietly in its stall. The resulting information has surprised veterinarians.

When a normal horse is resting, its heart usually beats 30 to 35 times a minute. During strenuous exercise, Dr. Fregin has measured the rate as high as 260 beats a minute!

No More Guessing. Doctors had only guessed the maximum heart rate of a horse, because before radio telemetry there was no way to measure it. “The increase in rates between rest and heavy exercise that we have seen with radio telemetry are remarkable and much higher than many doctors would have believed possible,” Dr. Fregin comments.

The doctor has begun to compile statistics on horses’ heartbeats under varying exercise conditions to establish what is normal and what is abnormal. Without such data for comparison, future examinations would be meaningless. He has confined his study to taking radioelectrocardigrams of 20 clinically normal horses at rest, during exercise, and immediately after exercise.

“We know certain changes occur in the ECG of humans during various stages of exercise. Similar changes also appear in horses. Some people have felt that these ECG changes in horses suggest signs of mild cardiac damage, others say the changes are normal. I want to find out what they really mean in otherwise normal, healthy horses.”

Before he reaches any conclusions, the doctor will weigh whatever he learns by means of radio telemetry with information gathered during extensive physical examinations of the horses. He expects his study to take about a year, and the results will be the basis of his master’s degree thesis. The 29-year-old doctor spends much of his time in his second-floor office and in the adjacent barns and laboratories which make up the quadrangle of the School of Veterinary Medicine in downtown Philadelphia.

(Continued on page 112)
"Yes, Sir, that's quite an antenna you have."

"The main thing it picks up is girls!"

"I'll carry it up... you ask if it's waterproof!"

"Come on, Tommy, tell Daddy where his radio is!"

"Yes, I would mind moving to the left!"

"Have to get it checked... picture's weak again!"
In this issue of White's Radio Log we have included the following listings: U.S. AM Stations by Frequency, Canadian AM Stations by Frequency, U.S. Television Stations by States, Canadian Television Stations by Cities, and World-Wide Shortwave Stations.

In Our Next Issue, Oct.-Nov., 1968, the Log will contain the following listings: U.S. AM Stations by Location, U.S. FM Stations by States, Canadian AM Stations by Location, Canadian FM Stations by Location, and an expanded Shortwave Section. The shortwave listings are always completely revised in each issue of Log to insure 100 percent up-to-date and accurate information.

In the December, 1968 issue of RADIO-TV EXPERIMENTER, the Log will contain the following listings: U.S. AM Stations by Call Letters, U.S. FM Stations by Call Letters, Canadian AM Stations by Call Letters, Canadian FM Stations by Call Letters, and an expanded World-Wide Shortwave Section.

Therefore, in any three consecutive 1968 issues of Radio-TV EXPERIMENTER magazine, you will have a complete cross-reference listings of White's Radio Log that is always up-to-date. The three consecutive issues are a complete volume of White's Radio Log that offers up to the minute listings that are not to be found in any other magazine or book. If you are a broadcast band DXer, FM station logger, like to photograph distant TV test patterns, or tune the shortwave bands, you will find the new White's Radio Log format an unbeatable reference.

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Every effort has been made to insure accuracy of the information listed in this publication; but absolute accuracy is not guaranteed and, of course, only information available up to press-time could be included. Copyright 1968 by Science & Mechanics Publications, Inc., 505 Park Avenue, New York, New York 10022.
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1490 – 201.0

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5000 – 10000

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**Canadian AM Stations by Frequency**

Canadian stations listed alphabetically by call letters within groups. Abbreviations: kHz, frequency in kilocycles; W.P., power in watts; d, operates daytime only; n, operates nighttime only. Wave length given in meters. Listing indicates stations on the air up to April 1, 1968.
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### Canadian Television Stations by Cities

**Abbreviations:** Chan., channel; C.L., call letters.

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<thead>
<tr>
<th>Location</th>
<th>C.L. Chan.</th>
<th>Location</th>
<th>C.L. Chan.</th>
<th>Location</th>
<th>C.L. Chan.</th>
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<tbody>
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<td>Cawston, B.C.</td>
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<td>Mad River, Ont.</td>
<td>CHSTV-5</td>
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<td>White, Ont.</td>
<td>CHSTV-5</td>
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<td>Sydney, N.S.</td>
<td>CHSTV-5</td>
<td>Wicklund, B.C.</td>
<td>CTV-5</td>
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<td>New Glasgow, N.S.</td>
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<td>Williams Lake, B.C.</td>
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**Canadian Television Stations listed alphabetically by cities.**

**Vermont**

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<td>St. Johnsbury</td>
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<td>Windsor</td>
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<tr>
<td>Hampton-Norfolk</td>
<td>WVEC-13</td>
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<tr>
<td>Richmond</td>
<td>WTVR-10</td>
</tr>
<tr>
<td>Portsmouth</td>
<td>WWVA-7</td>
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<tr>
<td>Portsmouth, Norfolk</td>
<td>WAVY-10</td>
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<td>Richmond</td>
<td>WRVA-2</td>
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<td>Roanoke</td>
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<td>Ogden</td>
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**Wisconsin**

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<td>Milwaukee</td>
<td>WTMV-15</td>
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<td>West Bend</td>
<td>WTMJ-4</td>
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<td>Milwaukee</td>
<td>WITI-6</td>
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<td>Huntington</td>
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<td>Oak Hill</td>
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<td>Wheeling</td>
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**Wisconsin (cont.)**

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<td>Milwaukee</td>
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<td>WTMJ-4</td>
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<td>Waukesha</td>
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<td>Riverton</td>
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<td>Laramie</td>
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**Guam**

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<td>Pago Pago</td>
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<td>Tumon Bay</td>
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**Puerto Rico**

