How to Gyp a TV Serviceman

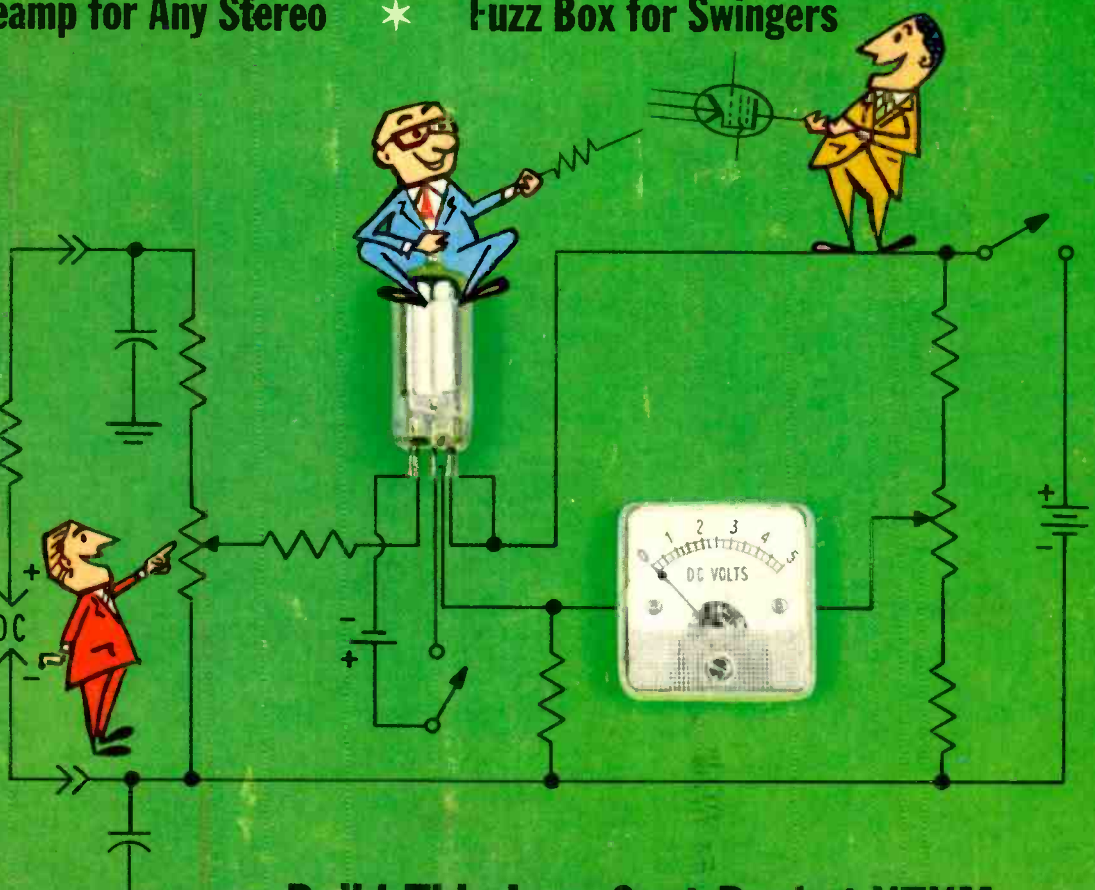
ELECTRONICS ILLUSTRATED

By the Publishers of MECHANIX ILLUSTRATED

JULY 1968 • 50¢

Eyewitness Report on Radio Americas
El Expedition Finally Ends the Mystery!

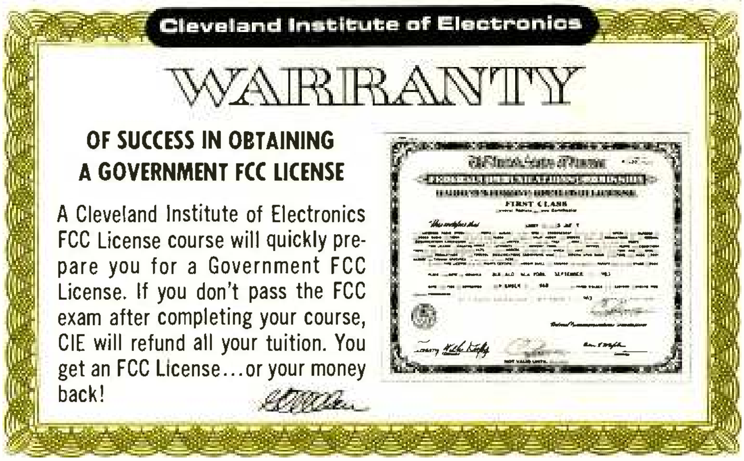
Build: CB Band Scanner ✶ Automatic FM Radio
6/10 Meter Converter ✶ Solid-State Keying Monitor
Preamp for Any Stereo ✶ Fuzz Box for Swingers



Build This Low-Cost Pocket VTVM

You can earn more money if you

Here's our famous CIE Warranty that you <u>will</u> get your License if you study with us at home



NOT SATISFIED with your present income? The most practical thing you can do about it is add to your Electronics know-how, pass the FCC exam, and get your Government License.

The demand for licensed men is enormous. Today there are over a million licensed broadcast installations and mobile transmitters on the air, and the number is growing constantly. And, according to Federal law, no one is permitted to operate or service such equipment without a Government FCC License or without being under the direct supervision of a licensed operator.

This has resulted in a gold mine of new business for licensed service technicians. A typical mobile radio service contract pays an average of about $100 a month. It's possible for one trained technician to maintain eight to ten such mobile systems. Some men cover as many as fifteen systems, each with perhaps a dozen units.

Opportunities in Industry

And there are many other exciting opportunities in the aerospace industry, electronics manufacturing, telephone companies, and plants operated by electronic automation. Inside industrial plants like these, it's the licensed technician who is always considered first for promotion and in-plant training programs. The reason is simple. Passing the Federal Government's FCC exam and getting your License is widely accepted proof that you know the fundamentals of Electronics.

So why doesn't everybody who "tinkers" with electronic components get an FCC License and start cleaning up?

The answer: it's not that simple. The Government's licensing exam is tough. In fact, an average of two out of every three men who take the FCC exam fail.

There is one way, however, of being pretty certain that you will pass the FCC exam. That's to take one of the FCC home study courses offered by the Cleveland Institute of Electronics.

CIE courses are so effective that better than 9 out of every 10 CIE graduates who take the exam pass it. That's why we can afford to back our courses with the ironclad Warranty shown above: you get your FCC License or your money back.

Mail Card for Two Free Books

Want to know more? Send the card at the left for a FREE copy of our school catalog, "How To Succeed In Electronics," describing opportunities in Electronics, together with our special book, "How To Get A Commercial FCC License." If card has been removed, just send your name and address to us.

ENROLL UNDER NEW G.I. BILL

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get a Government FCC License

These CIE men did it —so can you

Not too long ago, the men shown here had only limited prospects in Electronics. Most had no training beyond what they'd gotten on the job or in service. So these men decided to "train up" with CIE for the FCC License exam. Today, as a result, they hold important jobs, with salaries to match. If you'd like to join their ranks, see for yourself on the page at left how easily you can train for an FCC License the CIE way.

Owns His Own Two-Way Mobile Radio Business. Ed Dulaney of Scottsbluff, Nebraska, got his 1st Class FCC License with CIE training. "It's helped me realize my highest ambition—owning my own business," he writes. "Now I manufacture my own two-way radio equipment, with dealers who sell it in seven states, and have seven full-time employees on my payroll."

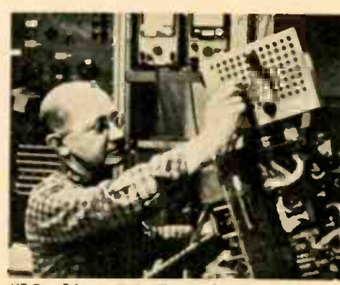
Senior Transmitter Operator for Radio Station WBOE. Says Matt Stuczynski: "I give CIE credit for my 1st Class FCC License. Even though I had only six weeks of high-school algebra, CIE's lessons made Electronics easy. I now have a good job in studio operation, transmitting, proof of performance... and am on my way up."

"Theory Man" at General Dynamics. Harry J. Remmert III, of Groton, Connecticut, passed his 1st Class FCC License exam less than 11 months after enrolling with CIE. Since then, he's had two pay raises within 10 months. And, he adds, "I'm getting to be known as a theory man in my job with General Dynamics Research and Development Division."

"A Real Fine Business and Income." That's how the FCC License he got with CIE training has paid off for him, says Donald E. Breidenbach of Ponca City, Oklahoma. "Since passing the 2nd Class exam, I've opened my own two-way mobile radio business, and now have one of the best-equipped shops in northern Oklahoma."

Associate Customer Engineer for IBM. Raymond Ott of Erie, Pennsylvania, trained with CIE when he was in the Air Force. "The day after leaving service, I passed my 2nd Class FCC License exam with Radar Endorsement. When I arrived back home, I applied to IBM—and am now an Associate Customer Engineer on computers and related equipment."

"Swamped with Job Offers from All Over." Thomas E. Miller, Jr., completed his CIE training and passed the 1st Class FCC License exam while in the Navy. "After discharge," he reports, "my only problem was to pick the best offer, and I did—engineer with Indiana Bell Telephone. CIE made the difference between just a job and a management position."



"My New Job Pays $228 a Month More!" Eugene Frost of Columbus, Ohio, was stuck in low-pay TV repair work before training with CIE and getting his 2nd Class FCC License. Today he holds an important job as an inspector with North American Aviation. He says, "I earn $228 a month more and have a new home, two good cars, and a color TV."

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ELECTRONICS ILLUSTRATED

JULY, 1968 A Fawcett Publication Vol. 11, No. 4

COVER — Ektachrome by John Capotosto. Schematic by Eugene J. Thompson. Figures by Edward Appleby.

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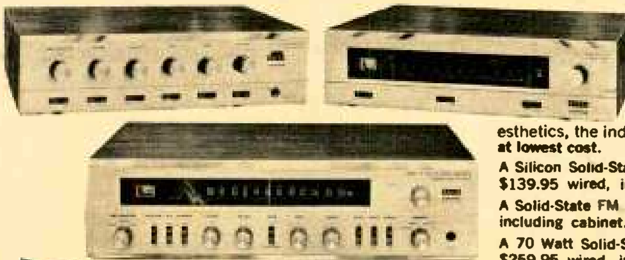

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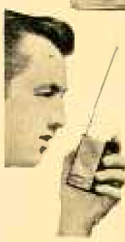

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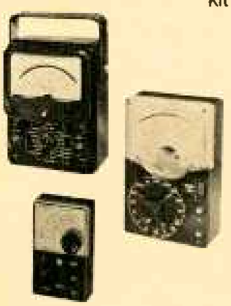
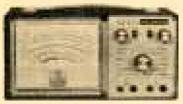


Automotive

EICO 888—Car/Boat Engine Analyzer
For all 6V/12V systems; 4, 6, 8-cyl. engines.



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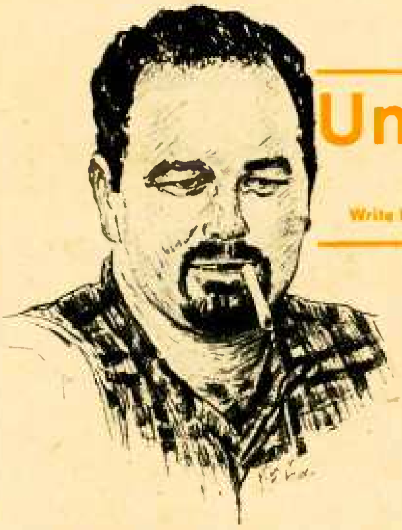

Uncle Tom's Corner

By Tom Kneitel, K2AES/KQD4552

Uncle Tom answers his most interesting letters in this column. Write him at Electronics Illustrated, 67 West 44th St., New York, N.Y. 10036.

★ **Radio Astronomy Dept.** Remember Project Ozma? It was an attempt to monitor the hydrogen line frequency (1420.4 mc) for signals transmitted by other civilizations. It was abandoned for lack of funds and available time on radio-astronomy equipment. Radio astronomers are now excited about puzzling signals on the hydroxyl ion frequency, 1600 mc. Possibilities as to its source include a natural galactic maser or attempts at communication by a remote, highly advanced civilization. So it's listening time again.

★ *I have a Hallicrafters SX-42 receiver that has problems. Most of the stations I hear on the short-wave bands below 4 mc are only harmonics of BCB stations. What can I do to eliminate these harmonics?*

Eric Lebowitz
Jackson Heights, N.Y.

Sorry, Eric, but it looks like the best thing you can do is move out of Jackson Heights. You're right on top of the transmitting antennas of several of New York City's broadcast stations and their powerful signals are probably being rectified and rebroadcast by all manner of non-linear devices near your home (corroded or rusty fences, bolts, elevated subway tracks, building frames, etc.). Some of the harmonics may be caused by strong BCB signals that overload the front-end of your receiver, though. If so, a high-pass filter with a cutoff frequency of 1600 kc in your antenna lead should help.

★ **Low Power Dept.** DX listeners who moan about the good old days of the 1920s and early '30s when there were scads of flea-power broadcasters to monitor will rejoice at the news that the FCC is now authorizing many broadcasters to operate extra presunrise (6 o'clock starting) hours at reduced power. Some of these stations are running less than 10 watts in the early a.m. For instance, 250-watters WBHT (Brownsville, Tenn., 1520 kc) and WUNN (Mason, Mich., 1110 kc) are both running about 5½ watts in the predawn hours. KTON (Belton, Tex., 940 kc) drops from 1000 watts to 5¼ watts. One of the more dramatic power reductions is 10,000-watt station KLPR in Oklahoma City, which has been cut to 8½ watts. There are many others, too. Go get 'em, tiger!

★ *I know something gets blitzed when you play a stereo disc on a mono phonograph. Is it the platter or the machine?*

Nick Tarapolus
Buffalo, N.Y.

It's the disc that would get the fuzzy end of the bargain if it were played on an older machine because its mono stylus lacks the vertical compliance to track a stereo groove without damaging it. It's safe to play stereo records on most machines made in the last few years since modern mono cartridges are just about identical in this respect to their stereo siblings. In fact, some stereo recordings have been relabeled as compatible mono/stereo in the belief that either type of pickup can do the job these days.

★ *I have a Zenith Model 25X8520 color TV that is causing problems. I occasionally find a giant fingerprint (about the size of a baseball) on the right side of the screen. I've had the service man over and it wouldn't show for him. I see it mostly when the background of the picture is dark. The face of the picture tube is clean. How can I make it appear for the service man so I can get it removed before my service contract expires?*

Harry Von der Ahe
Arcadia, Calif.

[Continued on page 8]

UNCLE TOM'S CORNER

Continued from page 6

Give the service man a shot of whatever you're having.

★ *Other than price, is there any real difference between tube types 6AQ5, 6AQ5A, 6AQ5W, EL90, 6005, 6095, 6669? They all have the same characteristics.*

Bill Day
Seven Hills, Ohio

The 6AQ5A is a version of the 6AQ5 with controlled heater warm-up time. The 6AQ5W is a military version, as is the 6095. The 6005 is a 6AQ5 with ruggedized construction, long life and special quality control. The 6669 is a mobile version. An EL90 simply is the overseas name for the 6AQ5. You'll find this pattern is true of most popular tubes, some having more than ten variations on the theme.

★ *Many department stores and restaurants these days play background music. I understand that much of it comes by radio. What frequency is used and how do they get away with transmitting no call-sign?*

Kerry Richards
Cleveland, Ohio

The background music is transmitted as a hidden channel (a type of multiplexing) over some regular FM broadcast stations. To hear it you must have either a special receiver (not available to the public) or a thing called an SCA adaptor that attaches to any good FM receiver. SCA adaptors are advertised in the radio magazines. But the music they pick up is copyrighted by the broadcasters, who charge a fee for all commercial SCA installations. Use in homes without permission is regarded by the stations as something akin to stealing apples from a pushcart. Station IDs are heard on the main channel only.

★ *What's the latest guess on the location of the mysterious Radio Libertad, La Voz Anti-Comunista de America?*

Michael Rodriguez
Waco, Tex.

Seems to boil down to two possibilities: Andros Island in the Bahamas or Vieques Island off the east coast of Puerto Rico. The

[*Continued on page* 10]

Learn I.C.'s...Build this new RCA Audio Amplifier Kit

RCA's new Integrated Circuit Experimenter's Kit, KD2112, is the first of its kind. You get a "short course" in integrated circuits, and you can build a 500-milliwatt audio amplifier or a variable-tone audio oscillator.

The heart of this new "all-parts-included kit" is an RCA linear integrated circuit – a multipurpose wide-band audio amplifier – containing the equivalent of 7 transistors, 11 resistors, and 3 diodes.

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RCA's new Integrated Circuit Experimenter's Kit KD2112 is available from your RCA Distributor. Ask him for it, and learn more about I.C.'s.

RCA Electronic Components, Harrison, N. J. 07029

RCA

UNCLE TOM'S CORNER

Continued from page 8

western end of Vieques contains a U.S. military compound, leading to speculation that R. Libertad is a black (secret) operation of the little-known Defense Intelligence Agency (DIA).

★ *Would you tell me how big an electric motor I would need to replace a 383 Mercury car motor? How much would it cost?*

Gordon McDermott
Edmonton, Alta.

First worry about the price of the extension cord.

★ *A few months ago you gave a report on our Army's secret gas warfare experiments. Isn't it true that the Army also is working on lethal bacteria and poisons—and also on chemicals that destroy plant life?*

Arnold Paxton
Richmond, Va.

True! One of our most potent weapons for combatting hostile plant life is a fungus called Rice Blast. Only a few well-placed spores could wipe out all the rice in Southeast Asia in a jiffy. On the human side of the festivities, we also are building up a reserve of something with the quaint name of Clostridium Botulinum Types A and B. Takes only six millionths of a milligram of the stuff to do you in—the entire population of the earth with less than 1/3000th of an ounce (diluted in a specially-prepared base). An anti-toxin is available.

★ **Mid-East Broadcasting Dept.** Probably the hottest electronic battleground for men's minds today is the Middle East. Israel, which has always disdained TV as a bit of worthless fluff, quietly has set up recruiters in several Arab cities to hire a staff of crack TV technicians, directors and performers. The new Israeli station will carry 75 per cent of its programming in Arabic and will compete directly with Cairo and Beirut for the audience. The British, on the other hand, are vieing to take over Radio Cairo's audience with a new Arab station in the Persian Gulf. Staffed entirely by Arabs, it gives out with large doses of music and drama as an alternative to Cairo's heavy politicking.

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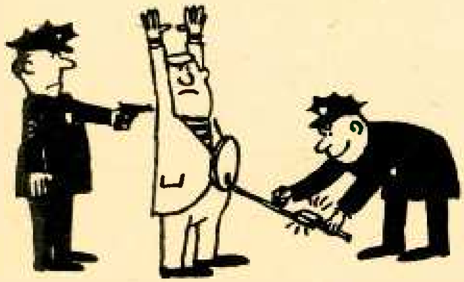

As a law-enforcement officer, I want to build your metal locator [May '68 EI] for use in detective work.

G.R.
Chicago, Ill.

● NOW LISTEN

When is the best time to DX and will the summer be promising for SWLing?

K.R.
Fort Smith, Ark.

C'mon, K.R. Haven't you seen the propagation forecast at the end of Notes from EI's DX Club in each issue?

● CARRYING A TORCH

Please send plans for turning my welding torch into a loudspeaker [Hi-Fi Today, May '68 EI]. I've tried adding a good speaker to my transistor radio but it makes it too big to carry with me on the job.

John Henry
Pittsburgh, Pa.

● DJ FEVER

I am immensely interested in the article in your March '68 issue about the fellow who makes like Murray the K on 100 mw. I've had experience going on the air with phono oscillators before but never got any "two-mi. radius." How does he do it????

J. C. Kennedy
Fremont, Calif.

How well is his signal picked up toward the limits of his two-mi. radius?

Barry A. Lehman
Bethlehem, Pa.

The most I got was about 1½ blocks. I also had a hard time hooking up a microphone to the oscillator.

Todd Anderson
Iron Mountain, Mich.

How do you get a sponsor?

Steve Mausteller
Santa Clara, Calif.

Could I use the call-sign KMJK?

Michael Kupka
Denison, Tex.

I also operate an AM station: Radio V6A, the Voice of the Valley Green Apartments.

Ron Reimers
Cupertino, Calif.

I operate in the FM band with the same power.

Jesse D. Swisher
Newton, Ill.

I'm entertaining the idea of a network of such stations.

J. Fine
Montreal, Que.

Please send me plans for the wireless phono oscillator. I enjoy your magazine very much but could you please mail me the plans instead of putting them in your magazine because I only get 25¢ a month allowance.

Rey Ryzak
E. Hartford, Conn.

Thanks, Rey, for squandering a week's income in postage to us. But it will take you a decade or more to save up enough to build the super-duper 100-mw broadcast station we're preparing for publication as a project in a future issue. It's got the works—multiple

[*Continued on page* 14]

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- Illuminated "S"/"PFR" Meter
- CB/Public Address Switch
- Headphone/External Speaker Jack
- 2.5 Kc Fine Tuning Vernier
- Adjustable Squelch Control with Standby Switch for Low Drain Instant Operation

A dynamic duo of complete 23 channel 5-watt 2-way radios at budget prices. No additional crystals are necessary for operation on all 23-channels in receive or transmit modes. Either model provides superb mobile or fixed station use and feature sensitive dual conversion superheterodyne receivers. The low cost Comstat 23 Mark V offers as a bonus a tape recorder output jack, Range Boost and power standby switch for low current drain and instant operation. The deluxe Comstat 25A features switchable Range Boost for improved "close-in" communication, fine vernier tuning and a Priva-Com® selective call socket. Both have Lafayette quality built-in and are outstanding instruments in their class.

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Dept. EG-8, P.O. Box 10
Syosset, L.I., N.Y. 11791

Send me the FREE 1968 Lafayette Catalog 680
EG-8

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CIRCLE NUMBER 8 ON PAGE 11

Feedback from Our Readers

Continued from page 12

inputs, three meters and adjustable output so you can get every bit of the allowable 100 mw of power.

These letters (only a sample out of the blizzard of paper that came our way when the story on Bob Brown's transmitter appeared) make us confident that the project will be one of the most popular we have ever published. They also prove that more needs to be said about what you can and can't do with 100 mw. For one thing, you can't expect to reach everyone within a two-mi. radius. It's true Bob Brown claims that coverage but we have yet to learn on what basis—perhaps an optimistic statement of the manufacturer of his phone oscillator.

So long as your output power is under 100 mw and your antenna is under 10 ft. long you're considered by the FCC to be too small to cause trouble and are exempt from their broadcast-station rules. But that doesn't mean you can sell commercials on your station. Nor can you use the call letters of a local station. In either case, the for-real broadcasters would have a legitimate bone to pick with you as a poacher in their legally established preserves.

● THE PRICE WAS WRONG

We are appreciative of the write-up you gave our Guardian rigs in the March EI but a gremlin seems to have gotten into your typesetting machine and made the price a bit high. The correct price for the Guardian 23 and 23B is $269.90 each.

Ralph Asherman
Pearce-Simpson, Inc.
Miami, Fla.

Sorry about that, Ralph.

● WANT TO JOIN?

The Great Lakes Tape Club is a national organization of 75 teens who exchange conversation and music via tape recordings. Teens who would like to join our activities are welcome to apply for membership.

Bruce Sherman, director
The Great Lakes Tape Club
13346 Sherwood
Huntington Woods, Mich. 48070

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When you train at home with NRI, you train with your hands as well as your head. You learn the WHY of Electronics, Communications, TV-Radio the NRI pioneering "3-Dimensional" way. NRI training is the result of more than half a century of simplifying, organizing, dramatizing subject matter, and providing personal services unique for a home study school. You get the kind of technical training that gives you priceless confidence as you gain experience equal to many, many months of training on the job.

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

Broadsides

Pamphlets, booklets, flyers, application notes and bulletins available free or at low cost.

NEWCOMERS to **short-wave listening**—and even DXers with QSL wallpaper—will find Your Window On The World a handy reference guide. It includes concise discussions of SW signal properties, antennas, receiver features, some anatomy of the HF and VHF bands and a time-conversion chart. Amateur and CB radio also are described briefly. Copy 25¢. Hammarlund Manufacturing Co., 73-88 Hammarlund Dr., Mars Hill, N.C. 28754.

It's not often that we can call attention to **Canadian electronics parts** distributors. But recent samples have come to us from two companies north of the border. For free copies, Canadians can write to Gladstone Electronic Supply Co., 1923A Avenue Rd., Toronto 12, Ont., and Etco Electronics, Mailorder Div., Dept. BC Box 796, Montreal 3, Que.

The RCA Linear **Integrated Circuit** Manual (Technical Series IC-41) proves a designer's-eye view of ICs. The manual gives working parameters, schematics and application diagrams and discusses use in audio and video amplifiers and a host of other applications. Copy $2. Commercial Engineering, RCA Electronic Components and Devices, Harrison, N.J. 07029.

Antennas for CB base stations are described in catalog CB-68. There are single and dual beams, ground-planes and a universal antenna for CBing, SWLing, aircraft and emergency service monitoring, amateur radio and FM/TV reception. Free from Cush Craft, 621 Hayward St., Manchester, N.H. 03103.

Training is the name of the game if you've sights on a **career in electronics.** A sample lesson is offered by National Technical School along with their catalog to give you—literally—a free sample of what you can expect if you enroll. Write National Technical Schools, 4000 S. Figueroa St., Los Angeles, Calif. 90037.

A catalog of **automobile speakers** and accessories features add-on speaker kits for mono or stereo. For a free copy write Arkay Products Mfg. Co. 1241 W. 134th St., Gardena, Calif. 90247.

If you're a designer type you can get dimensional and electrical **information about SCRs,** trigger diodes, uni-junction transistors, triacs and 4-layer diodes in the Thyristor Products Selector Guide. It's not a complete listing of the manufacturer's line but represents the most popular of its thyristor products. Free from Motorola Semiconductor Products, Inc., Box 955, Phoenix, Ariz. 85001.

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Swap Shop

Individual readers (not commercial concerns) may swap electronic gear by sending one listing, name and address to Swap Shop, ELECTRONICS ILLUSTRATED, 67 West 44th Street, New York, N.Y. 10036. Space is limited; only most interesting offers are published.

SERVICE EQUIPMENT

EICO 360 sweep generator. Want Supreme TV manuals TV-6, TV-7 plus best offer. Ted A. Pozyski, 1215 Thompson St., Houston, Tex. 77007.

HEATH HD-20 100-kc crystal calibrator. Want Joy-match antenna tuning unit. Alan Traganza, 7908 Clearview Dr., Citrus Heights, Calif. 95610.

HICKOK 600A tube tester. Want short-wave receiver. Curtis A. Cook, 5821 Winona Ave., West Des Moines, Iowa 50265.

EICO 145 multi-signal tracer. Will swap for best offer. Robert Gatchel, Rt. 1 Box 219, Wabash, Ind. 46992.

AEI A-200 RF generator. Want electronics books, components or service gear. Tom Moran, 17238 Community St., Lansing, Ill. 60438.

EICO 368 sweep/marker generator. Want SWL gear. Derek H. Rout, 1347 Easy St. N., Glendale Heights, Ill. 60137.

HEATH oscilloscope. Want CB transceiver, communications receiver or best offer. Larry Griffith, 3010 Lillie St., Fort Wayne, Ind. 46806.

EICO 145A signal tracer. Want Heath HM-15 relative power/SWR meter and DC milliammeters. Michael St Angelo, 248 Bay Ave., Patchague, N.Y. 11772.

EICO oscilloscope—5 in. Want novice amateur gear. Steve Texin, WN2DKX, 82-55 251st St., Bellerose, N.Y. 11426.

EICO 221 VTVM, factory-wired. Will swap for best offer. Nicholas J. Denaro, 170 Wellington Rd., Elmont, N.Y. 14901.

AUDIO & HI-FI

LAFAYETTE 99-0154 stereo amplifier. Will swap for best offer. Walter J. O'Brien, 279 Valley Rd., Clark, N.J. 07066.

OLSON AM-232 mono tape recorder. Want color TV pattern generator. L. Persley, 31031 Eveningside, Fraser, Mich. 48026.

AM/FM RECEIVER. Want CB transceiver or best offer. L. Olson, 1510 Dunsmuir, Los Angeles, Calif. 90019.

PHONOTRIX portable tape recorder. Will swap for best offer. Gary M. Barclay, 2501 Edison Ave., Apt. 21, Sacramento, Calif. 95821.

NATIONAL KIT integrated 12-watt amplifier. Want Channel Master 6475 AM/FM transistor radio. J. Dembinski, 12772 Castle, Southgate, Mich. 48075.

WILCOX-GAY tape recorder. Want Heath GR-54 short-wave receiver. Greg Scoggan, 712 Fernwood Ave., Apt. 19, West Covina, Calif. 91790.

WOLLENSAK T-1500 tape recorder. Will swap for best offer. Ernest H. Weaver, 32 Main St., Ashland, Maine 04732.

TAPE RECORDER—portable. Want Knight Star Roamer short-wave receiver or best offer. Randy Bush, 4503 Lowell Rd., Montgomery, Ala. 36105.

GARRARD RC-88 changer. Will swap for best offer. V. R. Hein, 418 Gregory, Rockford, Ill. 61108.

RCA YJH36 tape recorder. Want ham transmitter or best offer. John C. Tompkins, 8444 Oakwood Ave., Munster, Ind. 46321.

MIDLAND 12-204 tape recorder. Will swap for Knight Ocean Hopper short-wave receiver. Jack Berkstresser, 409 W. Williamson, Versailles, Mo. 65084.

GENERAL ELECTRIC transistorized tape recorder, accessories. Want antenna rotator, CB beam antenna or best offer. Larry Stafford, 553 Victor Ave., Lebanon, Tenn. 37087.

AMATEUR RADIO

KNIGHT Span Master 40-meter CW transceiver. Want good ham gear. Carey Coggins, 7235 Hunters Branch Dr., Atlanta, Ga. 30328.

NATIONAL NCX-3 transceiver, power supply, accessories. Will swap for best offer. Rick Tashman, 1156 Passmore St., Philadelphia, Pa. 19111.

KNIGHT T-60 transmitter, R55A receiver. Want Hammarlund HQ-170A, VHF receiver. James Emerich, 308 East Derry Rd., Hershey, Pa. 17033.

JOHNSON Challenger transmitter. Want Johnson Messenger III or similar CB transceiver. L. C. Askins, 2409 Lakeview Dr., Florence, S.C. 29501.

HOME-BREW novice transmitter—80, 40 meters. Swap for best offer. Richard Landis, 36 Wartman Rd., Graterford, Pa. 19426.

HEATH AT-1 transmitter. Will swap for Heath Twoer or best offer. Charles Thompson, WN4HVD, 2010 Birch St. S.E., Decatur, Ala. 35601.

SURPLUS BC-625 AM transmitter. Want Knight Star Roamer or similar SWL gear. Mark S. Foster, 1515 Ave. B, Eau Claire, Wis. 54701.

UTICA 650 transmitter with VFO. Will swap for best offer. R. J. Shumsky, 582 Spring St., Southington, Conn. 06489.

SURPLUS ARC-5 aircraft receivers. Want Swan 250 or other VHF transceivers. David T. White, 266 Main St., Irvine, Ky. 40336.

NATIONAL NC-88. Want Knight R-100A or similar communications receiver. Tim Bedgood, 710 Woodward St., Lakeland, Fla. 33803.

GONSET G-63 receiver—6, 80 meters. Want Regency MR-10B, ME-33B or VHF receiver. Phil Kurman, 1729 S. Durango Ave., Los Angeles, Calif. 90035.

WRL TC-6A 6-meter transceiver, power supply, ground-plane antenna. Want electric guitar or bass. Mike Bratcher, WA5QJK, Rt. 1, Maysville, Okla. 73057.

HEATH OM-2 oscilloscope for 6-meter transceiver. Will swap for best offer. Sam Davis, WA1GQY, 128 Bainbridge, Malden, Mass. 01348.

SHORT-WAVE LISTENING

KNIGHT Star Roamer. Want turntable, tape recorder or best offer. Charles Dauwalder, 1155 West Arbor Vitae St., Inglewood, Calif. 90301.

HALLICRAFTERS S-120. Want BC-454 and power supply. Neil Kamikawa, 2373-D Palolo Ave., Honolulu, Hawaii 96816.

PHILMORE CR-5AC receiver. Want CB base or mobile transceiver or VTVM. William Via, 1870 Marshall Rd., Baltimore, Md. 21222.

LAFAYETTE Explor-Air receiver. Want Eico 232 VTVM, 324 RF signal generator or similar. Wayne Link, 10051 Arnold, Detroit, Mich. 48239.

HALLICRAFTERS S-38E receiver. Want 30-50 mc receiver. Donald Farris, Box 65, Miller City, Ill. 62962.

KNIGHT Star Roamer. Want Lafayette RK-142T or similar tape recorder. Michael Lonnquist, 10523 Penn Ave., Bloomington, Minn. 55431.

HALLICRAFTERS S-120. Want novice ham receiver or other gear. Sand Mersky, 7544 Brockton Rd., Philadelphia, Pa. 19151.

KNIGHT Star Roamer. Want tape deck. David Brumley, 1524 San Alano Pl., Orange, Calif. 92667.

HEATH GR-64 receiver. Want Lafayette LA-218 or similar amplifier. Barry Yezek, RD 3, Mt. Pleasant, Pa. 15666.

KNIGHT Star Roamer. Want Bogen MX6A-T or similar mixer. George W. Rigler, 2801 16th Ave., Sterling, Ill. 61081.

HALLICRAFTERS S-76 receiver. Want Hy-Gain 14-AVQ antenna or best offer. Kent W. Miller, 308 N.E. 6th, Linton, N.D. 58552.

KNIGHT Star Roamer. Want Heath GR-64. Bruce Slykhouse, 24337 Ross, Dearborn, Mich. 48124.

KNIGHT Span Master, phones. Want Heath HX-11 or DX-60 transmitter. Jim Wheeler, 324 Robert St., Detroit Lakes, Minn. 56501.

SKY BUDDY receiver. Want Electro-Voice 719 ceramic microphone. Frank Iacono, KOA2997, 94 Fay's Ave., Lynn, Mass. 01901.

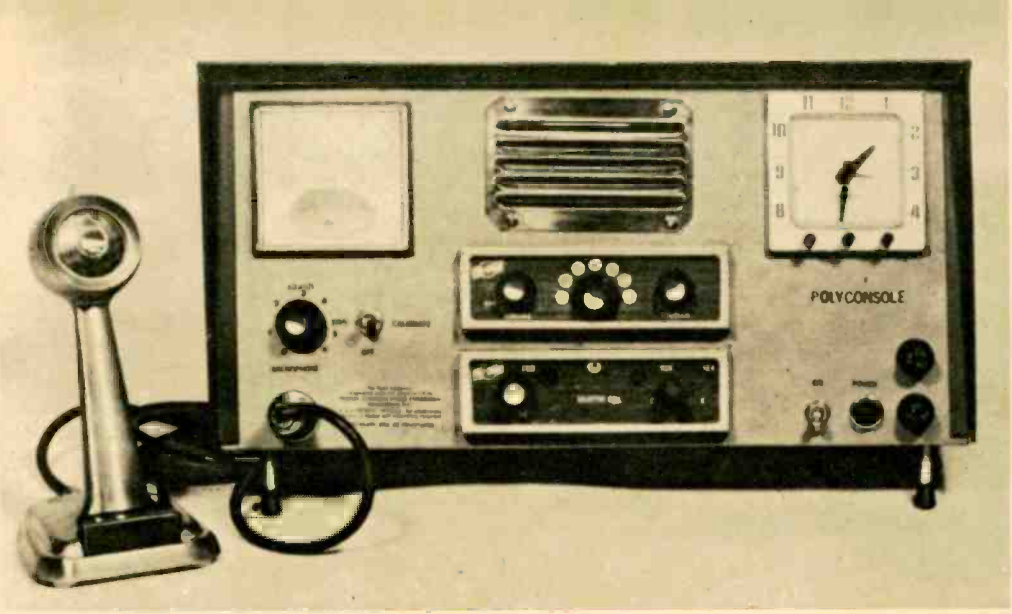
KNIGHT Star Roamer. Will swap for best offer. Jerry Lamoureux, 45 Carter Ave., East Blackstone, Mass. 01504.

GENERAL ELECTRIC SW/BCB receiver. Want VLF receiver. Dave Felix, 1741 Thames St., Clearwater, Fla. 33515.

HALLICRAFTERS SX-28 receiver. Want transistorized CB transceiver or best offer. Thomas R. Porter, General Delivery, Silver Creek, Miss. 39663.

DRAKE 2B communications receiver. Will swap for best offer. Richard Martin, Box 140, Lincoln Hall, Athens, Ohio 45701.

HALLICRAFTERS S-40B receiver. Will swap for best offer. Byron Tatum, Box 506, Alvin, Tex. 77511.



HOME BASE. . . A console with all the fixin's for base-station use is designed for use with electronics of the same manufacturer but will accept "most CB radios on the market today," says the manufacturer. Clock (for timing contacts), output meter, monitor speaker, microphone gain control, power switch and fuses are mounted on the front panel of the Polyconsole; a PP1 power supply is built into it. Standard installation would include the 23C transceiver and its selective-call accessory. AC or 12-VDC operation. $89 without transceiver, selective call or mike. Polytronics Communications, Box 536, Baltimore, Md. 21203.

Electronic Marketplace

For the Pro. . . The R-530 communications receiver tunes AM, SSB, CW and RTTY on all bands from 500 kc to 30 mc. Among its more sophisticated features are an adjustable RF attenuator, switchable selectivity-filter widths, AVC action control, choice of RF or AF metering and adjustable noise blanking. Frequency accuracy is listed as 1 kc, stability at 100 cps drift after turn-on. About $700. Galaxy Electronics, 10 S. 34th St., Council Bluffs, Iowa 51501.

Tubeless TV. . . The RA-23 is a VHF FM/TV portable receiver—for listening only. In addition to the regular FM stations you can tune in TV channels 2-13. It's portable (8 x 5 x 2 in. with a carrying handle), has a telescoping antenna and an earphone for personal listening. The receiver can be used as a tuner with a tape recorder or hi-fi system, according to its distributors. $39.98. Olson Electronics, Inc., 260 S. Forge St., Akron, Ohio 44308.

Electronic Marketplace

Values. . . The Handy 75 Model RC-146 substitution box permits substitution of 75 component values—including carbon and wire-wound resistors, capacitors (including electrolytics) and rectifiers. The circuit contains an electrolytic

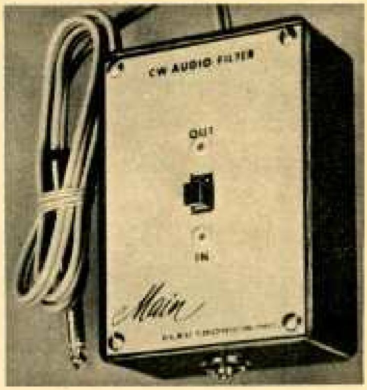
surge protector to prevent capacitor damage. $44.95 Sencore, Inc., 426 S. Westgate Dr., Addison, Ill. 60101.

Beat the Bands. . . The Star-Fire VI is a portable receiver covering AM and FM broadcast bands, VHF-FM police bands (with the regional Weather Bureau forecasts on 162.55 mc) and

international short-wave bands. Features include AFC for FM reception, time-zone chart, tuning meter and earphone jack. Case is genuine black leather. Power is provided by four D cells (or AC with optional adaptor, $5.95). $79.95. Lafayette Radio Electronics, 111 Jericho Tpk., Syosset, N.Y. 11791.

Electronic Marketplace

CW Filter. . . The CWF-1 is a narrow-band audio filter that increases effective selectivity in reading CW. Bandwidth is listed as 120 cps at the 6db points, 200 cps at 10db. The unit is connected to the low-impedance (2-3 ohms)



phone jack on a receiver or transceiver; 2,000-ohm headphones are plugged into the CWF-1. Only control is an in/out switch. $19.95. Main Electronic, Inc., 353 Pattie, Wichita, Kan. 67211.

Sound Brother. . . Two recent hi-fi kits are the KG-795 stereo FM tuner (top) and the KG-865 stereo amplifier (bottom). The tuner's RF and IF stages come factory-assembled. Specifications for the tuner include 3-μv sensitivity (IHF), 30-15,000 cps frequency response, less than 1

per cent harmonic distortion. Amplifier output (both channels) is rated at 50 watts (IHF) or 34 watts continuous sine-wave; frequency response is 18-30,000 cps and power bandwidth (1 per cent harmonic distortion) is 20-20,000 cps. $69.95 each. Optional walnut case, $14.95 each. Allied Radio Corp., 100 N. Western Ave., Chicago, Ill., 60680.

CIRCLE NUMBER 37 ON PAGE 11

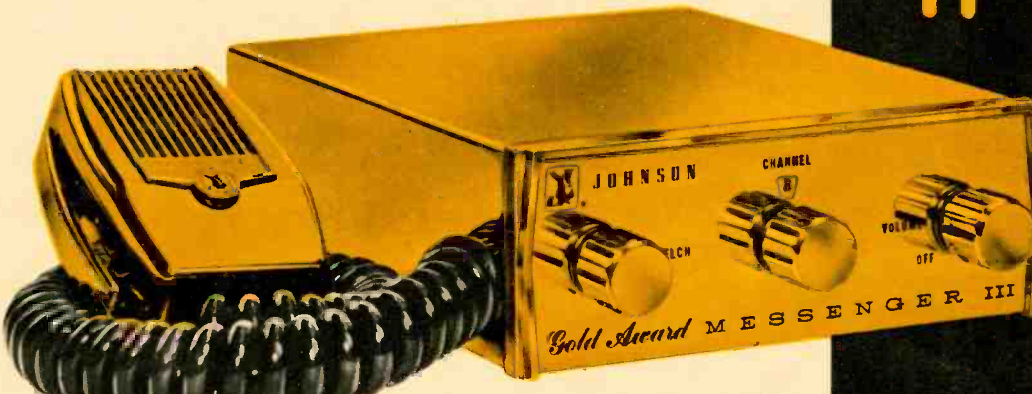
JOHNSON'S Spring GOLD RUSH

YOU MAY HAVE ALREADY

STRUCK IT RICH!

GOLD AWARD MESSENGER III's. Every CB call area will have a winner. YOUR call number may be lucky! See your Johnson dealer and find out if you have already won.

PLUS! Participating Johnson dealers in most areas will also give away Gold Award Messenger III's. See your dealer to find out how you can strike it rich! You have TWO chances to WIN!



(Contest ends June 30, 1968)

In commemoration of Johnson's production of its 100,000th Messenger III, the E. F. Johnson Company is releasing a limited number of 24-carat gold-plated Messenger III's to be given away free† Incorporating all the famous features that have made the Messenger III the standard of the industry, these Gold Award models will truly become CB collectors' items!

Hundreds of Winners

GOLD RUSH ACCESSORY SALE!

(Expires June 30, 1968)

ANTENNA METER-MATCHBOX COMBINATION ($30.90 value)
Get maximum range from your CB unit—eliminate mismatch between transceiver and antenna. Either of above with purchase of Messenger I or 110; both with purchase of any other Johnson 5 watt transceiver—for only **$1.00***.

AC POWER SUPPLY ($32.95 value)
Converts any transistorized Johnson transceiver into a full-power base station. Mounts beneath transceiver. With your purchase of Johnson Messenger III, 100, 300, 320 or 323—for only **$1.00***.

HALF PRICE SALE

PORTABLE POWER PACK ($79.95 value)
Permits full-power, portable operation for up to 8 hours without recharging. With purchase of Johnson Messenger III, 100, 300, 320 or 323 for only **$39.97***.

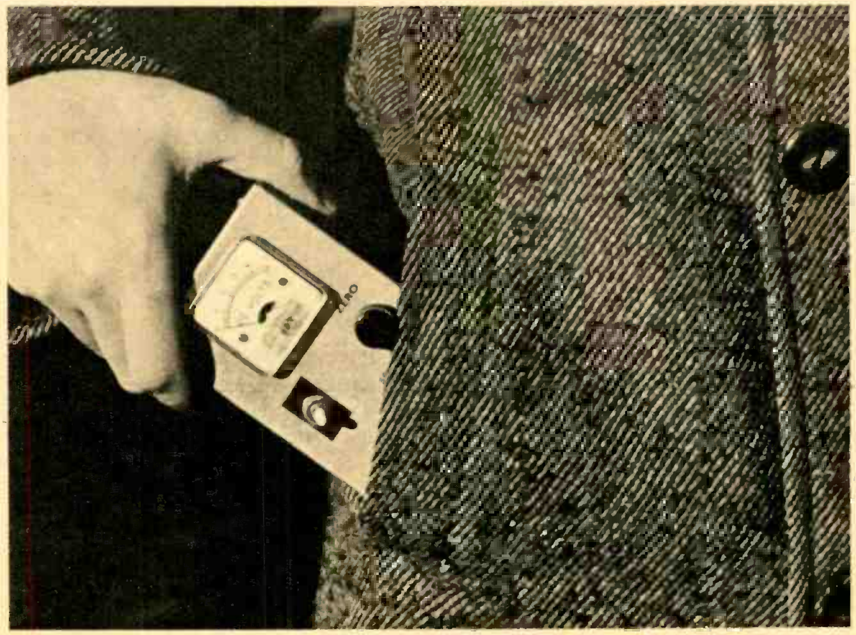
*at participating Johnson dealers

SEE YOUR JOHNSON ® DEALER TODAY

† Void where prohibited by law.

E. F. JOHNSON COMPANY
6565 Tenth Ave. S.W., Waseca, Minnesota 56093
Providing nearly a half-century of communications leadership

CIRCLE NUMBER 34 ON PAGE 11



Pocket VTVM

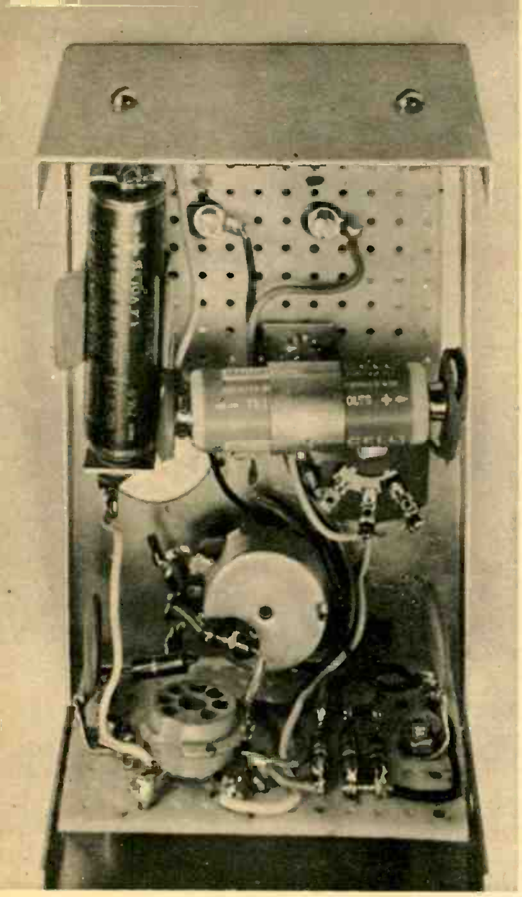
By CLARE GREEN, W6FFS

MOST versatile test instrument on practically every serviceman's and experimenter's bench is the VTVM. It has few peers in measuring DC voltages in high-impedance circuits which a VOM would load down like a dead short (ever try to measure an oscillator's grid voltage with a VOM?).

Because the VTVM requires AC operating power, its use is pretty much restricted to the shop or lab. EI's Pocket VTVM changes this picture. It operates anywhere on batteries and has a high input impedance to boot. To keep its cost down to around $15, we did not design it to measure AC or resistance; you can measure these with your VOM.

Our VTVM is built in a pocket-size cabinet as you see above. It uses only one tube (9.8- and 1.4-V batteries are required) and has VDC ranges 5, 50 and 500 volts. A 1-megohm resistor in the probe provides isolation and an offset zero-adjust potentiometer permits center-scale meter positioning for aligning discriminator and ratio detector circuits.

Construction. Our model is built in a 5¼ x 3 x 2⅛-in. Minibox but you could get things into a smaller cabinet. All of the components are mounted in the main section of the box; the U-section serves as a cover. Parts placement is not critical, but because of the small size, construction will be easier if you follow our arrangement.