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<td>Guaynabo</td>
<td>WSRU-9</td>
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**Virgin Islands**

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<tbody>
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<td>Charlotte Amalie</td>
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<td>Christiansted</td>
<td>WSVI-8</td>
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<table>
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<tr>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>White's</td>
<td>C-kTV</td>
</tr>
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</table>
A THANK YOU NOTE FROM THE EDITORS

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

For this issue we have some real goodies for you to seek out from the static in DX-ing’s biggest no-prize non-contest. Let's see how your ability and equipment stack up in the hunt for the following stations:

1. Nepal is one of those mysterious little Asian countries which seldom make the headlines, and even less often the loudspeaker of a shortwave receiver. They are in there though and it's a real challenge to dig them out. Look for Radio Nepal, in Kathmandu, broadcasting in English at 1400 GMT on 4600 kHz. They are also being reported with a Sunday program on 4500 and 7100 kHz from 0745 to 0805 GMT.

2. While we’re in the remote reaches of Asia, would you believe that there’s also a station in Inner Mongolia? Surely is, and if you try real hard (with a good receiver) you just might hear it! The station is located in Huhehot and operates 4068 kHz from 2200 GMT. Another one reported is in Hailar and is on 3900 kHz from 2330 GMT, but this in the 75-meter Ham band and you can probably forget about hearing it unless you're also in Inner Mongolia.

3. With the government urging us to curb our overseas travel we can still play at being part of the international jet set. It's easy, just tune your receiver to 8879 kHz some evening and listen to the jets talking to the ground stations throughout Europe, Africa, and Asia.

This Issue’s Contributors


Jerry Padgett, Kansas City, Kans.
Helen Parker, N.Y., N.Y.
Jim Rueske, Hillsboro, Ore.
Bill Sand, Chicago, Ill.
Gladys Sienkiewicz, Brooklyn, N. Y.
Ernst Smith, Alto, Ala.
Clifford Steggell, E. Detroit, Mich.
Loren G. Vanderzyl, Pella, Iowa
Gary Yates, Ogden, Utah

August-September, 1968

105
the Pacific. How many ground stations and aircraft can you log in a 30 minute period?

4. Not to forget those of you who prefer ship travel to the airliners, here are some hints on listening to ships on the high seas communicating with shore stations. For instance, if you listen on 12355 kHz tonight you might be treated to some of the major passenger liners contacting ports throughout the world. How many can you log in 1-hour?

5. Tune to 9555 kHz. Do you hear the BBC's West African Relay Station in Monrovia, Liberia? You do? Good, take 5 points off your score because the station just ceased operation. If you didn't hear it, give yourself a 5 point bonus for being honest—a rare quality in many areas of the DX reporting hobby.

6. Get this one while it's still on the air! It's The Voice of The Arctic, a bootleg 100-watt broadcaster which transmits programs to the Eskimos in their own language on the Ham-band frequency of 3750 kHz. The owner, a colorful fellow by the name of Dutchman Joe Sanders, is trying to get the station licensed by the Canadian D.O.T. Schedule isn't regular, so check the channel from time to time.

7. Martinique is a beautiful island which isn't too often reported by listeners. Of late, it has been heard and you might try to cash in on this. Look for the French Telecommunications Service, in Fort de France, on 17575 kHz at 1215 and 1800 GMT.

8. Do you wait for Kuwait? If so, wait no longer, this tiny Persian Gulf country is being heard on 4967 kHz from 0400 to 0600 GMT.

9. The Swiss Red Cross is going to run some radio tests from their seldom-heard transmitter. The tests will run from now until the end of November (only 2 or 3 days per month) and are on 7210 kHz at 0600, 1130, 1700, and 2300 GMT. If you hear the tests, send a report to them at 7 Avenue de la Paix, Geneva, Switzerland. You'll get a QSL if your report is complete and correct.

10. Listen in on the latest charges, counter-charges, peace talks, peace-talk condemnation, etc., etc. from North Vietnam's one and only Radio Hanoi, also called The Voice of Vietnam. In English at 1000, 1300, 1530, and 2300 GMT on 7210, 9760, 9840, 11760, and 11840 kHz. If you have a good sense of humor you'll enjoy their rantings.

Here's how to score. 10 points for numbers 1, 2, 6, 7, 8, 9, 10. Numbers 3 and 4 get one point per logging. Number 5, as indicated.

Since this month we had a few real toughies thrown in we'll go easy on the ratings, but you should make a showing of at least 30 points without any trouble. From 31 to 50, very good! From 51 to 60, excellent. From 61 to 80—you're a super shortwaver! Above 80—who are you trying to kid?

---

**10-Meter Band—3200-3400 kHz**

<table>
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<tr>
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<th>Call</th>
<th>Identification</th>
<th>Location</th>
<th>GMT</th>
</tr>
</thead>
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<td>3305</td>
<td>VLBBD</td>
<td>R. Daru</td>
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<td>3335</td>
<td>VLRCD</td>
<td>R. Wewak</td>
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<td>3340</td>
<td>R. Tucker</td>
<td>Guiné—</td>
<td>1245</td>
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<tr>
<td>3346</td>
<td>R. Zamba</td>
<td>Lusaka, Zambia</td>
<td>0400</td>
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<td>3346</td>
<td>R. Exitois</td>
<td>Santiago, Dom.</td>
<td>0310</td>
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<td>3400</td>
<td>Peoples Liberation Army</td>
<td>Fukuin, China</td>
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<tr>
<td>4715</td>
<td>CRAB</td>
<td>R. Clube Mindelo</td>
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<td>4753</td>
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<td>Makassar, Indonesia</td>
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<td>V. Evangelica</td>
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**60-Meter Band—5950-6200 kHz**

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<td>R. Jan</td>
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### 41-Meter Band — 7100-7300 kHz

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### 31-Meter Band — 9500-9775 kHz

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### 25-Meter Band — 11750-11975 kHz

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### 19-Meter Band — 15100-15450 kHz

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### 13-Meter Band — 21450-21750 kHz

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</table>
Ham Traffic
Continued from page 78

which expires while he’s on overseas military
duty, he may apply to have it renewed when
he returns to the U.S. Formerly, Novice
tickets were not renewable. This exception
to the rule is a worthwhile one.

Radio Shorthand. In a previous column,
some radio operating procedure signs (“pro-
signs”) for use on CW were introduced as
an aid to efficient operating. Here are some
more you can put to use. AR (sent with the
letters run together, like this: didahdidahdit)
has two uses. It can mean go ahead when
you have called another station, but haven’t
actually made two-way contact yet. For ex-
ample, if I called WA2CQL, I would send
WA2CQL DE W7DQS AR on my first call.
After he acknowledged my call, I would no
longer use AR when telling him to go ahead,
but would use the normal K each time I
stood by for him.

The other common meaning for AR
(again with the letters run together into one
Morse character) is to serve as a warning
to the station you’re working that you are
preparing to stop transmitting and will listen
for him. In this case, you send AR before
actually sending the calls. You still use the
regular K after signing the calls.

For example, after concluding one trans-
mittance in a series making up a QSO, I
would send AR WA2CQL DE W7DQS K.
The AR serves to tell WA2CQL that it’ll be
his turn to transmit in a jiffy, so he’d better
push aside his coffee cup and reach for the
transmitter key.

SK (again sent with the letters run to-
gether: didididahditah) means this is my
final transmission, but I will stand by for
your final. Good operating practice calls for
this to be sent before signing the calls, again
to give the other chap a warning as to what’s
on your mind.

For example, when I run out of things to
say to WA2CQL, I would send SK WA2CQL
DE W7DQS K. He would then say what was
on his mind, send a 73 (I hope!) and sign
out, concluding the QSO. I might send a
snappy GE meaning good evening, or GN
meaning good night and the QSO would be
ended.

KN (with the letters run together: dah-
didahditahdit) is a go ahead to the specific
station you called, with the additional request
that no one try to break in. This one is not
used very often (there really isn’t much need
for it), but once in a while it comes in handy.
Anyone trying to break into a QSO after
hearing KN sent is a double-headed, droop-
eared, diddle-brained lid. Agreed?

AS (with the letters run together: didah-
didit) means simply wait. You use it any-
time you need to stop sending for a few
seconds, but want the other op to sit quietly
until you resume. You can use it any time
you need to look up something in a book,
pick up a pencil that rolled under the desk,
put out the cat, or hush up the kids. As a
matter of courtesy, try not to make the other
fellow wait too long.

The pro-sign C means simply yes and N
means no. They’re very useful because
they’re short, and there’s no chance of a
mistake if they are sent clearly. Even so,
many hams ramble on and on to say what a
simple dahdidahdit or dahdit would do.

Pro-signs can speed up CW operating
tremendously by taking care of all routine busi-
ness with snappy abbreviations and allowing
more time for the real meat of your trans-
missons. Use ‘em often—and accurately!—
and you’ll soon rank among the pros on the
ham bands.

Hear That Star?
Continued from page 60

“No need,” said Gerard. “I have one crew
running a complete recheck of all equipment
while Pitts and his boys play anagrams with
your new theory of versified astronomy.
Besides, if I went down there Pitts might start
asking questions, and then what would I
say?”

Pitts came in, tight-lipped and plainly an-
noyed, clutching a scrap of notebook paper
in his right hand. He looked like he thought
the sky was falling.

“We have two complete words, and the
rest is falling into place quite rapidly,” he
told Gerard. “But I’m afraid the staff is a
little upset.”

Paul looked quickly at Gerard, then jerked
the sheet from the young man’s hand; and
he and Gerard read it together. It said,
“Twinkle, twinkle...”
New Products
Continued from page 33

Martel Electronics Sales Uher Deck 7000

± dB @ 3¾ ips. And the Uher Deck 7000 is only $139.95. Write to Martel Electronic Sales, Inc., 2356 S. Cotner Ave., Los Angeles, Calif. 90064, for further info.

Little Box—Lotsa Zotz!
The Black Cat from Wawasee Electronics (model JB75A) is a mobile linear amplifier for 10-meter ham band and business band operating from 21-38 kHz, principally designed for remote operation with complete automatic switching of the antenna for transmit-receive. This is done by a transistorized RF keyer. The keyer also switches the high-voltage power supply on during transmit time, thus allowing a very low standby receive current drain. The operating voltage is 12-14 VDC, negative ground only; input impedance is 52 ohms; output impedance, 52 ohms. Size is only 2 x 6 x 8 in., and the Black Cat weighs 3 lbs. Maximum output is 75-100 watts; maximum power gain 14-16 dB. The manufacturers would have you put a Black Cat in your trunk, instead of a tiger in your tank. List price is $147.50, and you can get further specs from Wawasee Electronics Co., Box 36, Syracuse, Ind. 46567.

Light Around a Corner
Here's a neat tool for hobbyists! A flexible flashlight which can be twisted, bent around corners, snaked into narrow openings. Based on the principle of the gooseneck lamp, the body is 5-in. long and the flexible head is another 4 in. It has a black leatherette cover and a clip for fastening to shirt or belt. The price is $2.00 postpaid, less batteries. Send for this handy dandy to Bryce-Branton, 690 Southern Ave., Muskegon, Mich. 49440.