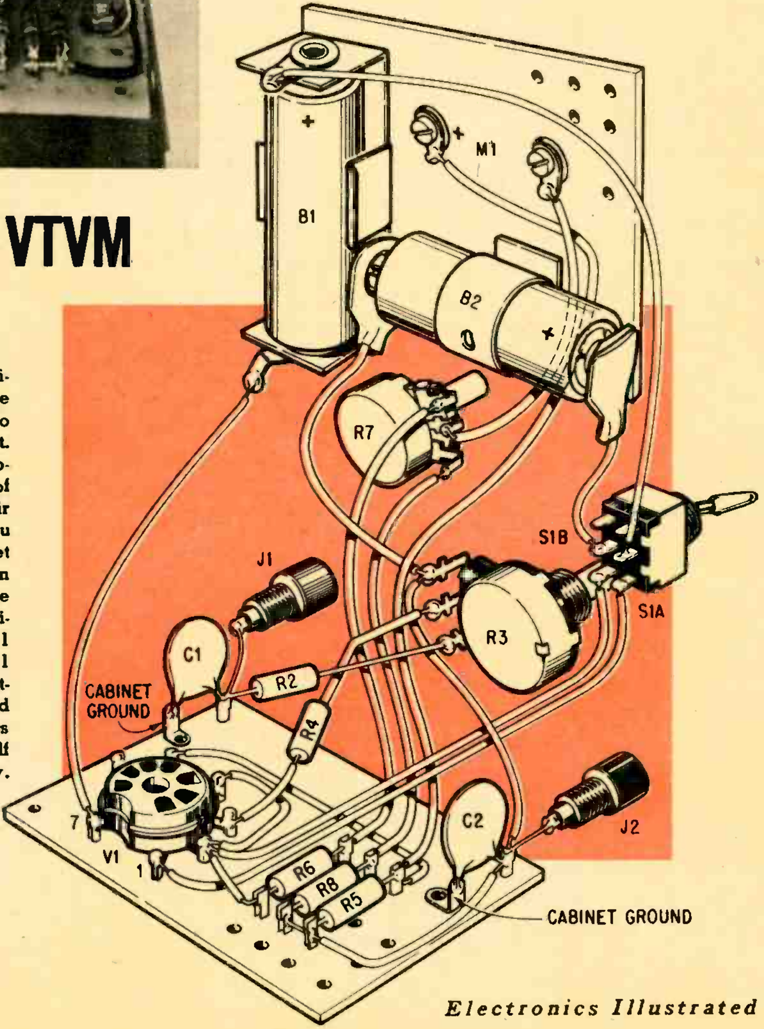
Make sure that there is no direct connection between the circuit ground and the box. The box is normally floating to allow both positive and negative measurements to be made. C1 and C2 tie it to circuit ground.

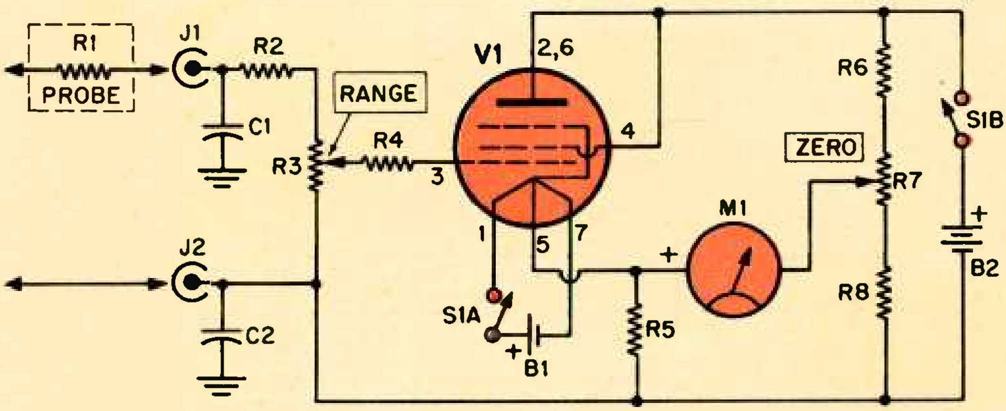
Best way to start is to lay out and cut the holes for the panel components—the meter, potentiometer, switch and pin-tip jacks. Mount the parts on the panel as shown. Cut a 2¾ x 1¾-in. piece of perforated board and mount it at the bottom of the cabinet with two ½-in. long metal spacers. Install two ground lugs under the spacers' screw heads. The socket for V1 is mounted on the perforated board by soldering its lugs to push-in terminals (flea clips) installed in the board. Mount all components where shown on push-in terminals.

Cut a 2 x 2½-in. piece of perforated board and position it over the rear of M1. Locate

Pocket VTVM

Parts placement is not critical and you can rearrange things to squeeze them into an even smaller cabinet. Do not use miniature potentiometers. Because of the shorter length of their resistance elements, you may find it difficult to set them precisely. Note in pictorial below that the circuit is grounded to cabinet through capacitors C1 and C2, at inputs, only. B1 is held in place with battery holder. B2 is strapped in place; the connectors are made by cutting in half connector for 9-V battery.





Normally, current through R5 causes voltage drop across it. R7 is adjusted for same voltage from its wiper to ground; meter now indicates zero. Voltage at J1, J2 increases drop across R5 and meter deflects.

and cut holes for M1's terminal screws, then mount the board behind the meter with an aluminum angle bracket. Mount B1 and B2 on the perforated board. We used a battery holder for B1 and a small metal strap for B2. Install R1 in the probe of the red test lead.

Calibration. Set R3 full counterclockwise and set S1 to *on*. Adjust R7 for zero indication on M1. Connect the meter leads to a DC voltage source such as a power supply. If you use a battery, connect a potentiometer across it to provide a variable voltage. Connect an accurate voltmeter across the variable voltage source and adjust the potentiometer until the voltmeter indicates 5 V. Now, carefully adjust R3 until M1 indicates exactly full scale. Mark the position of the knob pointer on the front-panel dial.

Set R3 full counterclockwise and adjust the DC voltage source to 50 V. Carefully adjust R3 for a full-scale indication on M1 and mark the knob's position on the dial.

Set R3 counterclockwise again. If you have 500 VDC power source, connect the leads to it and adjust R3 until M1 indicates full scale. Mark the position of the knob on the dial. If you don't have a 500-V source, the 500-V range can be calibrated using, 100, 200, 300 or 400 V by adjusting R3 until M1's indication is equal to the applied voltage. Then mark the knob position on the dial. For example, if a 200-V source is used, adjust R3 until M1 indicates 20 μa (equiv. to 200 V). The 30 μa, 40 μa and 50 μa, markings will correspond to 300, 400 and 500 V, respectively. (You get greater accuracy if you calibrate with a high voltage.)

Operation. Because J1 and J2 are insulated from the metal cabinet, you can measure negative voltages such as oscillator grid voltages. To measure a negative voltage, plug the red lead with 1-megohm resistor in J2 (−) jack and connect the black lead to J1 (+) jack.

For adjusting discriminators and balancing stereo amplifiers, turn R7 for a mid-scale meter-needle position. The meter will then indicate positive and negative swings at each side of zero.

If the 5-V range cannot be set with R3, try a different value for R2 to compensate for a difference in resistance of R3.

PARTS LIST

B1—1.4 V mercury battery (Mallory ZM9 or equiv.)
B2—9.8 V mercury battery (Mallory TR177 or equiv.)
C1,C2—.01 μf, 1,000 V ceramic disc capacitor
J1—Insulated phone tip jack (red)
J2—Insulated phone tip jack (black)
M1—0-50 μa DC microammeter (Lafayette 99 H 5049)
Resistors: ½ watt, 10% unless otherwise indicated
R1—1 megohm, 5% (mounted in probe)
R2—8.2 megohms, 5%
R3—1 megohm linear-taper potentiometer
R4—1 megohm
R5,R6—10,000 ohms
R7—1,000 ohm linear-taper potentiometer
R8—680 ohms
S1A,S1B—DPST miniature toggle switch (Lafayette 99 H 6162 or equiv.)
V1—3S4 tube
Misc.—5¼ x 3 x 2⅛-in. Minibox, red and black test prods, perforated board, printed-circuit-type 7-pin socket for V1, metal spacers, knobs

DXing Folk Music

By ALEX BOWER

IN SPITE of an occasional ad plugging a hi-fi short-wave receiver, no DXer would expect great sound from the international bands. But don't let that blind you to the opportunities for unique music that are available only to the DXer. Most of the SW music programming—aside from the stuff you can hear a lot better in commercial LPs or on FM—is, of course, folk music. Some exotic folk music, particularly that of India, is *in* these days. And what could be closer to the horse's mouth (so to speak) than a short-wave broadcast direct from the stable?

Fortunately, folk music doesn't depend on hi-fi sound to be enjoyed. Nor does it matter what language is used in the broadcast. All that matters is when and where to tune in. Quality and quantity will vary a great deal with the station—and the calendar.

For example, the commercial service of R. Ceylon beams programs to India mornings (EST) on 9667 and 11800 kc. These transmissions consist mostly of East Indian music. (Often you'll hear the sitar, a stringed instrument that has suddenly made it big on the western pop scene in the last year.) Reception in North America will range from good to poor, with West Coast SWLs having the edge, of course. Best period east of the Mississippi will be around 0800 EST, probably on 11800 kc. You might also be able to hear R. Ceylon evenings (sign-on at 2000 EST) on 15230 kc. Despite its limitations, R. Ceylon is the best source of folk music from the Far East.

Also somewhat *in* is Japanese music. You can hear a little of it over R. Japan's broadcasts to North America (15135 and 17825 kc). Times are listed in our guide. Elsewhere in the Far East, most international stations devote most of their schedules to talk. R. Peking does air an occasional Chinese piece, however—party-line lyrics added, sometimes complete with English translation—during its North American transmission evenings on 15060 or 15095 kc.

R. Cairo is tops in the Near East's music department. When the North American transmission is concluded on 9475 kc at 2200 EST the U.A.R. home service appears on the channel. It can also be heard on 7050 kc but there you will have to buck intermittent ham QRM as this is 40-meter amateur territory here. Daytime frequencies of 15050 and 15475 kc might also be used after 2200. You also will want to hear R. Ankara's Turkish home service relay (15160)

EI'S GUIDE TO DXing FOLK MUSIC

FREQ. (kc)	STATION (& Country)	TIME (EST)	FREQ. (kc)	STATION (& Country)	TIME (EST)
4740*	R. Progreso (Ecuador)	Evenings	11705	R. Sweden	2200-2330
5900	V. del Norte (Ecuador)	Evenings	11750*	R. Tehran (Iran)	1530-1630
5980	R. Demerara (Guyana)	After 0415	11800	R. Ceylon	Mornings
6015	R.T.I. (Ivory Coast)	1700-1900, 0000-0200	11805	R. Sweden	1900-2130
6155	R. Nationale (Guinea Rep.)	1700-1900, 0000-0200	11865	R. Lubumbashi (Dem. Rep. of Congo)	Around 1300
6240	R. Cuzco (Peru)	Evenings	15050	R. Cairo (U.A.R.)	Daytime
7050	R. Cairo (U.A.R.)	After 2200	15105*	R. Tehran (Iran)	1530-1630
7210	R. Senegal	After 0100	15160	R. Ankara (Turkey)	Around 2345
7290	R. Ethiopia	2230-2300	15135	R. Japan	1800-2200
9475	R. Cairo (U.A.R.)	After 2200	15230	R. Ceylon	After 2030
9535	Swiss B.C.	2030-2215	15475	R. Cairo (U.A.R.)	Daytime
9667	R. Ceylon	Mornings	17825	R. Japan	1800-2200

*Frequency varies.

and R. Tehran's hour of Persian music (11750 and 15105).

Many African home-service relays have strong signals on both 40 and 49 meters between 1700 and 1900 and again between 0000 and 0200 EST. The list includes Radiodiffusion du Senegal at Dakar (7210), Radiodiffusion Nationale at Conakry, Guinea Republic (6155) and R. Abidjan (Radiodiffusion Television Ivorienne) in the Ivory Coast (6015). All are in West Africa. East African music is somewhat different, of course, and much more difficult to hear in North America. You might try R. Ethiopia (7209) and the station at Lubumbashi in the Democratic Republic of Congo (11865). Also Kenya and Tanzania are currently testing new high-power international transmitters.

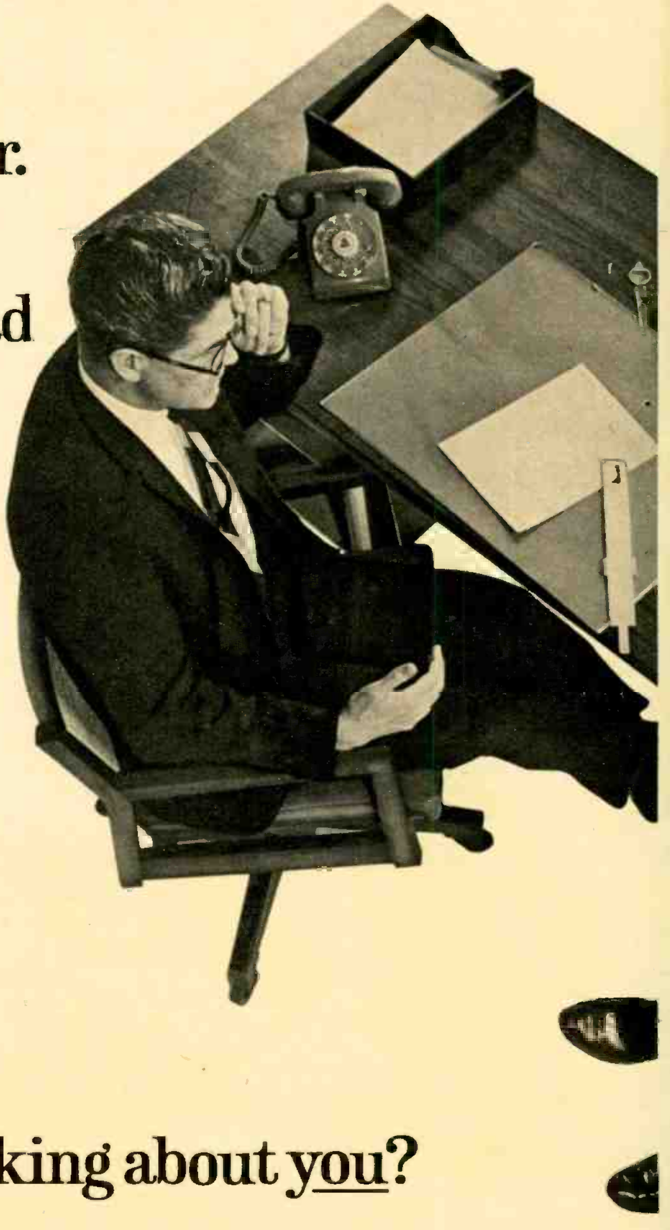
In most of Latin America the music aired by stations in the smaller centers has a less polished, more primitive flavor than that emanating from major cities. Small-town Mexican stations (such as R. Acapulco) occasionally can be heard in many areas of the U.S. right on the MW band. In other parts of Latin America such stations have regional short-wave outlets.

The music of the Andes is particularly interesting. Possibly the most consistently-heard Andean regional station (all of which are low-power) is R. Progreso at Loja, Ecuador (approximately 4740 kc). Both frequency and modulation level vary and the station is in 60-meter territory where reception will be poor in summer due to static. A couple of Andean stations that are a little higher in frequency—and therefore less subject to static—are La Voz del Norte (5900) and R. Cuzco (6240). All three can be heard during the evening. And, strange as it may seem, sitar music can also be heard from Latin American—over R. Demerara (5980 kc) at Georgetown, Guyana, where there is a large East Indian population.

You should have no trouble hearing a variety of European folk music. R. Moscow (evenings EST on many frequencies), the Swiss Broadcasting Corp. (9535 kc at 2030-2215), R. Sweden (1185 at 1900-2130, 11705 at 2200-2330) and the BBC (almost any time on many frequencies) should provide the SWL with all he could possibly want. You'll even find some Australian folk music—most of it essentially European—in R. Australia's transmissions to North American (2000-2200 on 15320 and 17840). The European fare is, to Americans ears, less exotic than that of other continents and is often presented in arrangements for concert orchestra—hardly the genuine article.

And one last note: If you find that this kind of SWLing is to your taste why not consider connecting a tape recorder to your receiver? If you watch for first-rate openings you can build up an enviable collection of music that could not be duplicated in any other way.

"He's a good worker. I'd promote him right now if he had more education in electronics."



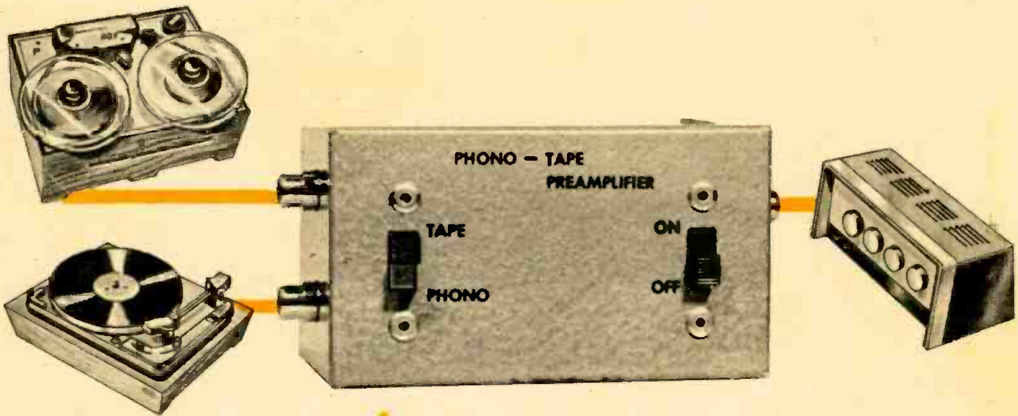
Could they be talking about you?

You'll miss a lot of opportunities if you try to get along in the electronics industry without an advanced education. Many doors will be closed to you, and no amount of hard work will open them.

But you can build a rewarding career if you supplement your experience with specialized knowledge of one of the key areas of electronics. As a specialist, you will enjoy security, excellent pay, and the kind of future you want for yourself and your family.

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

CREI Programs cover all important areas of electronics including communications, radar and sonar, even missile and spacecraft guidance. You're sure to find a program that fits your career objectives.



Phono/Tape Preamp

By JOSEPH RITCHIE

FROM one scrounger—who gets his kicks from salvaging old phonographs, radios and tape recorders—to another, here's just the accessory you need to update some of that junk into decent-sounding hi-fi gear. It's a $7 solid-state phono/tape preamp.

The preamp is a two-transistor device which provides RIAA (phono) and tape equalization, and about 40db of gain. This will permit magnetic cartridges and tape heads to be fed into radios, PA amplifiers or budget hi-fi amplifiers whose inputs have only enough gain for high-output ceramic or crystal cartridges. Feed a magnetic cartridge into one of these inputs and you'll have to sit right in front of the speaker to hear anything.

Or suppose you decide to purchase a tape *player* rather than a tape deck to play prerecorded tapes. A tape deck includes record and playback electronics. You can connect its output to the high-level inputs of your amplifier.

But a tape *player* has no such electronics. The signals come directly from the heads and must be fed into the low-level, equalized tape-head inputs of an amplifier.

To use a player with an amplifier which does not have tape-head inputs you need our preamp. Using a standard 9-V battery, the preamp provides about a 0.5-V output with an input signal of 6 millivolts. Noise level is low—nominally 60db down from maximum output. While it is best to feed the preamp into a load of 10,000 to 50,000 ohms, it will work into virtually any high-impedance load. However, there could be some hum pickup if you use a long connecting cable to an amplifier or radio and have a load impedance greater than 50,000 ohms.

The Circuit

Transistors Q1 and Q2 function as straight amplifiers. To provide a little temperature stabilization, the base bias for Q1 is taken from the emitter of Q2. Capacitor C4, which bypasses Q2's emitter resistor (R8), prevents negative feedback from getting to Q1's base.

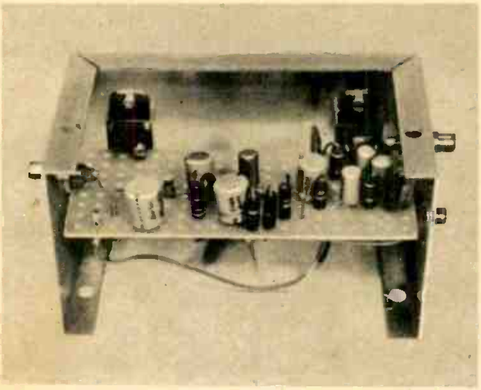
Depending on the feedback network—C6, C7, R9 or C8, R10—selected by switch S1B, the preamp will be equalized for records (RIAA) or for tape by frequency-correcting feedback which goes from Q2's collector to Q1's emitter.

The equalization for the *phono* input is within 2db of the RIAA curve. Since tape equalization depends on tape speed and equalization during recording, the preamp's tape equalization is a compromise to provide best sound.

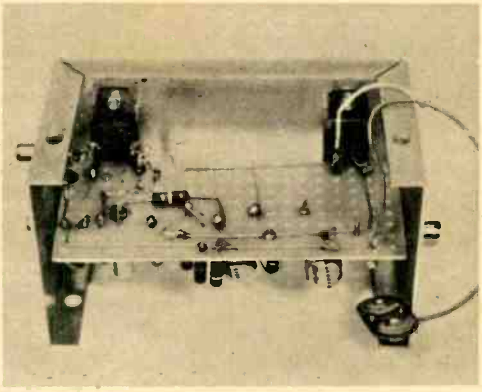
Actually, it is closer to correct equalization for 7½ ips but an amplifier's tone controls can be used to compensate for noticeable variations such as excessive highs or reduced bass.

Construction

The unit shown here is a mono version. For stereo, simply build two units or construct two circuits on a single circuit board.



View of top of circuit board. Note how components are mounted on end to save space. Board is supported by lugs on switches and input jacks.



Underside of circuit board. Resistor at left is R1. You have the option of running wires under board as shown or putting them on board's top.

If you need only a tape-head preamp, eliminate S1, C6, C7 and R9, connect C8 to Q2's collector and connect C1 to the input jack.

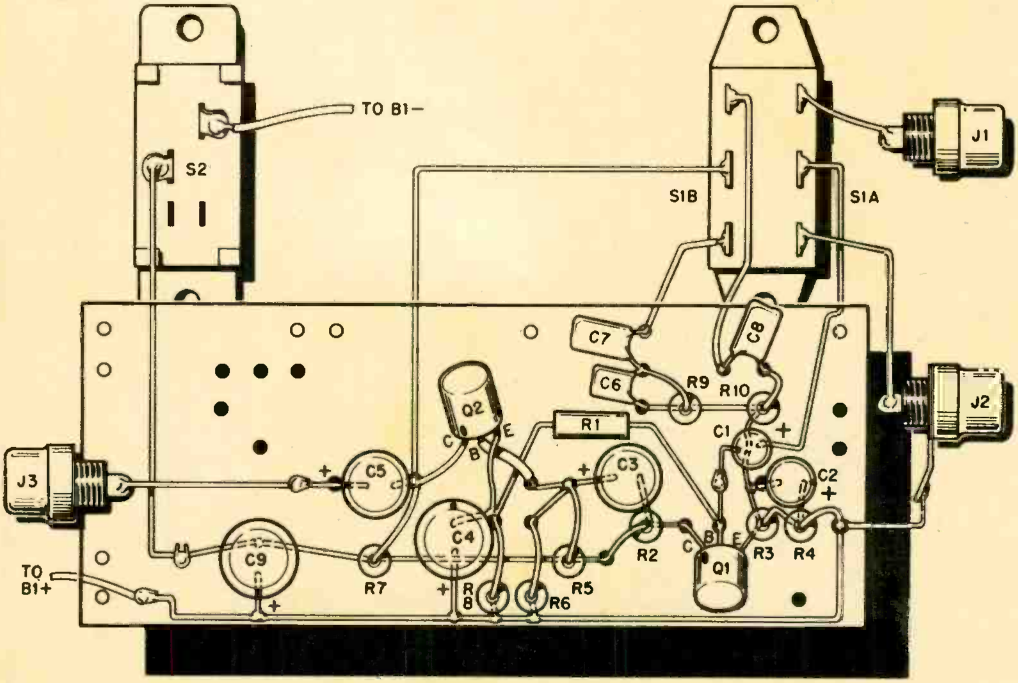
If you need only a phono preamp, connect C1 to the input jack, eliminate C8 and R10 and connect C7 to Q2's collector.