Wawasee Electronics Black Cat

“No-Parts” Slave Flash
Continued from page 56

with most modern-day miniature electronic flash units. Some flash units require a polarized standard AC plug, available at most photo dealers. A possible connector variation would be to install a P-C type connector directly at the end of the plastic tube. No, additional interconnecting cable would then be required; the electronic flash would plug directly into the triggering unit just like they were made for each other.

Sensitivity of the assembled unit is high enough to trigger on light reflected back from the subject being photographed. Angle of light acceptance is approximately 180 deg with the LASCR lens unshielded. If narrow angle of acceptance is desired, the LASCR can be recessed into the plastic tube.

No inclination toward self-trIGGERING has been evidenced in various levels of ambient light. However, if conditions are such that the ambient light triggers the flash units, sensitivity can be reduced by reducing the value of the gate resistor.

Since no batteries are required for this unit, and a minimum of components used, reliability is extremely high. Useful life, in fact, is limited only by mechanical failure.
In 1962, Sarnoff presented what many consider to be a definitive projection of man's world at the end of the century. Writing in Fortune Magazine, he outlined the shape of things to come—in food resources, raw materials, energy, health, communications and transportation, among others. And he wrote: "By the year 2000 A.D., I believe our descendants will have the technological capacity to make obsolete starvation, to lengthen appreciably the Biblical lifespan and to chance hereditary traits. They will have a limitless abundance of energy sources and raw materials. They will bring the moon and other parts of the solar system within the human domain. They will endow machines with the capacity to multiply thought and logic a millionfold."

As science continued to unfold at an astounding pace, Sarnoff's mind turned typically from problem to solution. At the celebration of his 60th anniversary in communications and electronics, he said: "In the past sixty years our attention has been focused primarily on the means to translate scientific knowledge to practical ends. Now I believe we must involve ourselves in the social applications of technology with the same energy and devotion that we give to its development. As the creators of progress, we share a new and fundamental responsibility to the purpose it serves."

Always a realist, Sarnoff's thinking nevertheless reflects a fundamental optimism about the prospects of the human race. In the last excerpt to appear in Looking Ahead, he writes: "If we muster the wisdom to use the tools which technology has given us, the generosity to devote them to the benefit of all men, the humility to live in harmony with nature, there is little in the spectrum of human progress that is not within our grasp."

Looking Ahead: The Papers of David Sarnoff, was published by the McGraw-Hill Book Company and is available at libraries, bookstores, or direct from the publisher—330 West 42nd Street, New York, N. Y. 10036.
Gold Grabber
Continued from page 44

the tuning screw of L2 until you hear a loud beat note. Further adjustment of L2 should cause the beat note to pass through the zero-beat point and back to an audio note again.

If a beat note cannot be heard with adjustment of L2, check the voltage on the gate leads of Q1 and Q2. The voltage should be measured with a VTVM. Our unit measured \(-3.5\) V at the gate of Q1 (across R1) and \(-10\) V at the gate of Q2 (across R3). The exact voltages are not critical, since they will vary with a particular FET.

If there's a negative voltage on the gates of Q1 and Q2, indicating that the circuits are oscillating, but a beat note is not heard, change the number of turns of L1 until the frequency of the Q1 oscillator circuit is close enough to the detector circuit of Q2 to zero beat.

Finally, move a section of aluminum foil towards the loop. The beat note should change frequency and indicate the presence of metal.

Positive Feedback
Continued from page 22

University of Maryland. Since about 1965, a second group, under Dr. Robert L. Forward, a former student of Prof. Weber's, has been working at the Hughes Research Laboratories in Malibu, Calif. Prof. Weber's group has recorded events which could be the arrival of gravitational waves generated by astronomical bodies, but he is far from ready to claim that they are. Dr. Forward's group has not yet seen anything of the sort. He is convinced that he could, were his equipment sensitive enough. And he is seeking Government support to build more sensitive antennas.

Gravitational waves should be generated by accelerated masses. In principle, a spinning rod should generate gravity waves. But in practice, something the size of a baseball bat would tear itself apart before it could spin fast enough to generate an amount of power detectable with existing techniques. More practical sources for detectable gravitational radiation are astronomical bodies—planets in their orbits, stars revolving around each other—and it is gravity waves from these that are being sought. To detect a gravity wave would mean measuring the tensions and compressions set up by a wave from a distant source in a receiving body.

Using It. Practice operating Gold Grabber by burying several sections of aluminum foil a few inches under the ground in locations with differing types of soil and gravel. Hold the metal locator close to the surface of the earth and adjust the tuning slug of L2 to a convenient audio pitch.

Pass the loop over the area until you hear a sudden change in the audio tone, then dig for the aluminum foil targets. Practice with different audio tones until your ear is accustomed to the change in audio pitch that denotes a metal object.

The sensitivity of Gold Grabber is dependent on the surface area of the metal, its depth below the surface, and the composition and moisture content of the earth.

The energy radiated by the loop will be absorbed by the earth in various degrees, depending on the mineral content, etc. The larger the surface of the metal and the closer it is to the surface of the earth, the easier it is to locate. Gold Grabber was able to find a 3x3-in. square of aluminum foil under several inches of gravel and earth. You probably can do better, so get out there and start grabbing.

The most extended gravitational antenna available is the earth itself, and Prof. Weber's group has used it, seeking fluctuations of the earth's surface—at rates such as one fluctuation every 54 minutes. To search for these, the Maryland group had to build a gravimeter that would sense changes of one part in a hundred billion. They haven't found what they seek, perhaps because there doesn't happen to be any radiation at that frequency. But, the instrument is so good that NASA, which paid for it, wants to send it to the moon to study gravity there.

Now, that's a good idea and it may save a lot of money; however, if NASA sends too many failure projects up there, watch out! We may turn the moon into one vast dump—keep the moon beautiful!