Most parts values are critical so make no substitutions unless specified. It is not even necessary to use flea clips for tie points. Parts will get enough support by passing their leads through holes in the board and pulling them tight until soldered.

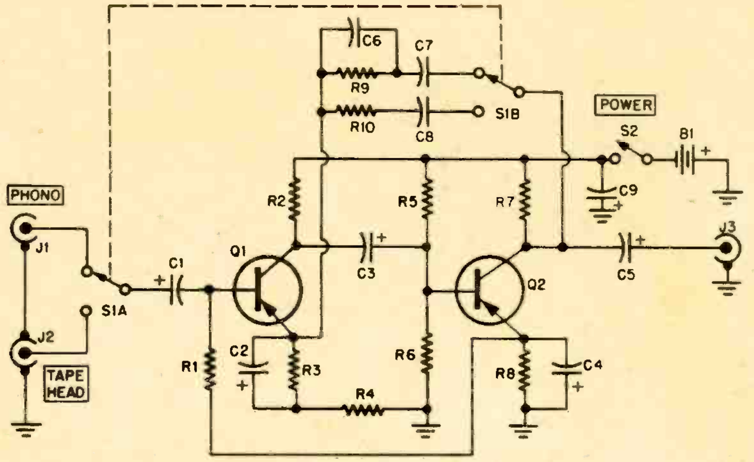
A flea-clip tie point at Q1's base is required for the connection of R1, which is the last resistor to be installed. If you can eliminate the tie-point without making the construction difficult, by all means do so.

The preamp components will fit on a

Our circuit board is 1⅝ x 3¾ in. Use flea clips for tie points; wires may be run above or below board.



Equalization is provided by feedback from Q2's collector to Q1's emitter. With input selector switch S1 in phono position (shown) RIAA equalization is provided by C6,C7 and R9. When S1 is set to tape head, S1B changes equalization by putting C8 and R10 in feedback loop. Overall gain of preamp is about 40db.



PARTS LIST	
B1—9 V battery (Burgess 2U6 or equiv.)	Resistors: ½ watt, 10%
C1—10 µf, 6 V electrolytic capacitor	R1—220,000 ohms
C2—30 µf, 6 V electrolytic capacitor	R2,R10—12,000 ohms
C3,C5—30 µf, 15 V electrolytic capacitor	R3—470 ohms R4—100 ohms
C4—100 µf, 6 V electrolytic capacitor	R5—100,000 ohms
C6—.005 µf, 75 V ceramic disc capacitor (see text)	R6—22,000 ohms
C7,C8—.01 µf, 75 V ceramic disc capacitor (see text)	R7,R9—4,700 ohms
C9—100 µf, 12 V electrolytic capacitor	R8—1,200 ohms
J1,J2,J3—phono jack	S1—DPDT slide switch
Q1,Q2—2N2613 transistor (RCA)	S2—SPST slide switch
	Misc.—2¼ x 2¼ x 4-in. Minibox, perforated board

Phono/Tape Preamp

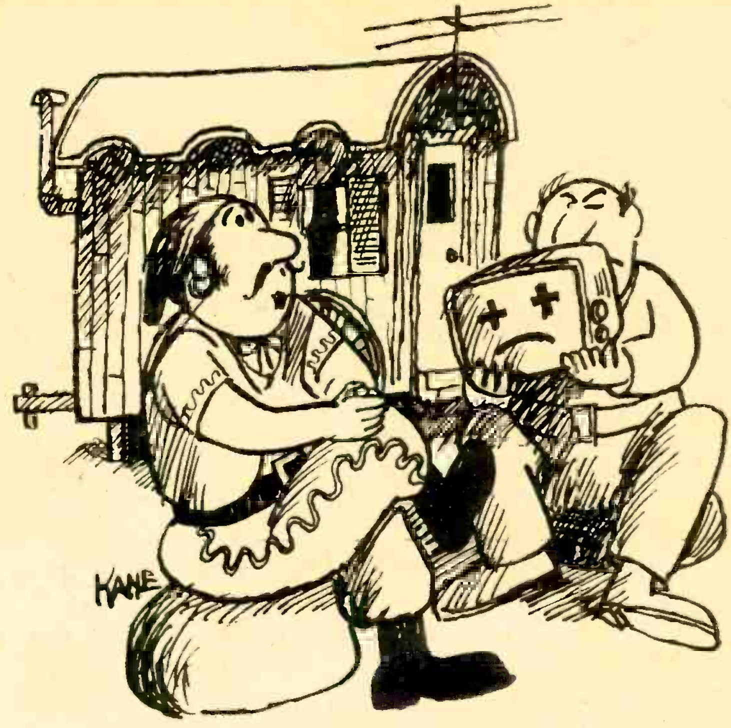
1⅝ x 3⅞-in piece of perforated board. It is held in position in the 2¼ x 2¼ x 4-in. aluminum Minibox by the lugs on switches S1 and S2.

Before installing any components on the board, mount S1, S2 and the three jacks. The centers of the switches are ¾ in. from each side of the cabinet directly in the cabinet's centerline. Position the board so it lies on top of the switches' wiper terminals. Insert a flea clip next to S1B's wiper and S2's top terminals, wrap the terminals around the flea clips, and then solder. Wire the connections from jacks J1 and J2 to S1A and then install all other parts. Mount the battery in the cabinet's cover so it will slide under the board without touching any components. Since the circuit's current drain is only 1.5 ma, the battery will last several months in intermittent service.

Using the Preamp

High-impedance tape heads can be connected directly to preamp jack J2. Some low-impedance heads might produce some unusual sound. Magnetic phono pickups should be connected without the usual 47,000-ohm load resistor across the pickup's terminals—feed the pickup directly to J1. If your preamp is a stereo job, in addition to duplicating all parts for the other channel, replace S1 with a four-pole, double-throw switch.

Depending on the equipment you're scrounging the sound might not be exactly to your liking; you can get wide frequency variations by changing the values of the capacitors in the equalizer networks. For example, suppose you are upgrading an old ceramic-cartridge phonograph by installing a magnetic pickup. These phonographs were not noted for their outstanding bass response. Therefore, to boost the bass increase the value of C7 from .01 µf to .015, µf or .02 µf. Similarly, the low-frequency response from a tape head can be boosted by increasing the value of C8. If you get excessive highs from your conversion job, increase the value of C6 to .01 µf. Reduced lows from a tape head (which will be most unusual) will require some bass boost at the amplifier.



How to Gyp the TV Repairman

By ART MARGOLIS

EVERY few years a rash of exposé articles appears in magazines telling how TV repairmen gyp the public. This is one of those times. I am a TV repairman and have been for 20 years. When I do house calls later today I'll be on my guard. For these exposés seem to stimulate some customers to revenge. Let me tell you about some of the sneaky methods they've come up with in a few cases from the last month or two.

"The on/off switch on my color TV is broken," a woman told me on the phone recently. "We know because my husband shorted it out and the TV is working. The only way we can turn it off is to pull the plug out of the wall."

Sounded logical. I asked her for the model number and told her I'd be there in about an hour. The parts house is only a few miles out of the way. I whistled when the counterman told me the price of the switch. It was his last one; he must have had a run on them.

As I pulled into the customer's neighborhood a friend of mine from another TV company was directly ahead of me. He waved. He must have had a call nearby. I made a left turn and he made a right. When I reached the correct address there were two other TV trucks in front of the house. One of the guys must have been inside. The other was standing in the doorway gesticulating wildly. Then, from the other end of the block, came my friend.

It was a race case. She had called four companies and the first one there won. (No wonder there had been a run on that on/off switch.) And not even a service charge for the rest of us to cover the cost of the fool switch!

Calculating a service charge for a house call is easy. You take into consideration the salary of the dispatcher who receives and routes the call to a serviceman, the truck expense, driving time, general overhead, the serviceman's pay for the time in the house and, I hope, a fair profit. It's normal routine to collect our minimum fee on every house call.

How to Gyp the TV Repairman

The customer obligates himself for the service charge when he places a service request and a man walks in his front door. But some people try to duck the charge. Take, for example, a call I made on an unsmiling blonde set-owner.

I looked over the TV. The tubes were lighting and the pilot light was on. But there was no sound or brightness. I moved the TV away from the wall and then I made my mistake. Instead of first taking off the back I began by resetting the circuit breaker. The sound and picture came back on.

"What did you do?" she hollered.

I showed her the little red button and how it is reset by pressing it. She shouldered me away from behind the TV and fingered the button. Then she shoved the TV back against the wall.

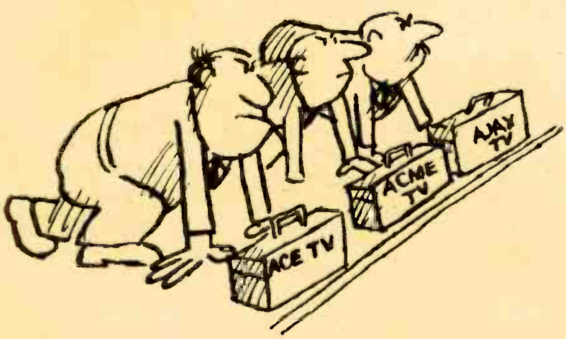
"I'm not finished yet," I said. Circuit breakers just don't open all by themselves. Nine times out of ten it's because of some kind of trouble.

"Oh yes you are," she snarled. "I'm not paying you any service charge for pressing a button." And she pointed to the door. Just then a large man in an undershirt walked in from the other room. Something told me I wasn't going to get anywhere arguing so I packed up to leave. As I started the truck she came running out. "Hey fellow," she called sweetly, "it went dead again." But I kept right on going.

In roughly one out of every five calls a TV technician must take the set back to the shop. An auto mechanic can change tires, batteries and spark plugs on the spot but not take time for a ring job. Likewise, a TV repairman can change tubes, fuses and other components in the house but must remove the TV to his bench for more complex work. Some unscrupulous customers see this as an opportunity to make money.

I did one repair job for a man who sounded like a side-show barker. The set was a 21-in. three-way color console and there was no brightness. Minor repair measures didn't work and I received permission to pull the chassis and take it to my shop. I left the picture tube in the cabinet with the radio and phonograph that are the other two parts of the three-way system.

On the bench, I found a defective flyback transformer. I installed a new one and returned the chassis the next day. It performed beautifully in the console and I handed the gent the bill. He examined it without complaint but insisted that I stick around to check out the TV.



"Sit down and watch the ball game. Don't be in such a hurry. Haste makes waste." I sighed and sat down. After five minutes of faultless black-and-white, it happened. The screen slowly turned light shades of green-and-white.

He jumped up. "See! The TV *isn't* working right." I reached around in back and turned the green control down a hair. That did it. I sat down again. As the ball game went on the screen gradually developed pinkish tones. He said indignantly, "You don't call *that* right, do you?"

My heart sank. He had a bad color picture tube. I sure was glad I had left the picture tube in the house. I tried to break the news gently. "That changing color is due to movement of the shadow mask." You need a new picture tube. It's been that way a long time hasn't it?"

"What are you talking about?" he snarled. "If there is any trouble in that TV you caused it!" My attempts to explain that I didn't touch his tube and that this trouble only could occur over months and months did nothing but make him still angrier. He showed me the door without paying the $50 repair bill. I didn't receive his check till he was served a summons from our small-claims court a few months later.

I guarantee my repair jobs according to normal industry practice—90-day warranty on any new parts we install. I also supply any labor that is needed to locate and replace these parts should they go bad. The only exception is a one-year warranty on picture tubes. Since there are over 2,000 parts and connections in the average TV set it's economically impossible to extend guarantees any further although we often do more than the guarantee calls for in order to clear up a misunderstanding. Sometimes, however, people want a bit more than we can supply.

A nice looking young couple brought a late-model 19-in. portable into the store for repair one morning. I examined it on the service counter and found it was dead. I took off the back, ran some quick checks and discovered the heater resistor, a large object resembling a dog bone, had burnt open. It was an orange one with a flocked finish. I soldered in a new one in shiny sky blue. The TV came on. I wrote up a bill. They paid it and were on their way. But about five minutes before closing that evening they were back again with the same complaint. From the back of the store I could hear them talking to the night man.

They both looked up startled as I walked up to the service counter. Then they gave me a big hello. I took over from the night man and found that they were right—the set behaved just as it had that morning.

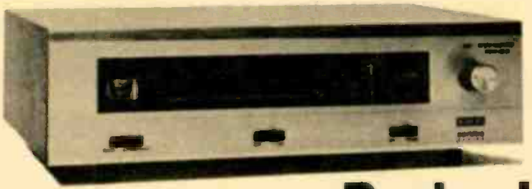
Perplexed, I removed the back of the TV and went searching for the blue heater resistor I had installed. It was gone! In its place was the orange flocked job I had removed. I began rooting through the trash can. Near the bottom was another flocked resistor. I pulled it out and held it up. The customers both flushed and stood there, trying to think of something to say.

She regained her composure first. "Oh my goodness," she exclaimed, fluttering her eyes, "do you know what must have happened, dear? We mixed up the two TVs. We have two portables exactly alike. They must have broken down together."

As it turned out this one had a bad tube. It's common in multiple-TV households for the owners to wait until all their TVs have conked out before they call for service. When identical sets failed from what appeared to be the identical complaints these folks saw a chance to chisel.

Fortunately most people are great to deal with and make a guy feel like a hero when he puts the picture back in their tubes.

EI Kit Report



Eico Cortina

Budget Stereo FM Tuner

AS you watch the price of stereo equipment soar these days you begin to feel second-rate performance is about all that can be expected from budget-priced gear. Not so! The Eico Model 3200 Cortina stereo FM tuner delivers quality performance, common to higher-priced equipment, at low cost. Priced at $99.95 ($139.95, wired) all cost-accumulating frills have been eliminated.

The front panel has only four controls: a tuning knob, *Mono-Auto/Stereo*, *AFC* and *Power* rocker switches. There is a signal-strength tuning meter and a stereo indicator lamp.

The tuner is self-switching. That is, when put in the *Auto-Stereo* mode and tuned to a stereo station, left- and right-channel signals will appear at the left and right output jacks. A mono station's signal will automatically be fed to both output jacks. In the *Mono* mode, the tuner will feed a mono signal to both output jacks even if the received signal is stereo. (The stereo lamp always comes on when a stereo signal is received.)

Because the tuner has virtually no drift AFC is almost unnecessary. Distortion was lower when the tuner was tuned for a peak meter indication rather than when tuning depended on the AFC for pull-in. From 106 to 108 mc, the AFC tended to pull the tuning off center.

You don't have to be an experienced kit builder to get the 3200 working perfectly. Our man, who was a novice at kit building, took about ten hours. But he was extra careful; normally it should take only about half that time.

The front-end, IF and multiplex boards are supplied pre-wired and factory aligned. All that's left is chassis assembly, power-supply wiring, and the interconnections between the front-end, IF and multiplex boards.

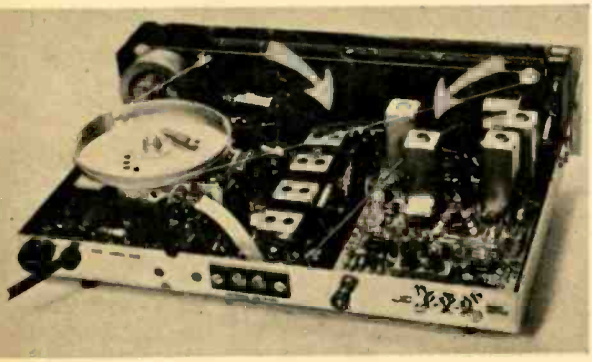
The frequency response in both the mono and stereo modes was within ± 2db from 30 to 12,000 cps. Mono noise checked out at better than 70db down with a standard 1,000 μv input signal. (This is 10db better than claimed by Eico.) Stereo noise level was 60db down on both channels.

Channel separation was 28db at 1 kc and 12db at 12 kc. Instrument alignment of the multiplex circuit (instructions are included for this but you need test equipment) increased separation to 35db at 1 kc and better than 14db at 12 kc.

Total harmonic distortion (THD) on a mono signal was 0.75 per cent (within specs), and 1 per cent for stereo.

The Cortina's sensitivity (IHF) was 6.5 μv at 92 mc. We made no attempt to improve sensitivity since a front-end and IF-strip alignment procedure are not provided in the instruction manual.

While not a DX champion, the Cortina delivered sound quality equal to that from tuners priced much higher. If you're not out in a fringe area you'll be hard pressed to find a low-cost stereo tuner which can equal the 3200.



As front-end (under dial pulley, left), IF strip (left arrow), multiplex board (right arrow) are preassembled, remaining work is interconnections.

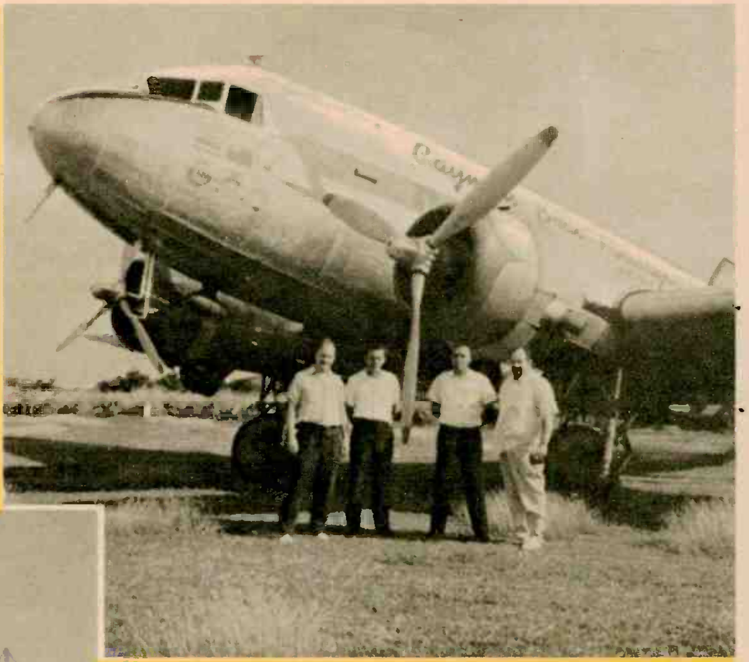
El Visits Radio Americas

By TOM KNEITEL, K2AES/KS4CH

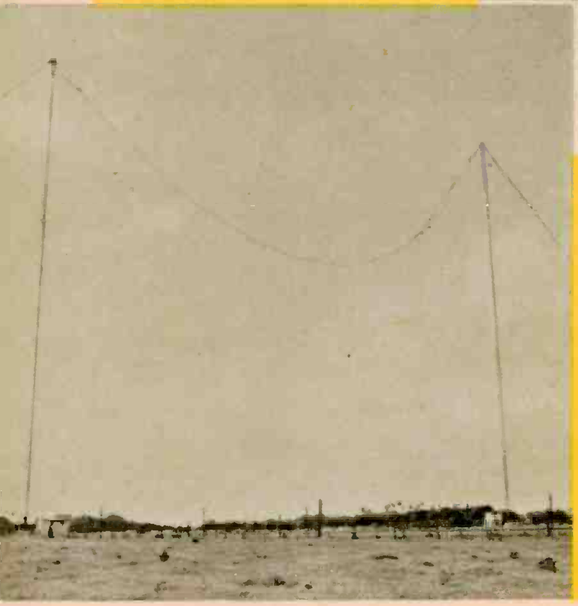
A SHORT history of the radio waves covering the last several years would have to include an awful lot of downright boring incidents and little controversy, the latter perhaps being highlighted by ruckuses involving the ownership of a certain station in Austin, Tex., the hullabaloo about international broadcasters shouldering hams around in the 40-meter band . . . and the strange assortment of facts and fantasies surrounding the Caribbean broadcasting station calling itself Radio Americas.

Way back in 1961, when the station was known as Radio Swan and sent what appeared to be coded messages ("the moon is red") during the Bay of Pigs invasion, charges that it was a secret operation of the Central Intelligence Agency were made in the press. Then secondary complications arose when respected members of the DX fraternity began doubting that the station was located where it said it was—namely on Swan Island, a lonesome little pinpoint 125 mi. north of the Honduran coast and 185 mi. southwest of Grand Cayman Island. As the years went by there were more and more DXers who seemed bent on uprooting Radio Americas and moving it to such varied Caribbean islands as Navassa and Cozumel, to Venezuela or

EI Visits Radio Americas



Members of expedition with chartered DC-3 on grass landing strip at Swan (left to right): EI editor Bob Beason, pilot Francisco Hernandez, copilot Ricardo Madrigal, author Tom Kneitel. Pilot made good landing despite primitive strip and crosswind.



Radio Americas broadcast-band antennas radiate a signal on 1157 kc. Tuning shack is at base of the left (eastern) tower, which gets more power than the other one, producing a directional signal pattern. This cleared area is carpeted with rich grass. Normal scrub jungle vegetation is seen in background.

even aboard a ship or aircraft. The hot speculation about the real location of the station continued long after the question of whether it was a CIA operation seemed to be settled to everybody's satisfaction—in the affirmative.

When it bothered to comment at all, the management of R. Americas maintained that it knew where its station was—and that it was on Swan. But such statements seemed only to confirm the suspicion that R. Americas *must* be somewhere else.

It was a hopeless puzzle that could not be solved with accuracy because almost nobody seemed ever to have been to Swan, except for those few people who belonged there. Rumor had it that the island was off limits to anybody not actually working for or authorized by the government or one of its contractors. So far as anyone could determine, the only outsiders to see Swan in recent years were an elderly couple from New England who went there to count birds.

In view of all this, EI's editors decided that a small DXpedition to Swan Island would be sportingly difficult to pull off but just the thing to solve the controversy. Those chosen to go were EI editor Bob Beason and

The author makes like an announcer in the 1-desk, 2-position Radio Americas booth. News and some station IDs are done live but most programs are taped. RA's announcers weren't seen on visit.

Station manager Paul Collamore with the author at one end of quonset hut containing studio, news room, and receiving-taping facilities shown here. Some programs are picked up, taped, rebroadcast.

Six-tube final stage of RA broadcast transmitter (left) is of ancient design. A seventh tube is used as standby. Signal comes through immense filter in foreground, exits via lines overhead.

the writer of this article.

Swan is a mile-and-three-quarter speck of coral overrun with tropical vegetation, except for clearings, that is almost as remote as the Mountains of the Moon. Its ownership long has been disputed by the United States and Honduras, though for the last century the U.S. has counted it as a possession. The island once was the site of a thriving, though small, cocoanut and guano (bird droppings) exporting industry. In 1912 the United Fruit Co. established a powerful wireless relay station there, erecting four giant transmitting towers at the west end of the island. The station was abandoned 20 years later and in the late 1930s the U.S. Government sent Weather Bureau and Civil Aeronautics Administration (now FAA) personnel to Swan to establish a weather and aeronautical radio station. In 1955 Swan was levelled by a hurricane but was rebuilt and still is the site of Weather Bureau and FAA operations.

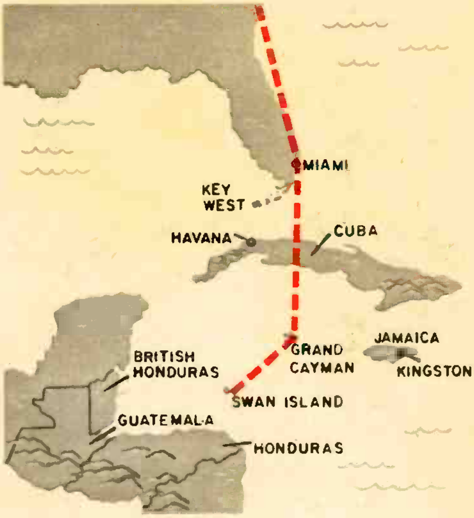
Wildlife on Swan includes large numbers of iguanas (a fearsome looking but harmless lizard), booby birds and man-of-war (frigate) birds. Vegetation, though heavy and thick, is commonplace with the exception of some manchineel trees, which can give the unwary a nasty sting. Waters surrounding Swan abound with fish, including amberjack, barracuda, snappers and queenfish (queenfish look like large barracudas and are known to local sportsmen as wahoos). Curiously enough, there are no swans on Swan. The name is taken from its discoverer, a Captain Swann, master of the vessel Cygnet, which landed there in 1680.