“We'll go to work on it immediately. My 'ace' technician is within reach.”

www.americanradiohistory.com
But he is no stranger to the rolling farmland and horse country around New Egypt, N.J., about an hour’s drive from the university.

With the Trotters. On a recent day there, he stood between two rows of stalls and carefully attached electrodes to Keystone Dream, a three-year-old trotter. The bay stallion was one of more than 100 trotters and pacers on two adjacent farms, Egyptian Acres and The Farm, run separately by Stanley and Vernon Dancer, brothers whose names are practically synonymous with harness racing in the United States.

Dr. Fregin shaved patches of the horse’s hair about the size of a quarter to reach bare skin where he could glue the electrodes for his telemetry equipment. “It’s important to be very careful applying the electrodes,” Dr. Fregin stated. “We don’t want to use anything on the skin which might later cause irritation.”

It took the doctor several minutes to attach electrodes to Keystone Dream’s back, just behind his neck. Then he cleaned the hair from a patch on the horse’s chest between the forelegs and attached an electrode there.

A few minutes later, the doctor and a trainer, James Dancer, brought Keystone Dream outside and harnessed him to a training cart a little heavier than the sulky a driver usually rides during a harness race. The trainer climbed onto the seat and grabbed the reins, while the doctor attached wires to the electrodes on the horse, strung them along the side of the cart, and connected them to a tiny transmitter about the size of a cigarette package. Dr. Fregin stuffed the transmitter into a pouch strapped to the driver’s back. With a click of his tongue, the driver started the horse across a narrow road toward the half-mile training track at Egyptian Acres.

Bright Future. Vernon Dancer had been standing near his office next to the stable at The Farm, squinting into the sun to watch Keystone Dream being hitched to the cart. “Dr. Fregin’s work has all kinds of ramifications for someone like me who’s training and racing horses,” he said. Sometimes a horse runs very well for a while; then, for some reason, he tails off. His time isn’t good. He isn’t running as well as he should. We could hook him to the telemetry equipment and perhaps find something wrong. Or we can see how he reacts to a different kind of training.”

By this time, Keystone Dream was on the track, standing near Dr. Fregin’s receiving equipment set up on the hood of an automobile. The ECG tracings came steadily, plotting graphs on paper rolling out of the recorder. Satisfied that the transmitter and receiver were functioning properly, Dr. Fregin signalled for Keystone Dream’s workout to begin. First the horse walked, then jogged, then went into a fast trot. As Keystone Dream moved easily around the track, the doctor’s equipment picked up strong signals.

Dr. David A. Meirs, a New Jersey veterinarian who cares for many of the horses on Egyptian Acres and The Farm, was watching the activity from a shaded bench at trackside.

“The fact that Dr. Fregin is a cardiologist sets him apart from most of the other veterinarians in the United States,” Dr. Meirs said. “And the fact that he further specializes in horses sets him apart from all but a handful of the others. But because he is now involved in radioelectrocardiography in veterinary medicine, you have to call him a pioneer. This work just hasn’t been done before.”

Dr. Meirs said there were thousands of applications for radio telemetry in veterinary medicine. “Not just for horses, but for any animal,” he said. “Fred Fregin is pioneering in some exciting work which could prove very meaningful in our field.”

Training Techniques. Though Dr. Fregin is sticking to healthy, normal horses in his preliminary studies, he, too, is excited about other possibilities that are apparent for radio telemetry in veterinary medicine. In race horses, for example, it might be used to help evaluate training methods and to study the fitness of the animal being trained.

“Certain trainers train certain ways and produce winners at the track,” he observed. “But who is to say there isn’t a better way to train horses? With radio telemetry, I think we will be able to evaluate what is happening more scientifically.”

The training of race horses is but one potential. Radio telemetry does not require wiring an animal to a stationary machine, as a regular ECG device does, so the animal can move about freely and unencumbered while doctors observe from a remote position. Horses, dogs, cats, or cows, for ex-
example, can continue to live quietly in their regular environment while their hearts are constantly monitored.

"You could use it to see how an animal is doing before, during, and after an operation," Dr. Fregin comments. "With radio telemetry, you will be getting a truer picture of heart rate because nobody would be near the animal to excite it."

**Research Reigns.** Radio telemetry could be invaluable in studying the effect certain drugs have on animals during treatment, and one researcher recently published a paper on the blood pressure of giraffes that he studied in the field with radio telemetry.

Dr. Fregin is thinking ahead to future applications of radio telemetry to monitor other physiological functions in animals, such as blood pressure, temperature, and respiration (he calls them a previously untapped reservoir of information). Radio telemetry could be an invaluable diagnostic tool in veterinary medicine, according to Dr. Fregin, not only for detecting heart disease, but for respiratory disorders, blood disease and others.

But these things are in Dr. Fregin's future. Right now, he is concentrating on the study of strong, healthy race horses. "We have to screen for the normal and find out what the normal is, then later we can find the abnormal," says he.

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**Join A DX Club?**

*Continued from page 83*

Averages about 40 pages. Coverage includes BCB, SWBC, TV and FM DX, as well as Ham and Utility columns. Dues are $4.00 yearly.

**Canadian International DX Club (CIDXC),** 44 Carmen Ave., Winnipeg 5, Man. President, Lorne Jennings. This club is general coverage, with a monthly publication *Messenger* that runs to 40 pages. Columns include SW, BCB, Technical, Cardswap, and Utility. Dues are $3.50 yearly.

** Fircrest DX Club (FDXC),** 1021 Alameda Ave., Fircrest, Wash. 98466. President, Juris Burkevics. This Club has a monthly publication *DX Telegramme* that runs to 20 pages. Coverage includes columns on SWBC, BCB, CB, and Ham operations. Dues are $3.00 yearly.