At present the island is home to about 40 souls, Americans, Cayman Islanders and Hondurans. The leading question for us was how many of these souls (if any) labored on behalf of Radio Americas? There was always the possibility that the station really wasn't there. Maybe it *was* floating or flying around, or possibly it was in South America. The station's shortwave transmitter (which was off the air for a year) had recently reappeared on 6 mc and started giving a Venezuelan mailing address. (The broadcast station, which lists itself as being on 1160 kc but actually is centered on 1157 kc, continued to use a Miami address.)

The EI DXpedition then hinged on our figuring out a way to get to Swan to peer through the palms for a first-person survey of the situation. EI had written so much about the station that the publication undoubtedly had become a headache to the staff. Nevertheless, we set out to hook ourselves an invitation to the exclusive island.

Figuring that the most obvious start would be to come right out and ask the RA office in Miami whether we could visit Swan, we fired off a letter. To our amazement, RA director Bob Wilkinson came back with the answer that we would be welcome on Swan so long as we had permission from the FAA (which, he said, controls the island). In addition, we would have to provide our own transportation since no regularly scheduled planes or ships have Swan on their itinerary. We envisioned miles of red tape to get FAA approval.

As things turned out, the FAA was the least of our problems. Gus Atkins, chief of the FAA's Airways Facilities Branch in the Miami region, gave us his approval and his position with the FAA makes him, in effect, manager of Swan, the whole of which is federally owned. He had been one of the government employees on Swan 25 years ago.



The route taken by EI's adventurers from New York. Commercial airlines run to Cayman; local airline chartered DXpedition DC-3 to Swan Island.

He even asked us to stop by his office on our way through Miami, which we did.

I wanted to get a ham license for Swan and so I applied for a 60-day authorization from the FCC. I waited and waited and nothing happened so I called a friend who works in the license-issuing end. He checked up and found that Swan licenses were issued so rarely that the computer was not programmed for KS4 calls and evidently lost its breakfast or something when given the request. Eventually the license (KS4CH) was issued by hand but for four years rather than 60 days. (I didn't bother asking the FCC why.)

The biggest problem was arranging for transportation. To fly by private plane from Miami or Key West was impractical since we would have to skirt around the west end of Cuba, stop for refueling at Mexico's Cozumel Island, then continue to Swan. This was long, complicated and tedious. Going by ship also was a major undertaking since it meant searching out a barnacle-covered island hopper and somehow getting the captain to wait for us while we poked around the island.

Eventually we decided to charter a DC-3 airliner from Cayman Brac Airlines. This is a Costa Rican outfit which runs an air service in the British colony of the Cayman Islands, just south of Cuba. The line had no flights on Wednesday and the DC-3 would be availa-

Transmitter building (left) is made up of trucks under roof. Power station is in the background.

Blue pennant sometimes sent by R. Americas with QSL cards. Broadcast frequency actually is 1157.

ble. The way it worked out, we had to be at Owen Roberts Field on Grand Cayman at 7 o'clock on Wednesday morning for our charter flight to Swan. In order to get to Grand Cayman on time we left New York on Monday morning to fly to Miami. Monday afternoon was spent with Gus Atkins, who briefed us on some of the colorful history of Swan Island. Monday evening we met with some ex-Radio Americas employees who wanted to bet (with two-to-one odds) that a big, clumsy DC-3 would never be able to land on the short and rocky Swan strip, which was designed for nothing larger than a twin Beech. That was not exactly encouraging news.

On Tuesday morning we departed from Miami on a British West Indian Airways jet for the 55-minute hop over Cuba to Grand Cayman. Grand Cayman is a picturesque tropical paradise, quite colonial, quite British and as yet almost undiscovered by American tourists. It's what Nassau and Bermuda were like years ago before being overrun by bands of visitors. Its coastline is dotted with ancient forts, castles, shipwrecks, secluded beaches and fishing shacks. Several luxury hotels are now being opened in expectation of future tourist trade from the States and Canada. So its days as a secluded paradise are numbered.

One thing that impressed us during our day and night on Cayman was the effect that the words *Swan Island* had on local Caymanians (pronounced ka-MON-ians). A few of these people have done work hitches on Swan but most of them have never been to the island and know little about it, except for the rumors all of them have heard. Almost every time we mentioned our destination we were given a look of disbelieving shock and awe.

[*Continued overleaf*]

Swan version of Playboy Club is in federal section. It might have live iguanas but only paper bunnies.

One taxi driver simply whistled. Two people asked us point-blank whether we worked for the CIA. Our reply, in the best CIA tradition, was to say no. (Actually, we thought later, we should have said, "The CIA—what's that?" but we were new at the 007 game.)

This general air of suspicion and seeming fear gave us the creeps in short order, though at the same time it was on the funny side and reminded us of one of those ancient horror movies where people in rented peasant suits listen intently while the landlord urges the clipped-mustache English traveler not to continue his journey after sundown.

"I beg of you," says the baron of the joint, "for your own safety, go back!"

"But I must get to Count Dracula's Castle," says the mustache, not getting the idea.

All the peasants pop their eyes wide and cross themselves like mad while the landlord yells, "Zvot nanhj haryostvl, sztjarchvuhlj!" What he's saying, of course, in Lower Transsylvanian is, "Man, you outta you cotton-pickin' mind?"

Tuesday night on Grand Cayman we took bearings on RA's short-wave and broadcast signals with a receiver loaned to the expedition by Lafayette Radio. Both signals appeared to be coming from the direction of Swan.

Wednesday morning when we got to the field we were met by Frank Roulstone, Jr., a lanky American originally from Tampa who runs the U.S. Weather Bureau station on Grand Cayman. Frank had heard of our trip (by that time, it seemed, *everybody* on the island knew about it) and wanted to go with us to visit his Weather Bureau buddies on Swan. In Frank's 13 years on Cayman he never had been to the island. Inasmuch as our DC-3 had room for 32 passengers we bundled him aboard with us and took off to the southwest toward Swan.

The flight over shark-infested Caribbean waters in our 1938ish twin-engine airliner was uneventful but somewhat longer than any of us would have preferred. The FAA facility on Swan includes a non-directional, low-frequency (407 kc) homing radio beacon with so much moxie it can be picked up all over the Caribbean. Our Puerto Rican crew, made up of pilot Francisco Hernandez and copilot Ricardo Madrigal, homed in on the beacon but we flew through a cold front and the clouds first were thick and then broken and it impressed the heck out of us when suddenly this dot of an island appeared exactly in front of our nose, then was lost again to sight through the clouds.

When we emerged at a much lower altitude Swan looked larger than we had thought it was going to be. Our pilot made two recon runs around Swan and Little Swan, a football-field-size, uninhabited islet lying at the eastern tip of the main island. The striking thing about the main blob of land was its antenna farm. Tall radio towers sprouted all over the place. Here and there were clusters of quonset huts, concrete buildings, some wooden houses and a few white coral roads.

We also were impressed with the shortness of the landing strip and the fact it was neither concrete nor asphalt—just plain grass. The DC-3 swung in low from the west on final approach with a stiff crosswind blowing from the left. We crossed our fingers and gulped. What happened next was one of the all-time great landings any of us had seen. Francisco crabbed the plane sharply left, then straightened out at the last instant and touched down so softly on the grass that we couldn't feel the bump. Even our welcoming committee was impressed.

We taxied around and ended up back at the western end of the strip beside the buildings making up the Radio Americas compound. A light twin plane flies to Swan twice a week from Miami, bringing in supplies for the RA operation, but the sight of an airliner landing was so unusual that virtually the entire island population of 40 turned out to greet us, making us feel for the moment like celebrities.

We were welcomed to Swan by a smiling and shirtless group of Weather Bureau and FAA people and by RA's station manager, Paul Collamore. It quickly became apparent that if Radio Americas wasn't on Swan Island Collamore certainly had sold his Miami office a nifty bill of goods.

Radio Americas was there, all right, big and brassy and making no attempt to conceal itself. The transmitting site was at the southeastern end of the island and the living/recreation compound was at the southwestern side of the island and consisted of a cluster of quonset huts.

First stop on our inspection tour was the RA receiving shack and studio. The place was clattering away with radioteletype machines printing out Spanish language news from the wire services. Banks of communications receivers lined one wall, maps of Cuba and the Caribbean covered other walls.

Since most of the programs are sent from Miami on tape there is no need for an elaborate studio. As a result, the studio consists of a tiny room with one desk and a microphone. Live announcing is done by a two-man staff. For some reason unknown to us the announcers were about the only RA staff members we didn't meet or even see wandering around. Their dormitory was the only building not included in our otherwise comprehensive tour of the station. The announcers undoubtedly are Cubans and the long-range goal of the station assuredly is to work against Fidel Castro. However, RA always has maintained a facade as a commercial station selling products in the Caribbean. It could be that the sight of Cuban announcers might seem to conflict with this image—or maybe the men just slept all day.

Leaving the receiving shack, we drove to the eastern side of the island toward the transmitter site. Our vehicle was an International Harvester Scout which, despite the fact that its odometer read only 6,000 mi., was well beat from too many trips on the rocky Swan Island roads and too many gallops through the Swan jungle. It was a four-wheel-drive job and had to nudge Swan's cow population out of the center of the road.

Since the station isn't on the air during the day, we arrived at the transmitter while maintenance work was being performed by one of the transmitter operators.

The transmitter site is dominated by two 243-ft. towers which are used for the broadcast band. The eastern tower is favored, power-wide, by a ratio of better than two to one, producing a null in the signal pattern to the west and northwest and preventing interference with WJJD of Chicago and KSL of Salt Lake City, both 50,000-watters operating on 1160 kc.

A few hundred yards to the west of the broadcast towers are a series of smaller towers and reflectors used for the Radio Americas short-wave signal.

The transmitters themselves are housed in large trailer vans from which the wheels have been removed. The vans are close to each other, share a common roof and are joined by wooden walkways. The transmitting gear consists of a vintage 50,000-watt broadcast rig and a 5,000-watt short-wave unit which also has seen better days. Both transmitters were on standby with filaments lit.

Adjacent to the transmitter vans is a new-looking building housing two huge diesel generators which supply all of the power for RA. Two diesel engineers are in attendance to keep these babies going (they also maintain the vehicles).

In all, there are six radio operators and engineers working there for RA, plus the two diesel men. The station also employs a crew of 10 Honduran and Caymanian workers to do heavy labor and the two announcers. Two of the laborers have wives and children living with them on the island.

The laborers live in a little community of wooden buildings called Gliddentown. It looks not unlike the small communities we found on Grand Cayman and even has its own church.

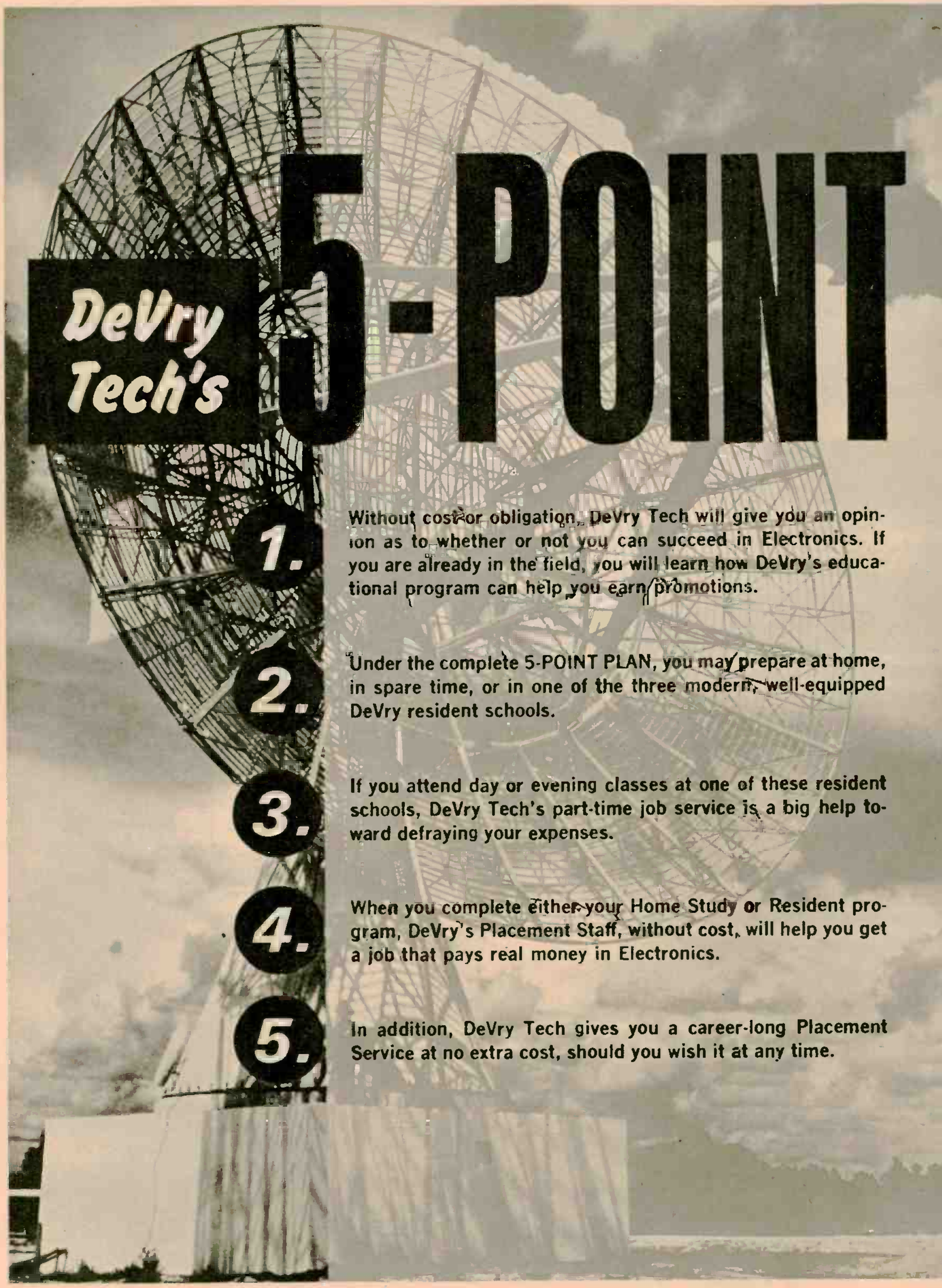
Paul Collamore told us that he and the other Americans working for RA actually were employed by Philco's Tech Rep Division, an organization which rents or leases engineers to private industry. As Philco employees, they did not have access to some of the information we sought on station policy and practices.

For instance, I wanted to know why the short-wave transmitter announces the Caracas address while the broadcast station requests that mail be sent to Miami. I was told that I would have to ask the Miami office. I had the same results with a question on why there was a need for short-wave transmissions when the station ostensibly was trying to cover only the Caribbean area and was doing a whiz-bang job with its 50-gallon broadcast-band rig.

(Miami eventually told me the Caracas address was announced so they could separate broadcast reception reports from those coming in from short-wave coverage. The short-wave transmitter was used, they said, to reach Central American and South American areas, where more people have SW receivers than broadcast sets, according to their figures.)

Of the Radio Americas men on Swan and whether they are employees of Philco, I would say I have no doubt that they are, and also no desire to challenge anybody on the subject. As a matter of fact, if one found some government agency—the CIA as a for-instance—that wanted to propagandize on the air, it would make a lot of sense to contract the project out to a commercial company. It also is normal procedure for government agencies.

[*Continued on page* 111]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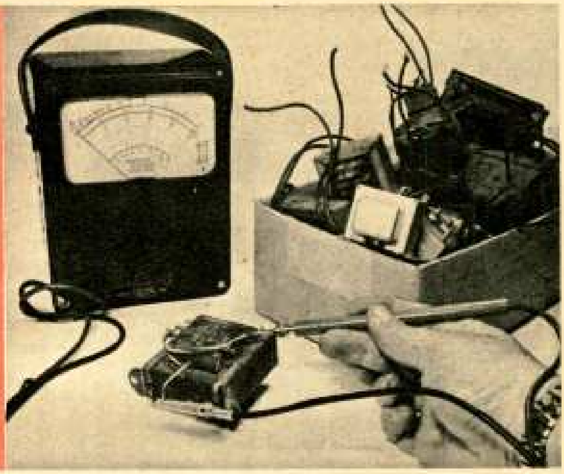
A Handy Guide to Unmarked Transformers

By LEN BUCKWALTER, K1ODH



These servicing and identification shortcuts will clear up the puzzlers.

NEED to replace a burnt-out transformer that has no identifiable type number? Or maybe you have a junk box full of goodies you figure are no good for the same reason. Well, here's how to find the facts. The job is done with color codes, an ohmmeter or with low-voltage AC to determine turns ratio.

Color codes are the simplest method. Coding used by nearly all manufacturers for power transformers is shown in Fig. 1, for audio output transformers in Fig. 2. Only problem is that color usually fades from the insulation (if it's cotton) after a few years. If there's no hue, don't cry. Try nicking the insulation with a razor blade. This should expose a bit of telltale color.

If you're checking an IF transformer use the diagram in Fig. 3. Older IF types also have color-coded wires leads; newer ones have unmarked lugs, identified by their position with respect to a color dot.

Check Combinations. When an aging transformer can't be identified, tackle the problem by first finding continuity between as many lead combinations as possible. (Use the ohmmeter's R×100 scale.) Wherever two or more leads show continuity, twist them together (but don't let bare ends touch).

If you measure a power transformer, like the one in Fig. 1, you'll find that windings fall into three groups: low resistance for fila-

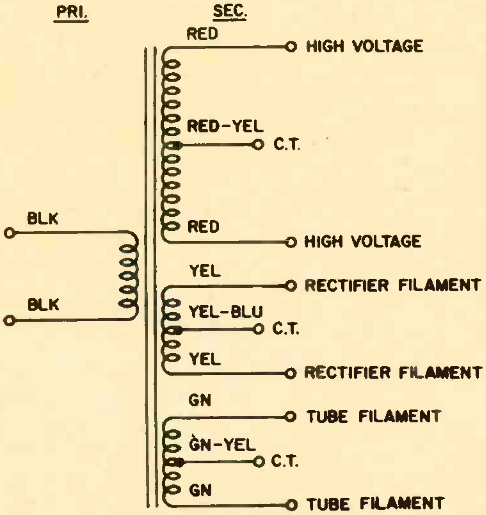


FIG.1—POWER TRANSFORMER COLOR CODE

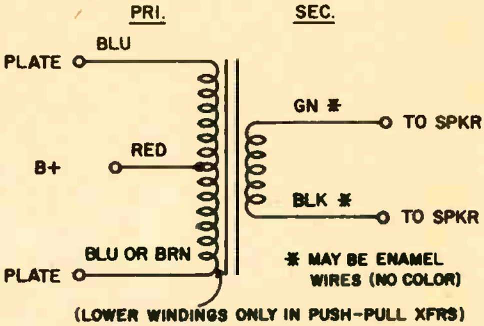


FIG. 2—AUDIO TRANSFORMER CODE

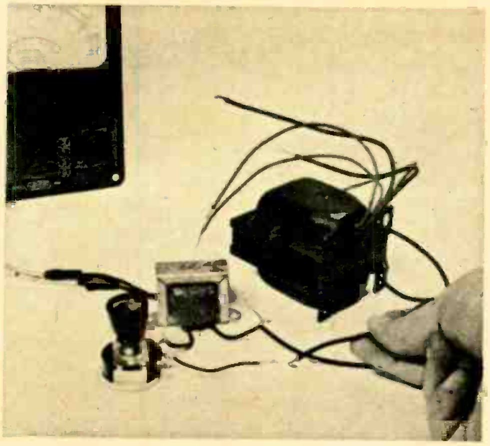


Fig. 4—This test setup, described in the text, is used to test voltage and impedance ratings.

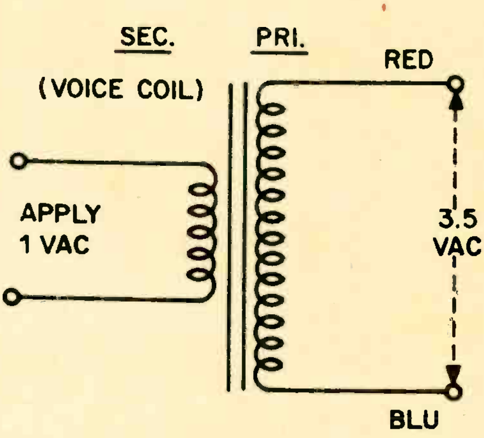


Fig. 5—Impedance ratio may be calculated as the square of the turns ratio (3.5:1 in test above).

ments, mid-range for 117-V primary, high resistance for high-voltage (B+) secondary.

Here's an example of resistance values measured in a small power transformer rated at 125-V high voltage and 6.3-V filament: high voltage (red to red/yellow in Fig. 1) —260 ohms; 117-V primary (black to black)—60 ohms; 6.3-V filament (green to green)—0.2 ohm. In measuring a second transformer, about twice as large, the same resistance groupings were encountered. Only now the resistances were lower, suggesting heavier wire and a higher power rating. The ohmmeter readings: 230-V high voltage—300 ohms; 117-V primary—7 ohms; 6.3-V filament—0.1 ohm.

Some windings may contain a high-voltage center tap, needed for some full-wave power supplies. The meter finds it by showing equal

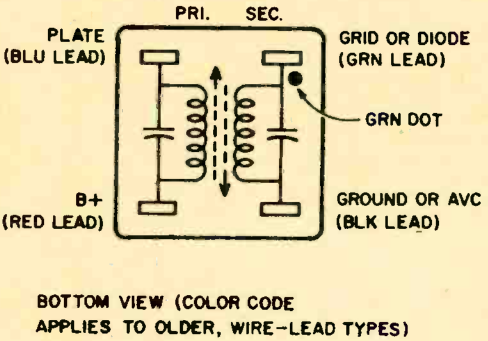


FIG. 3—IF TRANSFORMERS

resistance between each red and red/yellow pair. Center taps for filament windings are also found this way.

The same resistance checks can be performed on audio transformers. Now resistance of the primary winding generally will measure much higher than the secondary (or voice coil) side. For example, a common table-radio output transformer (single-end tube circuit) measures about 200 ohms across the primary (red to blue) and 0.2 ohm for the voice coil (enamel wires). You'll encounter lower resistances in tiny transistor output transformers. A typical push-pull model measures 6 ohms from each end of the primary to the center tap; voice coil resistance is 0.5 ohm.

Voltage Checks. An experienced technician might determine voltages of a power transformer by plugging the primary leads into 117 VAC and measuring AC across pairs that show continuity. If you elect to do this, be cautious. Keep clear of bare wires to avoid shock. With this method the voltages usually read somewhat higher than normal since the windings are unloaded.

By using the setup shown in Fig. 4 you can apply safer voltages and also perform the impedance measurements described later. You'll need a 6.3-V filament transformer with a 5,000-ohm wirewound potentiometer wired in series with one 6.3-V lead. This pot and the other 6.3-V lead are connected to the power transformer primary (black to

[*Continued on page* 117]

The Listener

By C. M. Stanbury II

Korea Again

SINCE early this year Korea has been back in the headlines and Korean DX has taken on new meaning. Top interest, of course, is in English-language transmissions, with those from South Korea the easiest to receive.

The Voice of Free Korea (Seoul) beams English to North America at 2200-2230 EST on 15428 kc. The lower frequency in our guide is used for the general overseas service. VOFK is the international arm of the pro-western Korean Broadcasting System. Reception averages about fair, with listeners west of the Mississippi having a decided edge.

R. Pyongyang has no English beamed our way but they do have such a transmission for Asia at 0300-0350 EST (0000-0050 PST) on 6540 kc. Pyongyang does beam transmissions to the Western hemisphere in Spanish and Korean at 1800-2000 EST on 16040 and 11763. We also have included in the guide several North Korean home-service frequencies that might prove interesting in the future.

En Garde! . . . In the fall of 1966, Radio RSA, the international section of the government-owned South African Broadcasting Corp., commenced transmissions beamed to North America. RSA's programs are soft sell with each minute of air time designed to recruit good will for the country and its policies.

Also that fall, a bill was introduced into the South African parliament to counter the effect of stations broadcasting to South Africa "with the aim of endangering the country's peace, order and public safety," to quote. The law would make it illegal for South African listeners to quote from, publish schedules of and (if the regime desires it in the future) send reception reports to any station on the government's prohibited list. The list, it appeared, could include any broadcaster the South African administration dislikes.