**Intercontinental DX Club (ICDXC),** 94 Pegasus Trail, Scarborough, Ont. President, Richard Langley. Club stresses active participation in SWBC, VHF, LF, Ham, and Utility bands. Bi-monthly publication is called *Hi.* Dues are $1.70 yearly for U.S.

**International Radio Club of America (IRCA),** Box 605, Beaverton, Ore. 97005. Secretary-Treasurer, Bill Nittler. This Club's publication *DX Monitor* is issued weekly during the BCB peak season and monthly during the summer months; it averages 25 pages. Coverage is BCB DX exclusively. Dues are $4.40 yearly.

**National Radio Club (NRC),** Box 99, Cambridge, Mass. 02138. Executive Secretary, John Callarman. This is an all BCB club and certainly tops in the field. Its bulletin *DX News* is issued weekly during the summer for a total of 34 issues per year. Research into MW DX is also under way. Dues are roughly $7.75 yearly.

**Newark News Radio Club (NNRC),** 215 Market St., Newark, N.J. 07101. President, William Schultz. This club is the oldest and possibly the largest. Its monthly bulletin averages 50 to 60 pages and, besides general coverage, has exceptionally fine Ham and SWBC columns. Dues are $5.00 yearly.

**North American SW Association (NASWA),** Box 989, Altoona, Pa. 16603. Executive Editor, William Eddings. This club offers excellent SWBC coverage and is an all-SWBC organization. Its monthly publication *Frendx* averages 50 pages, and is regarded as a journal for SWLs. Dues are $5.00 yearly.

**Northeast Shortwave Listeners Club (NESWLC),** 971 Iris St., Manchester, N.H. 03102. President, Norman Boisvert. Club publication, the *Bulletin*, appears monthly. Columns include SWBC, TV and FM DX, Cardswap, and Novice Section. Dues are $1.50 yearly.

**Worldwide TV-FM DX Association (WTFDXA),** Box 5001, Harbor Station, Milwaukee, Wis. 53204. Executive Editor, Ferdinand Dombrowski, Jr., Club is all TV-FM DX, plus 30-50 MHz band. Monthly publication *VHF/UHF Digest* covers most topics relating to TV-FM DX. Dues are $3.50 yearly.
What's With Old Sol?  
Continued from page 48

chargeable nickel-cadmium, type-F cells. Voltage ranges from 16.2 to 22 V. To conserve power, a day-night switch cuts off certain experimental systems while the craft is in the dark portion of its orbit. Signals from solar-sensing detectors actuate the switches to make the instruments operational at the crack of each orbital dawn.

**Cat with Nine Lives.** The electronic purring and clicking inside the OSO-IV will go on for six months. All the while, communications equipment will relay data about the sun lapped up by the nine separate experimental systems on board. An ultraviolet spectrometer is of primary importance (see photos and caption in box on page 48), but here are the other eight experiments. The OSO-IV contains:

- A spectroheliograph to obtain data about X-ray emanations from the sun in the 3- to 70-angstrom range. This information will reveal much about electron and ion densities in the sun’s corona, and about processes involved in solar flares.
- A Bragg crystal spectrometer to determine the spectral differences in the sun during its flare and non-flare periods. This will also distinguish between thermal and non-thermal mechanisms in the X-ray emission process in the 1 to 8 angstrom range.
- A celestial telescope to survey the night sky for cosmic sources of X-radiation with energies from ½ to 30 keV. Such information about interplanetary X-rays is vital to planning future, manned space jaunts.
- A spectrometer to detect solar X-rays in the 1-20 and 44-75 angstrom ranges. This will lead to a new understanding of the solar corona.
- A helium II and helium I monochromator to monitor the total flux of helium II solar radiation at the 204-angstrom level. The instrument also samples hydrogen radiation at the 1216-angstrom level. Objective: to determine how changes in helium radiation from the sun affect the earth’s ionosphere.
- A proton-electron telescope to measure the energy dependence and angular distribution of electrons and protons in the magnetic field of the earth.
- A monitor to measure the X-ray input to the earth’s atmosphere in several spectral bands ranging from 0.5 to 60 angstroms. This data will provide good characterization of solar X-ray emission, and also provide a set of X-ray indices which other geophysical parameters can be correlated against.
- A Lyman-alpha telescope to scan and record Lyman-alpha night skyglow which results from the scattering of solar hydrogen in the earth’s corona. This data will lead to a better understanding of how hydrogen emissions from the sun are absorbed in the earth’s upper atmosphere.

These instruments are gathering information vital to an understanding of the sun, and vital for the planning of safe space ventures of future astronauts. But the one instrument that dominates the entire project is an ultraviolet spectrometer constructed at the Harvard College Observatory by a group headed by Professor Leo Goldberg, and in collaboration with Harvard astronomers Edmond Reeves and William Parkinson.

In the first four weeks of operation, the equipment gave these astronomers over 4000 pictures of the sun, the like of which have never been seen before. The pictures reveal wholly new information about its chemical composition, and the temperature ranges at various heights in the sun’s atmosphere. The information will almost certainly modify currently held ideas about the origin and evolution of stars like the sun.

**Prize Portraits.** One reason why astronomers are so excited about these pictures is that for the first time they are able to make full-face mug shots of the sun’s corona. Previously, the sun’s corona could only be studied at the edge of the solar disc during an eclipse or by means of a coronagraph that creates an artificial eclipse. All of these were profile shots giving only a fraction of the desired information. Now it is possible to make pictures that include all of the corona except the relatively small portions hidden behind the solar disc.

Much is being learned about the distribution of chemical elements and about temperature patterns at various heights in the sun’s atmosphere. Such information is vital to a full understanding of the origin and evolution of stars like our sun.