Soon afterward, I wrote an item critical of South Africa's way with the airwaves for an SWL club bulletin with a circulation of only about 200. I was surprised to receive a letter in response from J. A. Jooste, head of external broadcasting for South Africa. His letter said the new law was "exactly the same kind of legislation" as adopted by the Nordic countries in 1962, that similar legislation already had been proposed by the British government and that the South African legislation had been urged by the ITU and EBU.

Neither the ITU nor the EBU had urged the South African legislation, so far as I've been able to find out. And the Scandinavian and British (Marine Offenses Act) bills to which Jooste referred are directed against unlicensed stations operating from international waters.

If an objective of SWLing is to be (in the words of one club's motto) friendship through short wave, SWLs should not be expected to view dispassionately the passage of a law that appears to impose arbitrary restraints on use of the short-wave bands. Nor can we overlook the broader meaning of those restraints. Remember 1938, when an SWL club happily announced that "some idea of the stability of short-wave broadcasting is given by the advances of the German activities. . ."?

Song of the Lark. . . While most DXers don't know it, there is at least one satellite currently transmitting on frequencies below 15 mc. This is the ionspheric top-side sounder aboard Alouette II, Canada's second entry in the space race. When turned on, the pulse-modulated sounder samples frequencies from

[*Continued on page* 107]

EI'S GUIDE TO KOREAN SHORT WAVE

Frequency (kc)	Station	Time (EST)	Language
4770*	R. Pyongyang	0300 & later	Korean
6250	R. Pyongyang	0300 & later	Korean
6285	R. Pyongyang	0300-0400	Korean
6540	R. Pyongyang	0300-0350	English
9640	V. Free Korea	0300 & 0545	English
11763	R. Pyongyang	1800-2000	Spanish & Korean
15428	V. Free Korea	0930-1030 & 2200-2300	English
16040*	R. Pyongyang	1800-2000	Spanish & Korean

* These frequencies vary

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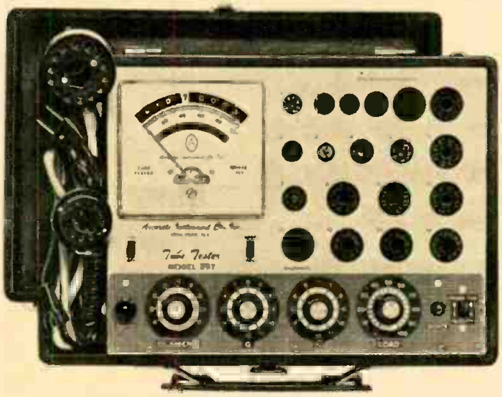

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CIRCLE NUMBER 41 ON PAGE 11

Good Reading

By Tim Cartwright

THE GREAT INTERNATIONAL PAPER AIRPLANE BOOK. By Jerry Mander, George Dippel and Howard Gossage. Simon & Schuster, New York. 127 pages. $2.95 paper; $10 hardcover

In comparison with most broad avenues of scientific research, the design of paper airplanes has been a twisting and narrow back alley of science—its shadowy darkness deepened still further by ignorance and prejudice. How many young spirits have been broken by a sharp crack across the knuckles from a backward school-teacher who simply coundn't understand the message of the creased piece of paper floating across the classroom? (A lot of them, that's how many.) While others, who simply choose to use metals instead of paper, have been rewarded with money, fame and girls.

The book, which chronicles the First International Paper Airplane Competition (sponsored by Scientific American magazine) in the winter of 1966-67, should bring paper airplane design once and for all into the bright sunlight of public understanding. It's full of nice, funny words. But its nicest feature is the set of tear-out pages with designs for entries (winners and otherwise) so you can fold them yourself. Some book!

GUIDE TO MOBILE RADIO. By Leo G. Sands. Chilton Books, Philadelphia, Pa. 210 pages. $4.50

With mobile radio growing in importance and coverage and a new generation of solid-state circuitry appearing every few months (or so it seems) there's need for a roundup book of this kind periodically. It contains thorough coverage of every important mobile application and good, if brief, handling of hardware and primary requirements. There's not enough emphasis, for my money, on the changes in circuitry but it's basically a good introduction for anyone with a beginning interest.

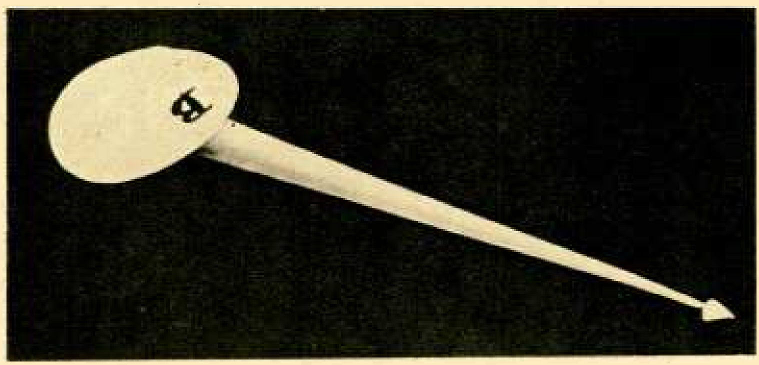
CONFIDENTIAL FREQUENCY LIST. By Tom Kneitel. Gilfer Associates, Park Ridge, N.J. 35 pages. $1.95

Although the right of hams and SWLs to listen in is tacitly conceded by just about everybody using broadcast transmissions for non-public purposes, nothing much is done—understandably—to encourage them. And certainly neither a distant spy station nor a friendly local weather station ever is likely to oblige with a broadcast schedule. So Tom Kneitel has collected his own list of non-public stations, their activities, locations, frequencies and (when feasible) operating times. He covers everything from radio beacons to spy networks.

ELECTRONIC MUSICAL INSTRUMENTS. By Richard H. Dorf. Radiofile, New York. 393 pages. $10

While junior is electrifying his guitar, bass and saxophone dad is preoccupied with the electronic organ. Maybe there's a communications gap between father and son but both of their hobbies are decidely Big Business. This book is on the solider (we won't say squarer) of the two, the electronic organ, which continues to attract a phenomenal fol-

[*Continued on page* 107]



One of the most intriguing in appearance of the designs illustrated in The Great International Paper Airplane Book is this by Yvon Belisle of Montreal, who won no prize. Entrants in the competition on which the book is based included everyone from grade-schoolers to real engineers.

Now There Are 3 Heathkit® Color TV's

The NEW Deluxe Heathkit "227" Color TV

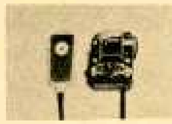
Exclusive Heathkit Self-Servicing Features. Like the famous Heathkit "295" and "180" color TV's, the new Heathkit "227" features a built-in dot generator plus full color photos and simple instructions so *you* can set-up, converge and maintain the best color pictures at all times. Add to this the detailed trouble-shooting charts in the manual, and you put an end to costly TV service calls for periodic picture convergence and minor repairs. No other brand of color TV has this money-saving self-servicing feature.

Advanced Features. Top quality American brand color tube . . . 227 sq. in. rectangular viewing area . . . 24,000 v. regulated picture power . . . improved phosphors for brilliant, livelier colors . . . new improved low voltage power supply with boosted B+ for best operation . . . automatic degaussing . . . exclusive Heath Magna-Shield to protect against stray magnetic fields and maintain color purity . . . ACC and AGC to reduce color fade and insure steady, flutter-free pictures under all conditions . . . preassembled & aligned IF with 3 stages instead of the usual 2 . . . preassembled & aligned 2-speed transistor UHF tuner . . . deluxe VHF turret tuner with "memory" fine tuning . . . 300 & 75 ohm VHF antenna inputs . . . two hi-fi sound outputs . . . 4" x 6" 8 ohm speaker . . . choice of installation — wall, custom or optional Heath factory assembled cabinets. Build in 25 hours.

Kit GR-227, (everything except cabinet) . . . $42 dn., as low as $25 mo. **$419.95**
GRA-227-1, Walnut cabinet . . . no money dn., $6 mo. **$59.95**
GRA-227-2, Mediterranean Oak cabinet (shown above), . . . no money dn., $10 mo. **$94.50**

Kit GR-227
$419.95
(less cabinet)
$25 mo.

Kit GRA-27
$19.95



New Remote Control For Heathkit Color TV

Now change channels and turn your Heathkit color TV off and on from the comfort of your armchair with this new remote control kit. Use with Heathkit GR-227, GR-295 and GR-180 color TV's. Includes 20' cable.

Kit GR-295
$479.95
(less cabinet)
$42 mo.

Deluxe Heathkit "295" Color TV

Has same high performance features and built-in servicing facilities as new GR-227, except for 295 sq. in. viewing area (industry's largest picture) . . . 24,000 volt picture power . . . universal main control panel for versatile in-wall installation . . . and 6" x 9" speaker.

Kit GR-295, (everything except cabinet), 131 lbs. . . . $48 dn., $42 mo. **$479.95**
GRA-295-4, Mediterranean cabinet (shown above), 90 lbs. . . . no money dn., $11 mo. **$112.50**
Other cabinets from $62.95.

Kit GR-180
$349.95
(less cabinet & cart)
$30 mo.

Deluxe Heathkit "180" Color TV

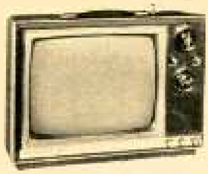
Same high performance features and exclusive self-servicing facilities as new GR-227 (above) except for 180 sq. in. viewing area.

Kit GR-180, (everything except cabinet), 102 lbs. . . . $35 dn., $30 mo. **$349.95**
GRA-180-5, table model cabinet & mobile cart (shown above), 57 lbs. . . . no money dn., $5 mo. **$39.95**
Other cabinets from $24.95

Deluxe 12" Transistor Portable B&W TV – First Kit With Integrated Circuit

Unusually sensitive performance. Plays anywhere . . . runs on household 117 v. AC, any 12 v. battery, or optional rechargeable battery pack ($39.95); receives all channels; new integrated sound circuit replaces 39 components; preassembled, prealigned tuners; high gain IF strip; Gated AGC for steady, jitter-free pictures; front-panel mounted speaker; assembles in only 10 hours. Rugged high impact plastic cabinet measures a compact 11½" H x 15¾" W x 9⅜" D. 27 lbs.

Kit GR-104
$119.95
$11 mo.



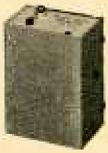
Kit GR-104, 27 lbs. . . . no money dn., $11 mo. **$119.95**

No Money Down On $25 to $300 Orders — Write For Credit Form

CIRCLE NUMBER 3 ON PAGE 11

11 New Kits From Heath . . .

New! Heathkit Wireless Home Protection System for Your Family's Safety



GD-97
Utility Transmitter
for Universal Protection

GD-87
Wireless Smoke/Heat
Detector-Transmitter

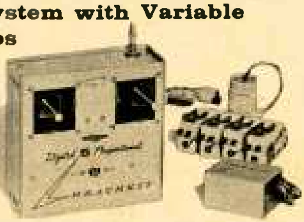
GD-77 Wireless Receiver/Alarm
fail-safe, always alert

Applications Unlimited . . . Customize Your Own System. Here's reliable, low cost, 24-hour protection for your family and property. System warns of smoke, fire, intruders, freezing, thawing, cooling, rising or receding water, pressures . . . any change you want to be warned about. Uses unique new signaling method developed by Berkeley Scientific Labs.; exclusively licensed to Heath. Your house is already wired for this system, just plug the units into any AC outlet. "Load transmission" design (not a carrier type as in wireless intercoms) generates unusual signal that is practically unduplicable in other devices or random noise sources. Solid-state circuitry has built-in fail-safe capability to sound alarm if power fails, if power supply components in any unit fail, or if 50,000 hour bulb in smoke detector fails. Receiver/Alarm has 2800 Hz transistor alarm and receptacle for extra 117 VAC bell or buzzer to extend range, plus rechargeable battery (always kept charged) to sound alarm if power fails. Smoke-Heat Detector-Transmitter capability may be extended to other areas by adding extra heat sensors to its built-in sensor. Utility Transmitter accepts any type of switch or sensor for any purpose; examples: magnetic reed switches for doors and windows to warn of entry; step-on switches for door or driveway; micro switches with trip wire around yard; heat sensors; water pressure switches warn of pump failure; thermal switches warn of freezing in gardens, or thawing in freezers; two wires act as switch to warn of changing water levels in sump-pump wells, pools, etc. Units are small and unobtrusive in beige and brown non-reflecting velvet finish. Any number of units may be used in the system. All units feature circuit board construction; each unit takes only 3 hours to build. Operating cost similar to electric clocks. Invest in safety for your family now with this unique Heath system.

Kit GD-77, receiver/alarm, 4 lbs. **$39.95**
Kit GD-87, smoke/heat det.-trans., 5 lbs. **$49.95**
Kit GD-97, Utility trans., 4 lbs. **$34.95**
(numerous accessory switches available from Heath)

New! Heathkit/Kraft 5-Channel Digital Proportional System with Variable Capacitor Servos

System Kit GD-47
$219.95
$21 mo.



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 ¾" in simultaneous opposite directions plus rotary wheel. Specify freq.: 26.995, 27.045, 27.145, 27.195 MHz.

System Kit GD-47, all of above, 5 lbs. **$219.95**
Kit GDA-47-1, transmitter, battery, cable, 3 lbs. **$86.50**
Kit GDA-47-2, receiver, 3 lbs. **$49.95**
GDA-47-3, receiver rechargeable battery, 1 lb. **$9.95**
Kit GDA-47-4, one servo only, 1 lb. **$21.50**

New! Heathkit 2-Channel, 200 Watt SSB Transceivers for CAP, MARS & 160 Meters

Assembled HWW-18-1 CAP model with crystals **$179.95**

Kit HW-18-1 CAP model with crystals **$119.95**

Kit HW-18-2 MARS model less crystals **$109.95**

Kit HW-18-3 160 Meter model less crystals **$109.95**

Good News For CAP, MARS And 160 Meter Ops. This unique series of Heathkit SSB Transceivers was designed with your needs in mind. No more adaptations, no more conversions, no more make-shift rigs. These new transceivers are tailored for your needs with the sensitivity, selectivity, power output and operating convenience that make for effective communications at a fraction of previous costs.

Compare. 200 watts PEP SSB input. 25 watts input with carrier for compatibility with AM stations. Crystal filter sideband generation. 2 channels, switch-selected, crystal controlled. Fixed tuned for easy PTT operation. Transmit and receive freqs. locked together for true transceive operation. Clarifier control adjusts transceiver frequency ±250 Hz. Relayless transmit-receive switching. Local-Distance switch prevents receiver overload from strong local stations. Built-in speaker. PTT mic. & mobilemount included. Carrier & sideband suppression 45 dB. Sensitivity 1 uV. Selectivity 2.7 kHz. 50 ohm coax output. Accessory power supplies (Kit HP-13, mobile, $64.95; Kit HP-23, fixed station, $49.95).

New! Solid-State Portable Volt-Ohm-Meter

So Handy, So Low Cost we call it "every man's" meter. Just right for homeowners, hobbyists, boatowners, CBer's, hams . . . it's even sophisticated enough for radio & TV servicing! Features 12 ranges . . . 4 AC & 4 DC volt ranges, 4 ohm ranges; 11 megohm input on DC, 1 megohm input on AC; 4½" 200 uA meter; battery power; rugged polypropylene case and more. Easy 3 or 4 hour kit assembly. 4 lbs.

Kit IM-17
$19.95

New! Heathkit Solid-State Utility Monophonic Amplifier

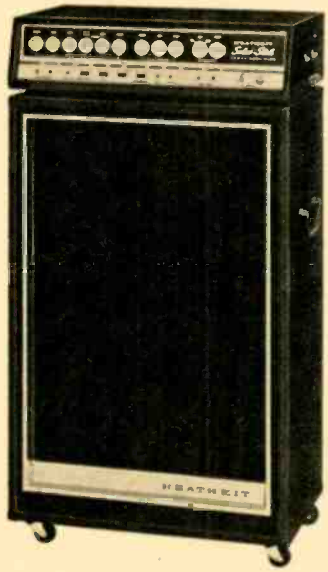
Kit AA-18
$19.95

This amazing little amplifier accepts ceramic phono cartridges, AM tuners, FM tuners, tape recorders, etc., and delivers a solid 4 watts of music power from 20 Hz to over 100 kHz at a low 1.5% THD. Drives high efficiency speakers of 4 to 16 ohms. Ideal for small music system or testing amp. for service shops. Circuit board construction is easiest; just 5 short hookup wires and 6" cable. Single knob tone control. Headphone jack. Pilot lamp. Transformer operated, 120/240 VAC, 50-60 Hz.

CIRCLE NUMBER 3 ON PAGE 11

See 300 More in FREE Catalog

What would you expect to pay for a Vox "Jaguar" Combo organ with a 180-watt 3-channel amp? $1000? $1250? $1500? More?



You can get both for only $598 during this Special Heathkit Offer!

Now you can get this famous professional combo organ with a versatile high-power piggy-back amp. and matching speaker system for just a little more than you'd expect to pay for the "Jaguar" alone! The Heathkit/Vox "Jaguar" is solid-state; two outputs for mixed or separated bass and treble; reversible bass keys for full 49 key range or separate bass notes; bass volume control; vibrato tab; bass chord tab; four voice tabs (flute, bright, brass, mellow); keyboard range C_2 to C_6 in four octaves; factory assembled keyboard, organ case with cover, and stand with case. Also available separately; you'll still save $150 (order Kit TO-68, $349.95).

The Heathkit TA-17 Deluxe Super-Power Amplifier & Speaker has 180 watts peak power into one speaker (240 watts peak into a pair); 3-channels with 2 inputs each; "fuzz", brightness switch; bass boost; tremolo, reverb; complete controls for each channel; foot switch; 2 heavy duty 12" speakers plus horn driver. Also available separately kit or factory assembled (Kit Amplifier TA-17, $175; Assembled $275; Kit Speaker TA-17-1 $120; Assembled $150; Kit TAS-17-2, amp. & two speakers $395; Assembled TAW-17-2, amp. & two speakers $545).

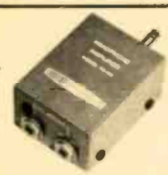
Kit TOS-1 Organ, Amplifier & Speaker Kits (240 lbs.)	Kit TOS-2 Organ Kit, Assembled Amplifier & Speaker (240 lbs.)
$598.00	**$698.00**

New! Heathkit Solid-State "Fuzz Booster" For Guitar Amplifiers

Kit TA-28
$17.95

"Fuzz" is what it's called, harmonic distortion is what it is, and you can add it to your guitar amp with this kit. Transistor circuit is contained in die cast footswitch housing and powered by internal battery (not supplied). Two controls adjust tone and intensity of "fuzz". Build it in one evening. 4 lbs.

New! Heathkit Guitar Headphone Amplifier



Kit TA-58
$9.95

Now you can play and practice your electronic guitar in private! Just plug this miniature amplifier into the jack of your guitar and use a pair of headphones. Solid-state circuit has tailored response; automatic off-on switching; self-contained battery (not supplied); and capability of operating one or two pairs of mono or stereo headphones of 4 to 2 meghohms. Ideal for practice or instruction. Easy to build.
Kit TA-58, 2 lbs. **$9.95**

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CIRCLE NUMBER 3 ON PAGE 11

CB Band Scanner

By HARRY KOLBE

IT's a quiet evening around the shack. You try one or two CB channels but there's only noise. Tuning from one end of the dial to the other still doesn't raise any excitement.

After about a half an hour of this back-and-forth dial twisting your wrist begins to get a little numb. In disgust you turn the rig off and go watch TV. But the boob tube doesn't have much to offer, either, so it's back to CB.

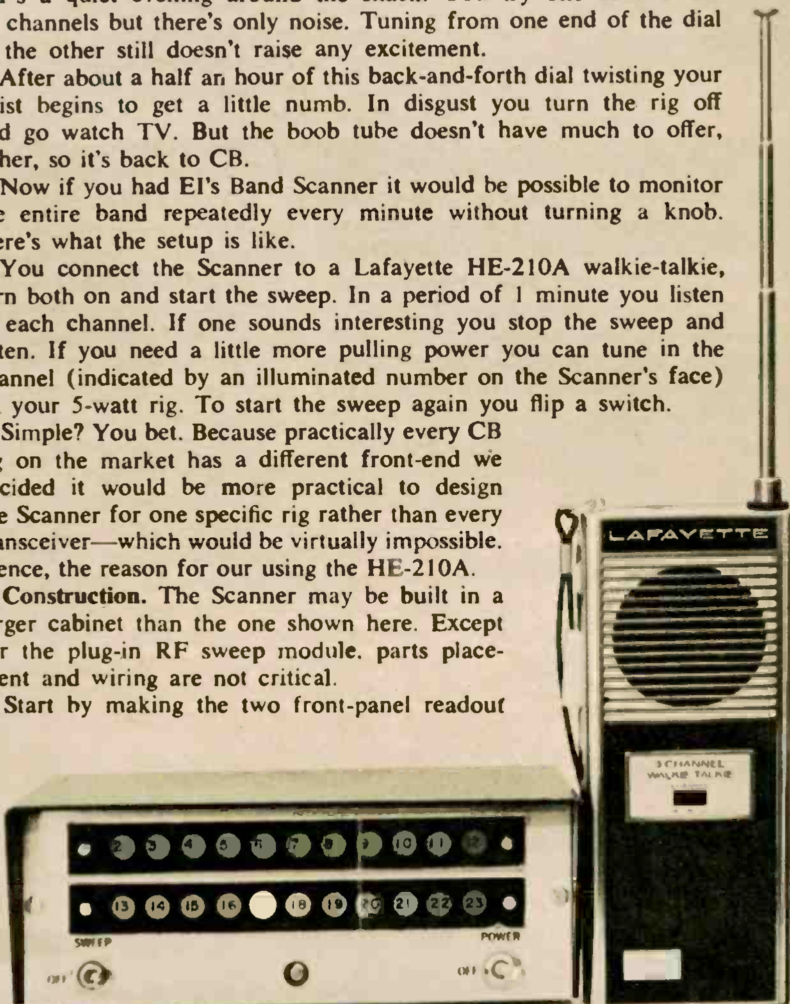
Now if you had EI's Band Scanner it would be possible to monitor the entire band repeatedly every minute without turning a knob. Here's what the setup is like.

You connect the Scanner to a Lafayette HE-210A walkie-talkie, turn both on and start the sweep. In a period of 1 minute you listen to each channel. If one sounds interesting you stop the sweep and listen. If you need a little more pulling power you can tune in the channel (indicated by an illuminated number on the Scanner's face) on your 5-watt rig. To start the sweep again you flip a switch.

Simple? You bet. Because practically every CB rig on the market has a different front-end we decided it would be more practical to design the Scanner for one specific rig rather than every transceiver—which would be virtually impossible. Hence, the reason for our using the HE-210A.

Construction. The Scanner may be built in a larger cabinet than the one shown here. Except for the plug-in RF sweep module, parts placement and wiring are not critical.