The data accumulated by the spectroheliograph is also revealing much new information about solar flares—those tongues of luminous gas that flick outward around sun spots. Solar flares are believed to be triggered by explosions of electrons that begin high in the corona and stream downward.
toward the center of the sun. When flares occur, clouds of protons and electrons shoot off the sun to fill interplanetary space with potent radiation.

Since each solar flare is accompanied by a burst of ultraviolet radiation, the Harvard spectroheliograph is ideal for studying the development of the flares and for observing temperature changes as the flares move through the corona.

**Forecasting Flares.** There is now tremendous practical value in predicting the probable occurrence of solar flares. OSO-IV is not charged with this forecasting responsibility, though data acquired by the orbiting observatory will be of tremendous value in perfecting present forecasting techniques.

The actual day-by-day job of forecasting solar flares is in the hands of a special detachment of the Air Weather Service of the U.S. Air Force. A specially trained group of the 4th Wing—identified as Detachment 7—works in collaboration with the staffs of several widely-scattered observatories to watch for solar flares 24 hours a day, seven days a week.

A complicated communications network utilizing teletype circuits, military electronic circuits, civilian and military telephone systems, and even the U.S. mail, has been set up to feed data to the central Solar Forecast Facility (SFF). There the information is collated, analyzed, and prepared into suitable form for four routine daily forecasts and an additional once-a-week extended-period forecast.

When there is reason to believe that detectable quantities of sun-generated high-energy protons may reach the vicinity of earth, a special alert system goes into action. This Proton Event Start Time Forecast—bearing the appropriate acronym PESTF—is an alert program organized into a four-part, color-coded warning system.

**PESTF**—Green means that proton events are not expected. Yellow indicates that optical and/or radio indicators suggest that proton activity on the sun is a possibility. Red means that a major flare has occurred and that a related Type IV radio burst (or other indicator) has been observed. Purple warns that a major flare has occurred, and that there is sufficient information to state that a proton event is definitely expected to begin before a stated time.

**Chinese Dragon.** The streaming clouds of high-energy protons, electrons, and alpha particles created by solar flares race toward the earth at speeds that may exceed 100 million miles per hour. Since the sun is only about 94 million miles from earth, any astronaut wandering about in space had better get home—or under cover—in less than an hour after the flare erupts! Unless the flare is anticipated in advance, there isn't much time to relay a warning to the hapless space wanderer.

The astronaut who leaves the earth's protective atmosphere behind must look on the sun as both friend and foe. He can never be quite certain just when the sun will suddenly change into a sort of celestial Chinese Dragon whose fiery mouth will belch vast clouds of lethal vapors into interplanetary space.

**More Problems.** Just after a flare erupts, the earth's atmosphere is bombarded by X-rays and ultraviolet radiation. These solar products travel at the speed of light and can make the sun-to-earth trip in about eight minutes. These radiations heat the earth's atmosphere and cause it to expand outward. A satellite or space capsule orbiting around the earth along a carefully calculated course will run into unexpectedly dense air and slow down. This alters the craft's trajectory, and results in a rapid loss of altitude. Unless the braking effect of the surging atmosphere is anticipated and offset by those handling flight programming, an unhappy astronaut may find himself coming down in Death Valley instead of making a cool splashdown in the Atlantic.

No radio ham needs to be told that when sunspots appear and solar flares tongue the cosmos, radio communications get fouled up badly because of the resulting magnetic storms. To a ham, this is usually at most an annoying inconvenience. But to others—especially the armed forces—disruption of vital radio communications can be a very serious matter indeed. Sunspots directly affect the ionosphere's ability to reflect signals.

Any advance warning about solar activity that may affect radio communications is obviously of great significance. Moreover, the scientific data now being accumulated about solar phenomena may some day enable electronics engineers to devise wholly new communications systems that will be unaffected by magnetic storms and the like.

As we said, it has taken mankind a half million years to get a really good look at the sun. But it was worth the wait. The view is fantastic!
Ask Me Another  
Continued from page 40

Because of electrical noise introduced by the alternator. How can I build a simple filter or power supply to eliminate the dry-cell battery and permit operation of the depth finder directly off the boat wiring system?

—A. M. K., South Natick, Mass.

Connect ignition capacitors C1, C2, C3, and C4 across the three AC outputs of the alternator and output of the depth finder as shown in the diagram. You may also have to install ignition noise suppressors at the spark plug and ignition coil.

Ham and Beacon

I recently bought a portable AM/FM/SW receiver of fairly good quality. On AM and SW every station is heterodyned by a CW beacon. I assume the beacon is operating around 455 kHz since it is received across the dial. Is there a simple remedy such as the addition of another tuned circuit in the loop antenna? I don’t have any test equipment and only limited parts from other radios.


It is possible that the interfering station is very close to you and is overloading the receiver’s front end. You might try connecting a 455-kHz wave trap in series with the input to the first transistor as shown in diagram. You can use a 455-kHz IF transformer. Adjust the active IF coil’s slug until the interference is minimized.

Miniature Invasion

In Robert M. Brown’s book The Electronic Invasion, he mentions a device called a match box for connecting a tape recorder to the telephone at the phone terminal. He states that these devices simply amount to a line-matching device, often a simple transformer, and that most people build their own. What type of transformer is used for a recorder with a 2000-ohm input?

—D. S., Milwaukee, Wis.

You can use a UTC 0-25 transformer which has a 600-ohm primary and a 2000-ohm secondary connected as shown in the diagram. Use a shielded cable from the phono jack to the tape recorder. You should be able to get this transformer at the Allied Radio branch in Milwaukee. Remember that it is unlawful for you to record any telephone conversation unless you advise the persons whose voices you are recording and also inject a beep tone periodically on the line.

Now Look Here!