Start by making the two front-panel readout



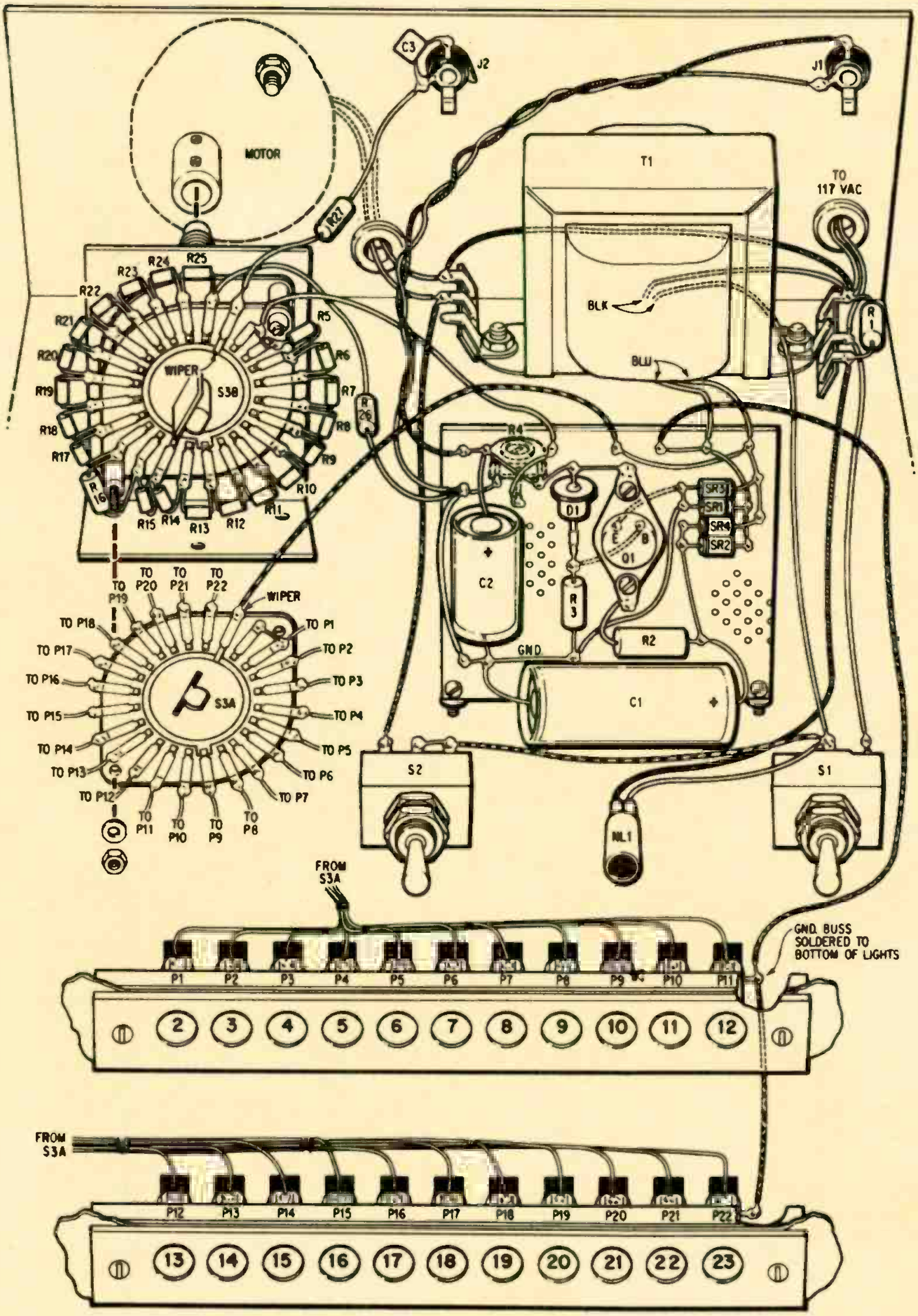


Fig. 1—Parts are mounted in U-section of Minibox whose front panel is not shown. Front deck of S3 has resistors. If you don't want to use specified lamps, use No. 57 pilot lamps and conventional sockets.

CB Band Scanner

displays. (Follow this procedure only if you wish to duplicate our model by using the miniature lamps specified in the Parts List. A simpler and cheaper display can be made with ordinary 12-V pilot lamps and sockets.) Cut two of each of the following strips out of plexiglass: 6½ x ¾ x ⅛ in. thick, 6½ x ¾ x ¼ in. thick. Cut a 6½ x ¾ x 1/16-in. thick piece of frosted acetate. Lightly scribe a center line lengthwise on the two 6½ x ¾ x ¼-in. strips. Measure in ¼ in. from each end of the ¼-in. thick strips and scribe lines across the strips. (These are the strips inside the cabinet in which the lamps are mounted.) In between these two lines on which indicate the positions of the mounting holes, scribe lines every ½ in. Dimple all line crossings with a sharp awl then drill out the mounting holes.

Attach the two ¼-in. thick strips to the rear of the front panel. Using a 1/16 in. dia. bit, drill 22 holes in each of strips through both the plexiglass and the front panel (on the U-section of the Minibox). Work up in three or four steps with progressively larger drills until the dia. of each hole is ¼ in.

Remove the two plastic strips from the front panel. Carefully enlarge the holes in the strips until the indicator lamps fit snugly in the holes. Install the lamps in the strips so the front of the lamp is flush with the front surface of the strip. Apply a small dab of cement to the point where the lamps come out of the back of the strip. Set aside to dry overnight.

Lay out the two 6½ x ¾ x 1/16-in. thick frosted-acetate strips exactly the same way the lamp strips were laid out, except make light pencil lines instead of scribe lines. These lines serve as guide lines for the numbers which may be put on with dry transfer decals or inked on. Drill the mounting holes in the acetate strips and the two ⅛-in. thick plexiglass strips.

When the cement has dried on the lamps, solder a bus wire to one of the metal contact strips on the base of each. Watch the heat and make the connections toward the front of the metal strip—away from the base. To the remaining contact strip on each lamp solder flexible insulated wires.

Enlarge the 22 in. holes to a dia. of ⅜ in.

PARTS LIST

C1—500 µf, 25 V electrolytic capacitor
C2—500 µf, 12 V electrolytic capacitor
C3—.002 µf, 75 V ceramic disc capacitor
C4—6.8 µµf, temperature-compensating tubular capacitor (Centralab Type TCZ, Lafayette 33 H 2138 or equiv.)
C5—22 µµf, 15 V or higher capacitor
C6—68 µµf, 15 V or higher capacitor
D1—8.2 V, 1 W zener diode (Motorola 1N4738 or equiv.)
D2—1N953 varactor diode (100 µµf, 25 V, 46-240 µµf, Q= 7. Hughes, Newark Electronics Corp., 500 N. Pulaski Rd., Chicago, Ill. 60624. $4.50 plus postage)
J1,J2—Miniature phone jacks
L1—Coil: 11 turns No. 26 enameled wire wound on J. W. Miller 47A024-4 form. (Form available for $2.25—postage included—from Tridac Electronics Corp., Box 313, Aldon, Manor Br., Elmont, N. Y. 11003)
L2—33 µh microminiature RF choke (J. W. Miller No. 9230-56, Allied 54 E 0337. $1.41 plus postage, not listed in catalog.
NL1—NE-2 neon lamp and holder
P1 through P22—12 V pilot lamp (Sylvania 12ESB or equiv.)
MOTOR—1 r.p.m. clock motor (Olson MO-113 or equiv.)
PL1—Miniature phone plug
Q1—2N3054 transistor (RCA)
R1,R27—100,000 ohm, ½ watt, 10% resistor
R2—150 ohm, 2 watt, 10% resistor
R3—56 ohm, ½ watt, 10% resistor
R4—6,000 ohm miniature trimmer potentiometer (Mallory Type MTC-4, Allied 46 E 3674 C; 29¢ plus postage. Specify resistance when ordering.)
R5 through R25—10,000 ohm, ½ watt, 10% resistor
R26—560,000 ohm, ½ watt, 10% resistor
S1,S2—SPST toggle or slide switch
S3—2 pole, 23 position, non-shorting rotary switch (Centralab PA-4003, Allied 56 E 6245. $3.18 plus postage, not listed in catalog.)
SR1-SR4—Silicon rectifier; minimum ratings: 500 ma, 100 PIV
T1—Filament transformer; secondary: 12.6 V @ 1.5 A (Triad F-25X or equiv.)
Misc.—3 x 8 x 5-in. cowl-type Minibox (Bud SC-2132), plexiglass, perforated circuit board, Lafayette HE-210A walkie-talkie (Stock No. 99-3127L)

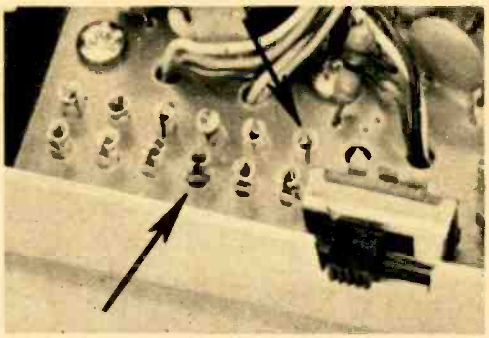


Fig. 2—Crystal connectors in HE-210A walkie-talkie. Arrows point to holders in which RF module pins are inserted. Right arrow points to C6's pin.

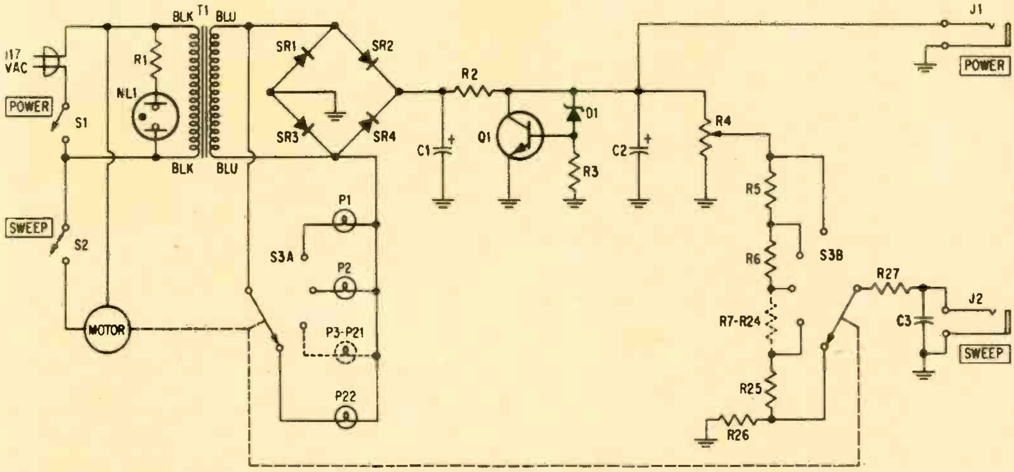


Fig. 3—Power-supply schematic. Motor turns both of S3's wipers. S3A's wiper lights lamps; S3B supplies regulated, stepped sweep voltage to J2. Walkie-talkie power is at J1.

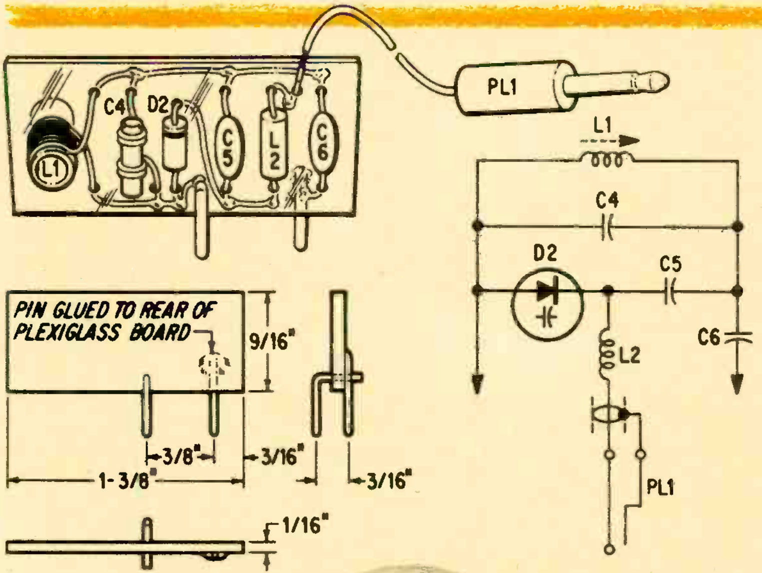


Fig. 4—RF sweep module. Sketch at top, left shows parts mounted on thin plexiglass. Shield in wire from PL1 must be cut off and not connected to circuitry on board. In schematic at right, pin connected to C6 gets inserted in connector in walkie-talkie to which right arrow in Fig. 2 points. Board must be size shown at lower left or it will not fit in walkie-talkie. Pins can be held to plastic with epoxy.

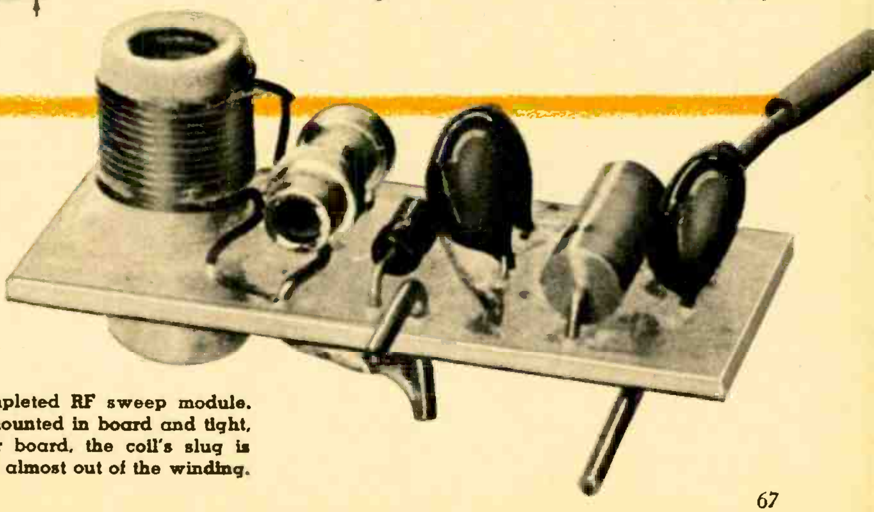


Fig. 5—Closeup of completed RF sweep module. Note how coil form is mounted in board and tight, even windings. On our board, the coil's slug is near bottom of form and almost out of the winding.

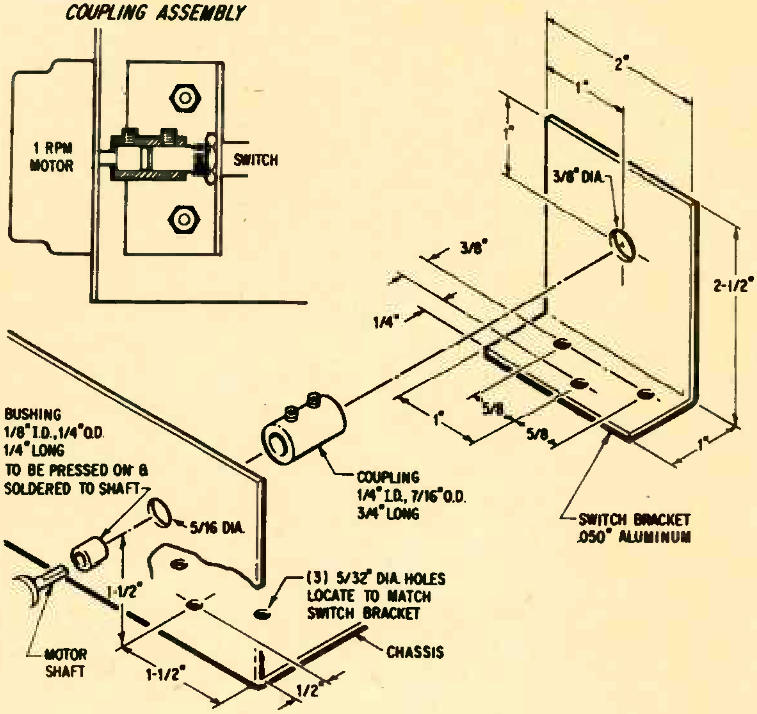


Fig. 6—Sketch at right shows dimensions of switch bracket and where to drill holes in cabinet for clock motor and bracket. Because motor's shaft dia. is ⅛ in. it is necessary to put a ¼-in. O.D. bushing on it so motor can be coupled to rotary switch with ¼-in. shaft coupling. Switch mounting bracket is made from scrap aluminum.

CB Band Scanner

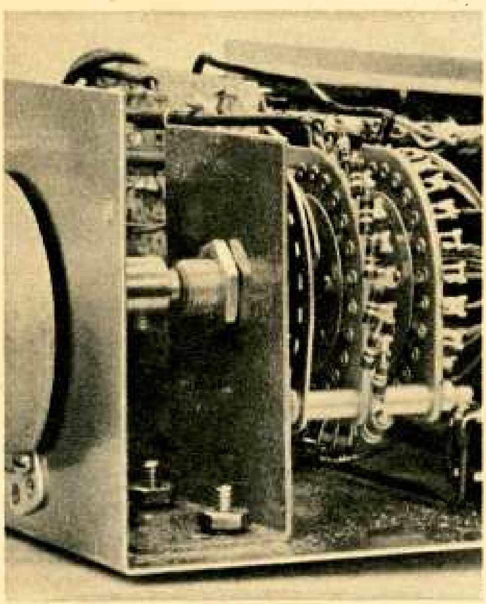
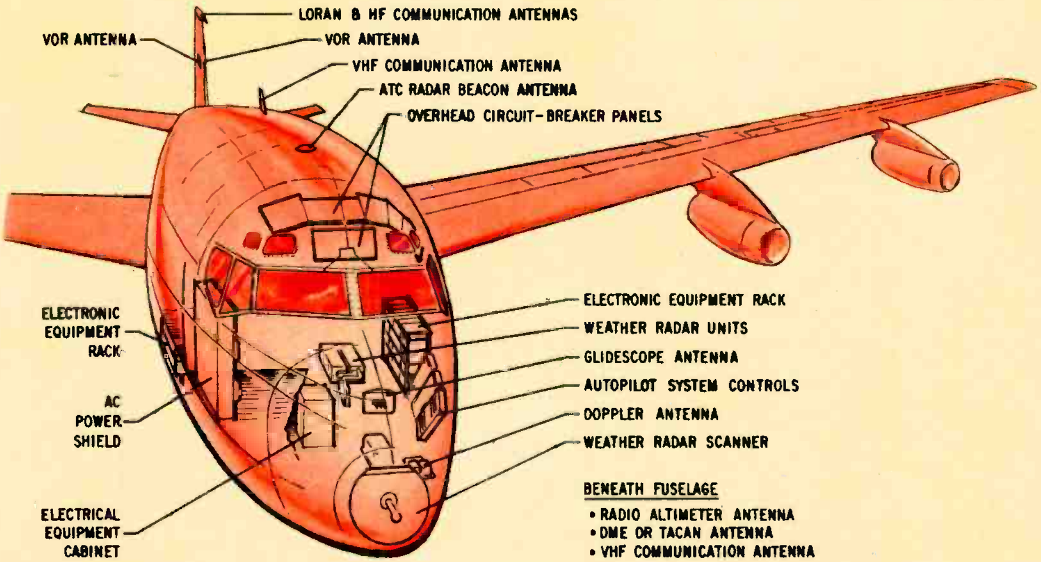


Fig. 7—Photo of corner shows mounted motor and switch bracket. Be sure to remove stop and ball-bearing detent on switch so wiper turns easily.

(Our model was designed for channels 2 through 23 only as they are the only really active ones in our area. For 23-channel coverage, install another 10,000-ohm resistor between the first and second lugs to the right of the wiper lug on S3B as shown in Fig. 1. Connect the additional pilot lamp to the corresponding lug on S3A.) Finish the front panel by drilling holes for the two switches and the pilot light. Lay out and drill the bottom of the cabinet for the transformer, power-supply board mounting lugs and the sweep-switch bracket. Next, make the sweep switch bracket by bending a 3½ x 2 x 1/16-in. thick piece of aluminum into an L shape as shown in Fig. 6. Drill three mounting holes in the bottom of the bracket and a ⅜ in. hole, 1½ in. up from the bottom of the bracket.

Remove the stops and the two ball-bearing detents from the rotary switch. Cut the switch shaft to ½ in. length and mount the switch on the bracket. Temporarily mount the bracket and switch on the cabinet to determine the exact position for the motor in the back panel. Complete the drilling of the back panel with two more motor mounting

[*Continued on page* 114]



How About
A High-Flying Career In Airline Electronics?

By ALAN R. SURPIN

THE travel privileges airline employees receive these days almost qualify them as junior members of the international jet set. For example, after working one year for United Airlines, an employee and his immediate family can receive up to four passes on the line. And he receives a vacation pass good for unlimited travel on United. (Pass holders may have to relinquish their seats to paying customers but can go coast-to-coast for a service charge of around $8 to $10.) Reserved space is available to them on United and other domestic airlines for half fare, on many international airlines at up to 75 per cent off regular ticket prices. And inexpensive travel is only one of the attractive features of airline employment.

There's a frantic search now under way for electronics technicians to keep airliners flying. The drawing above shows why. Although we have indicated only the major electronic installations aboard a typical Boeing 707, you can see that it holds a lot of gear—almost all of it absolutely vital to operation. Much of it is sophisticated equipment and it's growing more sophisticated each year. Automatic landing equipment is already in limited use; collision-avoidance systems are just around the corner. So the need for men to service this equipment grows even faster than the airlines themselves.

In the airlines, an electronic technician is, in fact, more than an Electronic Technician. That term—together with Ground Radio Mechanic, Radio & Electronics Technician and Radio Mechanic—is out of date, superseded by the jet-age title Avionics Technician. And to win it a man must be better qualified than his predecessor. He must have a working knowledge of physics and math. In fact, according to one airline maintenance executive, most amateurs today know more about electronics than

When more than routine maintenance is needed, airborne electronic gear is replaced by standy equipment and the defective unit brought to a facility like this one in TWA's Kansas City, Mo., overhaul base.

A High-Flying Career In Airline Electronics?

did the R&E technicians of 20 years ago.

Base pay for an avionics technician is between $8,000 and $12,000 a year with fringe benefits like hospitalization, life insurance, tuition refunds to help you pay for your training, company stock purchase programs, retirement plans and, of course, travel benefits. Details vary from airline to airline but they can add up to several thousands of dollars a year in extras.

Avionics technicians need a good theoretical background and an FCC Radio Telephone license—minimum, 2nd class—is a requirement. But this doesn't necessarily mean you have to have an FCC license to get a start with an airline.

For instance, under its Mechanics Advanced Acceptance Program, United Airlines will guarantee employment to anyone with an aptitude for electronics who meets its general employment standards—good physical condition, high-school diploma, etc. The applicant is given up to 18 months, at his own expense, to obtain an FCC license. Then he is employed at full salary and given extensive training on aircraft electronics systems. If, when he's finished, he decides to seek employment elsewhere he is free to do so.

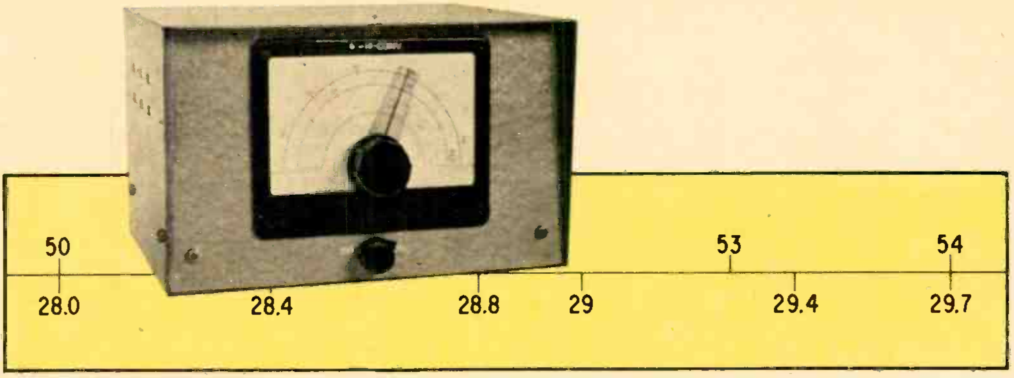
Another opportunity is the Apprenticeship Program conducted at United's overhaul base in San Francisco. This program takes up to four years of on-the-job training and classes in college-level work before a man is qualified as an avionics technician. An FCC license is not required for acceptance into the Apprenticeship Program but, again, applicants must qualify on the basis of aptitude and meet United's overall standards.

United's Advanced Acceptance Program takes less time. Once the applicant has completed it he can go directly to a higher-paying job whereas the apprentice starts at a reduced salary.

Pan American World Airways will accept a man who has the aptitude but does not have a license if he agrees to attend a technical school at his own expense. Pan Am will employ him in a non-technical job while he does. When he gets his FCC license he'll be trained for full-time avionics work.

At present, Pan Am has a few employees attending classes at New York City's (public) Aviation High School. They're preparing to take the FCC exam and, on passing, will be placed in avionics technical groups.

[*Continued on page* 108]



6 & 10 Converter

By CHARLES GREEN, W6FFQ

WHEN it comes to sleeper bands not good for anything more than local rag chews, 6 and 10 meters used to take the prize. A few years ago, that is. Right now they're busier than a dog trying to bury a bone in a marble floor.

What's brought on all this activity? Freckles on the sun. Sunspot activity is just about at a peak now (see An Expert Looks At the New Look in Sunspots, May 1967 EI) and is putting new life in the 6- and 10-meter ham bands. During the low part of the sunspot cycle, these bands were at best local lambs. But since old sol started to break out in spots, the bands have changed into DX lions. You can span the U.S. during the daytime on 10 meters. The 6-meter band also gets active (not as world-spanning as 10) and can be full of surprises when things really start swinging.