I note that you told L.J.H. of Chattanooga that he can’t receive aviation stations on his FM receiver. My dear sir, aviation stations are FM! I myself have taken a portable AM/FM receiver, and by spreading apart the oscillator coil and adjusting the trimmer capacitors I received the aviation band loud and clear.

—S. R. M., Chicago, Ill.

You are wrong, friend. Aviation stations use AM. If you can hear them on your FM receiver, its detector is capable of demodulating AM, and it is not a true FM receiver.

Listening Low

What’s to hear on VLF, conversation or mostly code?

—S. V., Miami Beach, Fla.

Mostly code and standard-frequency signals. Just the right thing to tune in when you’re reading Playboy.

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AUGUST-SEPTEMBER, 1968

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How to get into
One of the hottest money-making fields in electronics today—servicing two-way radios!

More than 5 million two-way transmitters have skyrocketed the demand for service men and field, system, and R&D engineers. Topnotch licensed experts can earn $12,000 a year or more. You can be your own boss, build your own company. And you don't need a college education to break in.

How would you like to start collecting your share of the big money being made in electronics today? To start earning $5 to $7 an hour... $200 to $300 a week... $10,000 to $15,000 a year?

Your best bet today, especially if you don't have a college education, is probably in the field of two-way radio.

Two-way radio is booming. Today there are more than five million two-way transmitters for police cars, fire department vehicles, taxis, trucks, boats, planes, etc. and Citizen's Band uses—and the number is still growing at the rate of 80,000 new transmitters per month.

This wildfire boom presents a solid gold opportunity for trained two-way radio service experts. Many of them are earning $5,000 to $10,000 a year more than the average radio-TV repair man.

Why You'll Earn Top Pay
One reason is that the United States Government doesn't permit anyone to service two-way radio systems unless he is licensed by the Federal Communications Commission. And there simply aren't enough licensed electronics experts to go around.
Another reason two-way radio men earn so much more than radio-IV service men is that they are needed more often and more desperately. A home radio or television set may need repair only once every year or two, and there's no real emergency when it does. But a two-way radio user must keep those transmitters operating at all times, and must have their frequency modulation and plate power input checked at regular intervals by licensed personnel to meet FCC requirements.

This means that the available licensed experts can "write their own ticket" when it comes to earnings. Some work by the hour and usually charge at least $5.00 an hour and evenings and Sundays, plus travel expenses. A more common arrangement is to be paid a monthly retainer fee by each customer. Although these rates vary widely, this fixed charge might be $20 a month for the base station and $7.50 for each mobile station. A survey showed that one man can easily maintain at least 100 stations, averaging 15 base stations and 5 mobiles. This would add up to at least $12,000 a year.

**Be Your Own Boss**

There are other advantages too. You can become your own boss—work entirely by yourself or gradually build your own fully staffed service company. Instead of being chained to a workbench, machine, or desk all day, you'll move around, see lots of action, rub shoulders with important police and fire officials and business executives who depend on two-way radio for their daily operations. You may even be tapped for a big job working for one of the two-way radio manufacturers in field service, factory quality control, or laboratory research and development.

**How To Get Started**

How do you break into the ranks of the big-money earners in two-way radio? This is probably the best way:

1. **Without quitting your present job**, learn enough about electronics fundamentals to pass the Government FCC Exam and get your Commercial FCC License.
2. **Then get a job in a two-way radio service shop and "learn the ropes" of the business.**
3. **As soon as you've earned a reputation as an expert**, there are several ways you can go. You can move out and start signing up and servicing your own customers. You might become a franchised service representative of a big manufacturer and then start getting into two-way radio sales, where one sales contract might net you $5,000. Or you may even be invited to move up into a high-prestige salaried job with one of the major manufacturers either in the plant or out in the field.

The first step—mastering the fundamentals of Electronics in your spare time and getting your FCC License—can be easier than you think.

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By the time you've finished your CIE course, you'll be able to pass the FCC License Exam with ease. Better than nine out of ten CIE-trained men pass the FCC Exam the first time they try. Even though two out of three non-CIE men fail. This startling record of achievement makes possible the famous CIE warranty: you'll pass the FCC Exam upon completion of your course or your tuition will be refunded in full.

Ed Dulaney is an outstanding example of the success possible through CIE training. Before he studied with CIE, Dulaney was a crop duster. Today he owns the Dulaney Communications Service, with seven people working for him repairing and maintaining two-way equipment. Says Dulaney: "I found the CIE training thorough and the lessons easy to understand. No question about it—the CIE course was the best investment I ever made."

Find out more about how to get ahead in all fields of electronics, including two-way radio. Mail the bound-in postpaid reply card for two FREE books, "How To Get A Commercial FCC License" and "How To Succeed In Electronics." If card has been removed, just send us your name and address on a postcard.

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The "EDU-KIT®" is the modern educational radio kit. It is designed to train you in a practical manner. It is a self-contained unit, complete in itself. It will show you how to get a "radio" for your home, how to install it, how to build it, how to operate it...everything.

The "EDU-KIT®" contains everything you need to make and build a complete "radio" for your home. It is complete in itself. The "EDU-KIT®" is the modern educational radio kit. It is designed to train you in a practical manner. It is a self-contained unit, complete in itself. It will show you how to get a "radio" for your home, how to install it, how to build it, how to operate it...everything.

The "EDU-KIT®" is for everyone. You do not need the slightest knowledge in electronics in radio or science. Whether you are interested in radio as a hobby, or you want an interesting hobby, a well paying hobby, or a job with a future, you will find the "EDU-KIT®" a worthwhile investment.

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The "EDU-KIT®" is the modern educational radio kit. It is designed to train you in a practical manner. It is a self-contained unit, complete in itself. It will show you how to get a "radio" for your home, how to install it, how to build it, how to operate it...everything.

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