You can listen in on the increased activity with our easy-to-build one-tube converter. Its output is at the high end of the broadcast band and can be fed to either a pocket transistor radio, an AC/DC set or a communications receiver. Two plug-in coils are used to cover about 27 to 29.7 mc and 50 to 54 mc. In addition to the 10-meter and 6-meter ham bands, the converter will pick up the Citizens Band. (The Citizens Band also is affected by sunspot activity. You'll be amazed when you hear CBers across the country.)

The converter is built in a 8½ x 6⅛ x 5-in. aluminum cabinet. It has an AC power supply and the simplified circuit makes for easy building.

Construction

Our converter is built on a 8½ x 6⅛ x 1½-in.-high aluminum chassis which is supplied with the cabinet. Best way to start construction is to remove the cover, rear and bottom panels. Tape a piece of graph paper (¼-in. squares) on the top of the chassis and scale the component layout from our photos and pictorial.

Variable capacitor C5 is mounted on a 1½-in.-wide x 1⅝-in.-high heavy-aluminum bracket with a ½-in. foot. You can make this bracket from a piece of scrap aluminum.

6 & 10 Converter

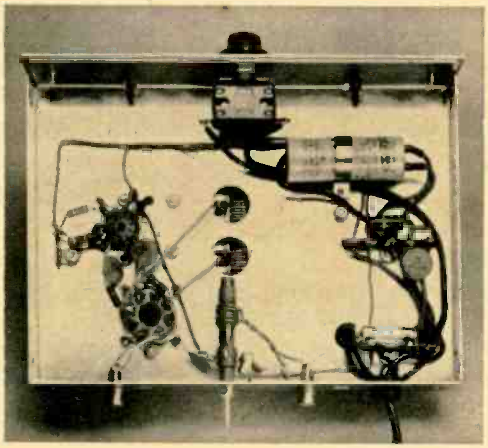
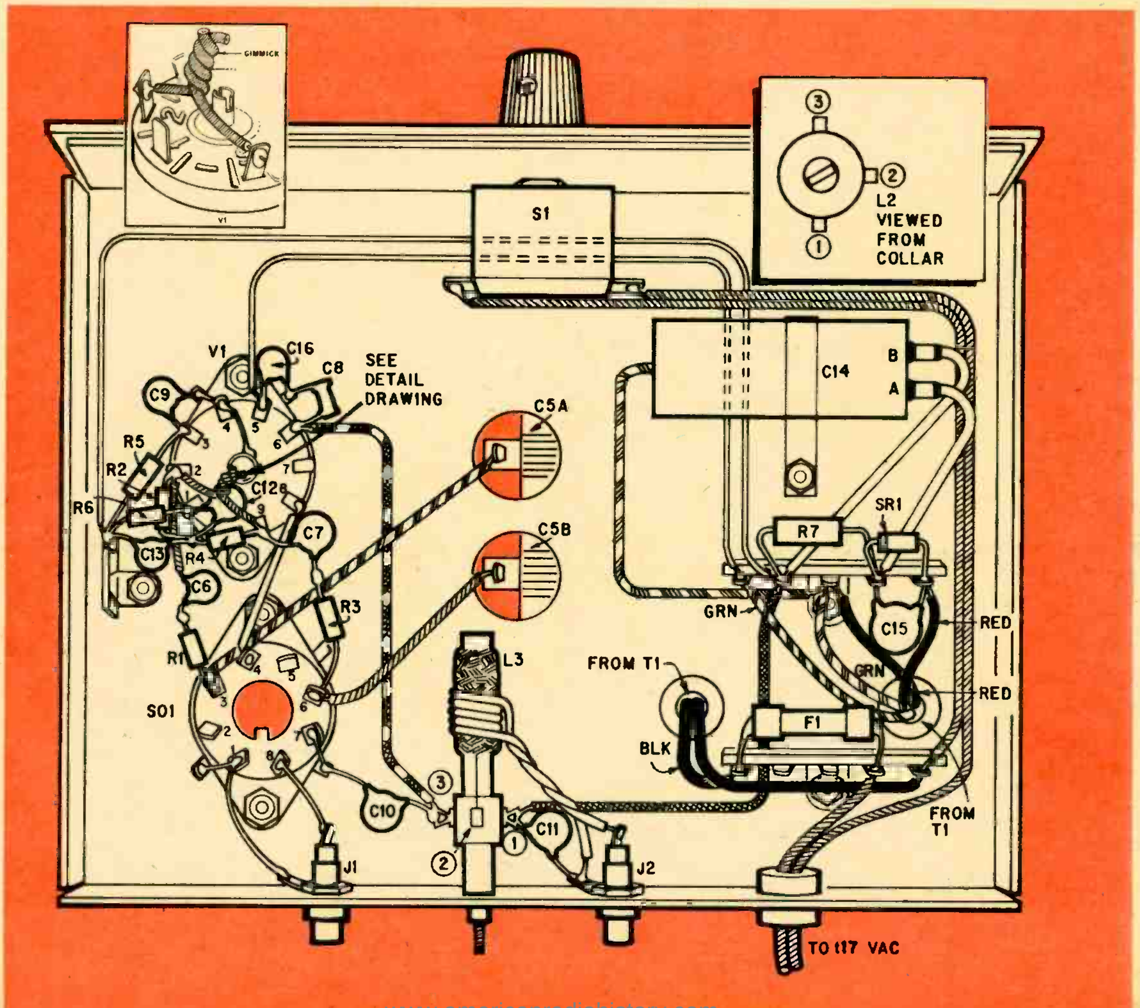


Fig. 1—Underside of chassis. Note in photo above clean open layout; there is no crowding. When wiring from pictorial (below), it is important, because of high operating frequencies, to duplicate layout. Keep leads short and away from chassis.

Next, determine the correct chassis location for variable C5's mounting bracket. Mount C5 on the bracket so it clears the chassis by approximately ⅛ in. Before mounting C5, remove the trimmer capacitor plates and screws on the side. Extend C5's lugs through two ¾-in. holes in the chassis as shown in the pictorial and photo in Fig. 1. Center and mount your vernier dial on the front panel as shown. Make sure that the vernier dial and C5's shaft are aligned to prevent binding when the dial is turned. If there's binding, drill oversized holes in C5's mounting bracket to allow the shaft and vernier dial to be aligned. Then tighten the mounting screws to prevent movement.

Drill the holes for the remaining components and mount them where shown. Because of the high frequencies at which the converter operates, parts placement is critical. Mount all components exactly where shown in the photos. Wire the parts around V1 with short direct leads and keep them up and



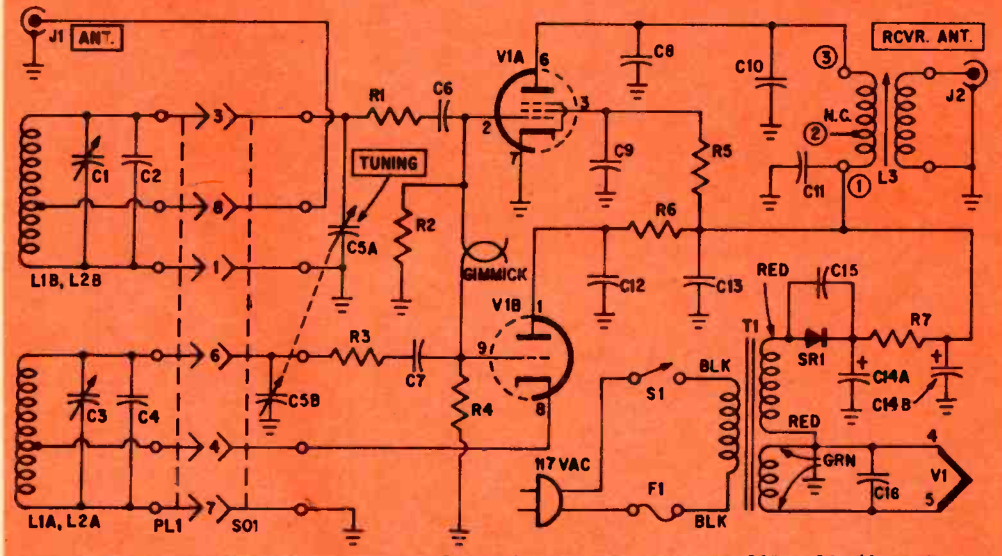


Fig. 2—Schematic. Signal from antenna at J1 is fed to tap on antenna coil L1B or L2B (depends on band). Signal is tuned by C5A. C5B tunes local oscillator V1B so its output is above frequency of incoming signal. Mixer V1A produces IF signal (around 1500 kc) which is coupled by L3 to output (J2).

away from the chassis. Use short lengths of No. 18 wire to connect C5 to SO1 and cover the wire with sleeving to prevent shorts.

Wind 5 turns of No. 22 hookup wire around L3 and twist the wires to keep the winding in place on the coil form. Connect the wires to J2, keeping them as short and direct as possible. The gimmick capacitor between pins 2 and 9 on V1 is made of two lengths of No. 22 hookup wire twisted together 3 turns. Cut the ends off close to the turns and make sure that they do not touch. The gimmick capacitor is shown in detail in the upper left corner of the pictorial in Fig. 1.

Use the coil drawings (Figs. 2 and 3) as guides to cut the perforated boards to size. The board for the 6-meter coils is 2½ in. wide x 2 in. high. The board of the 10-meter coils is 2⅞ in. wide x 2½ in. high (the holes are on 3/16-in. centers). Then insert the push-in clips which can be flea clips or Vector T-28 clips. Use No. 22 wires to wind the coils as shown, and mount the other components where indicated in the drawing. Capacitors C2 and C4 are mounted on the rear of the 10-meter coil. The other components on both boards are mounted on the front.

PARTS LIST

Capacitors: 1,000 V ceramic disc unless otherwise indicated
C1,C3—4-40 μμf midget trimmer capacitor (Allied 43 B 7079 or equiv.), four reqd.
C2,C4,C6,C7,C10—47 μμf (NPO) zero temperature coefficient (Allied 43 B 9968 or equiv.)
C5A,C5B—6.6-23 μμf variable capacitor (J. W. Miller 1461-2. Available from Tridac Electronics Corp., Box 313 Aldon Manor Br., Elmont, N.Y. 11003. $3.50, postage included. No foreign orders; N.Y. State residents include tax)
C8—10 μμf (NPO) zero temperature coefficient (Allied 43 B 9961 or equiv.)
C9,C11,C12,C13,C16—.001 μf
C14A,C14B—50/50 μf, 150 V electrolytic
C15—.01 μf
F1—½-A pigtail fuse
J1,J2—Phono jack
L1A,L1B—10-meter plug-in coil (see text)
L2A,L2B—6-meter plug-in coil (see text)
L3—40-300 μh ferrite rod antenna coil (J. W. Miller 2002, Newark Electronics Corp. Stock No. 40F159. $1.35 plus postage.)
PL1—Octal tube base (2 reqd.)
Resistors: ½ watt, 10% unless otherwise indicated
R1,R3—12 ohms R2—1 megohm
R4—33,000 ohms R5—47,000 ohms
R6—4,700 ohms R7—1,000 ohms, 2 watts
S1—SPST switch SO1—Octal tube socket
SR1—Silicon rectifier; minimum ratings: 100 ma, 500 PIV
T1—Power transformer; secondaries: 125 V @ 15 ma, 6.3 V @ 0.6 A (Allied 54 B 1410)
V1—6U8A tube
Misc.—Vernier dial, 8½ x 6⅛ x 5-in. cabinet (LMB Type W-1C, Newark 91F1085. $5.33 plus postage), perforated board

6 & 10 Converter

Cut slots on the octal tube bases to slip into the slots which you must cut in the coil boards. Position the slots so that the board is facing toward the rear of the converter when the coil is plugged into SO1. Use short lengths of No. 22 wire covered with sleeving to connect the coils to the pins in the tube bases. Cement the boards to the tube bases to prevent movement.

Alignment & Calibration

Plug 10-meter coil L1A, L1B in SO1 and plug in the converter. Set S1 to on and allow the converter to warm up for a few minutes.

Connect J2 to a short-wave receiver tuned to 1550 kc (or a quiet spot near this frequency). Use coax or twisted wire to connect to the antenna and ground terminals on the receiver. If the receiver does not have external antenna and ground terminals, wind 5 turns of No. 22 hookup wire around the receiver loop or antenna coil and connect to J2. Do not make direct connections to an AC/-DC receiver chassis. Indeed, connect .005 μf ceramic disc capacitors in series with each lead to this type of receiver to avoid getting a shock.

Connect a signal generator to J1 and set it to 1550 kc (or the frequency selected on the receiver). Adjust L3 for maximum signal output in the receiver.

Set C5 to a point just past center capacity (equivalent to 29 mc on our dial) or 64 on the logging scale. (Our logging scale went from 0-100.) Set the signal generator to 29 mc and adjust C1 and C3 (located on the coil board) for maximum output.

Set C5 at maximum capacitance (plates fully meshed) and tune the signal generator until you hear the signal (our converter received 27 mc), then set C5 to minimum capacitance and tune the signal generator until you hear its signal (our unit received 29.7 mc). If your converter does not cover from 27 to 29.7 mc, change the capacitance of C4 slightly and/or change the number of turns in (L1A left coil). Due to differences in layout and wiring the exact coil dimensions may have to be modified to tune the band properly. Also make sure that the oscillator is operating *above* the incoming signal. You check this by setting the dial to the 29 mc dial marking and tuning the signal generator until you hear the image frequency which

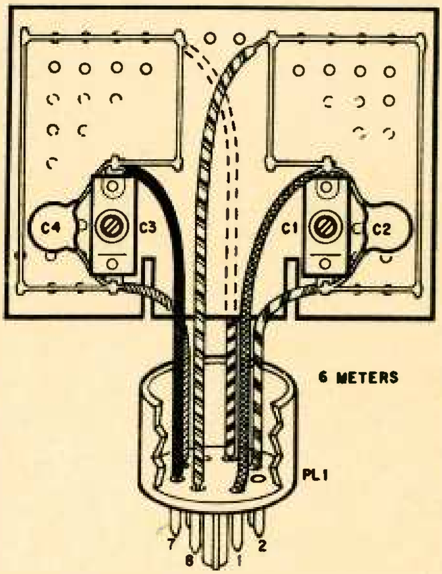


Fig. 3—6-meter coils. Oscillator coil L2A is at the left and antenna coil L2B is at right. Board (Vector 45B30) is 2½ in. wide x 2-in. high; holes are on 3/16-in. centers. Note the slots which fit over the tube base.

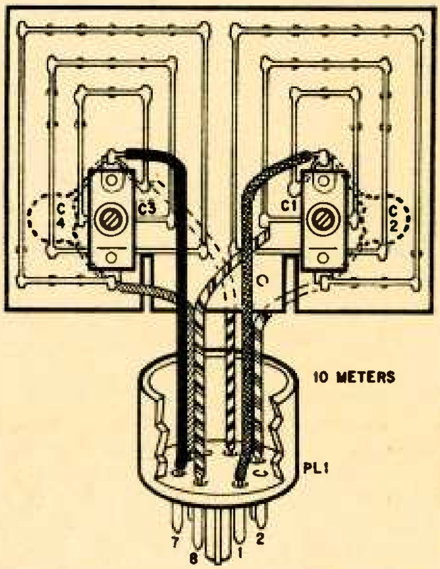
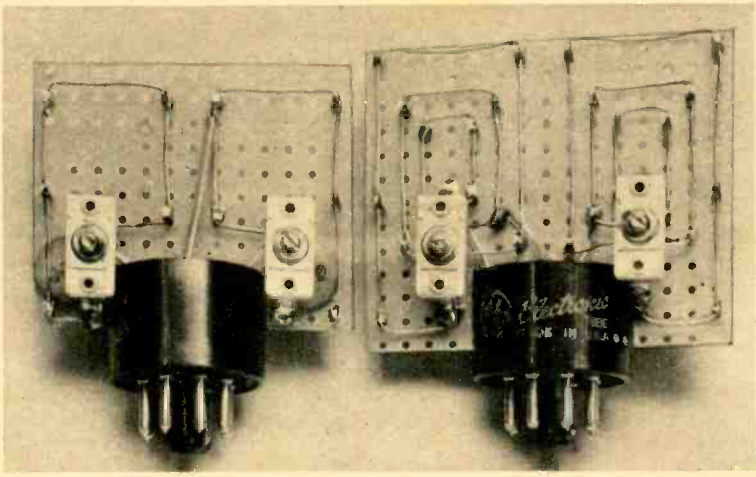


Fig. 4—10-meter coils. Oscillator coil L1A is at left and antenna coil L1B is at right. On these coils disc capacitors are mounted on back. Be sure to use spaghetti on leads from coils to pins in tube base to prevent shorts.

Fig. 5—Photo of coils; 6 meter is at left and 10 meter is at right. 10-meter coil board is 2⅞-in. wide x 2½-in. high. Use a drop of epoxy cement to hold boards firmly to tube bases. Be sure to install boards in bases as shown in Figs. 3 and 4 so screws on trimmer capacitors are accessible from the rear of the converter.



will be at approximately 30 mc. If the band coverage is satisfactory, calibrate the dial with the signal generator.

Take out the 10-meter coil and plug in the 6-meter coil. Set C5 to a point just to the left of center on the dial (52 marking on our logging dial) and set the signal generator to 52 mc. Adjust C1 and C3 for maximum signal output, then check the band coverage with the signal generator as you did during the 10-meter coil alignment procedure. Our converter covered 50 to 54 mc. If your unit does not cover this range, change the value of C4 and/or the length of the turns in coil L2A. Also, check for a received image of 55 mc at the 52 mc dial marking on the converter. This will indicate that the oscillator is operating *above* the incoming signals.

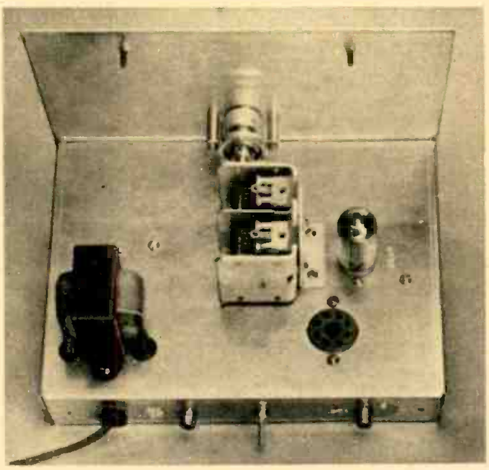


Fig. 6—Finished converter. Power transformer is at left and tube is at right. Socket for plug-in coils is mounted so trimmers face the rear of set.

Operation

For best operation, you should use an antenna cut for each band. However, this may not always be possible. An outside-mounted 10-meter whip or a good ground-plane will probably give excellent performance in most locations for vertically-polarized signals. Strong stations can be received with an 8-ft. length of wire indoors. Or you could try your TV antenna.

CB signals are usually vertically polarized, but the 6- and 10-meter bands can be either vertically or horizontally polarized. Check the Radio Amateur's Handbook for details on building antennas for these bands.

Circuit Description

Signals from the antenna are coupled via J1 to coil socket SO1. When either L1 or L2 is plugged into SO1, C5A tunes the coil (L1B or L2B) and the signals are coupled via C6 to the grid of mixer V1A. C5B tunes coil L1A or L2A in the oscillator circuit of V1B, so that the oscillator's output is always *above* the incoming signal's frequency.

The RF output is coupled via the gimmick capacitor to the grid of V1A. The resultant IF signal (difference between the tuned incoming signal and oscillator frequencies) is coupled from the plate of V1A to coil L3 and to J3. The IF output is coupled from J3 to the receiver, which is tuned to the signal.

The DC power and heater power for the converter are supplied by T1, SR1 and filtered hy C14A, C14B and R7.

Notes from EI's DX Club

ONE DX country that has been a bone of international contention (Spain vs. Brittain) for the past year is Gibraltar. Doug J. Saylor, WA8OKL (Ohio), has worked ZB2AM of that hot spot on 15 meters.

Another hot spot that amateurs can work these days is South-West Africa. Canadian Alfred D. MacDonald, VE3ACU, boasts a QSO with ZS3LU on 15 meters around 1000 EST.

California DXer William Sparks reports occasional reception of English news from R. Yaounde (Cameroun) at 0045 EST (2145 PST) on 4972 kc. This one suffers from RTTY QRM.

Also on the Pacific coast, Bill Kenney reports reception of the Burma Broadcasting System on 4795 kc at 0645 PST sign-off.

The latest station to get into the Listeners-Club act is R. Australia. To join, it requires 12 reports within six months.

R. Free Harlem, a clandestine station that first appeared on the scene about a year ago, is reported back on 3868 kc by Bruce Ted Goldman (New York) until 0010 EST sign-off. Whether this station really has any connection with anything or is merely someone's idea of a joke remains to be seen.

At this equinox period, West Coasters should watch for the Voice of Kenya down on 4915 kc around 0700 PST.

The Zambia B.C. now has a high-power transmitter on 3346 kc. Despite the sunspot count, it often has potent signals at 2245 EST sign-on.

Bob LaRose (New York) has bagged R. Uganda's Kampala station on 4976 kc at 1600 EST. East Coasters still may have a chance at this one before summer sets in.

The VOA's three new portable 50-kw transmitters are now operating from the Philippines. This brings their SW portable total to six. Coincidentally (maybe), the last apparently was delivered just about the time that R. Americas returned to short wave.

Watch for French Cable & Radio at Lome, Togo, with test tapes and telephone traffic around 0900 EST on 23787 kc.

R. Poland again has a transmission beamed to North America. It is scheduled on 11870 kc at 2215-2245 EST—Mondays with Polish, Fridays with English.

Juris Burkevics (Washington) reports that R. Jaen (Peru), formerly off the air for repairs, is back on 5005 kc. WWV makes this one tough for North American DXers.

Southeast Asia Confusion Dept. A few issues back, EI reported that R. Nacional Lao had appeared on 6199 kc with potent signals. Later, several expert SWLs identified the station not as RNL but as the communist La Voix de la Pathet Lao. But one Californian, acting on the original information, sent his report to RNL and promptly received one of their new QSL cards. Isn't RNL bothering to check reports? Or is it attempting to take credit for every station in Laos? Or could both stations be on the same frequency?

Propagation: During the summer months, a phenomenon occurring in the lower levels of the ionosphere results in good short-skip openings on the higher frequencies during daylight hours. This phenomenon, known as sporadic-E, begins in April and reaches a peak in July. As a result, excellent short-skip openings in the 10- and 11-meter bands are fairly common. Frequently, short-skip TV DX is possible because of sporadic-E. For suburbanites who live in fringe areas, sporadic-E is a cause of TVI, particularly on channels 2, 3, and 4.

During daylight hours short-wave conditions will be fair in the 13-meter band, good in the 16- and 19-meter bands. At night, all bands from 49 through 19 meters will be open from one part of the world or another. This should result in excellent DX opportunities on a wide range of frequencies.

EI Kit Report

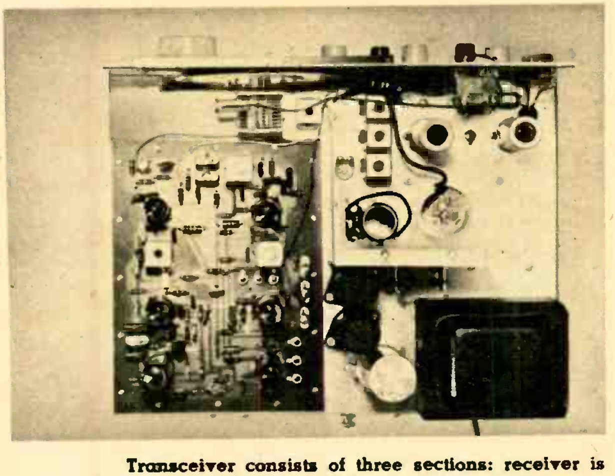
A Transceiver for Novices

Heathkit HW-16

FED up with the thought that because you're a Novice you have to settle for equipment whose appearance and features always make you feel like a second stringer? Then put the $99.50 Heathkit HW-16 Novice transceiver at the top of your must-buy list. It has virtually everything a Novice or CW operator would want. Containing an AC power supply, the HW-16 is a nine-tube transceiver designed to operate in the CW portions of the 80-, 40- and 15-meter bands. Speaker (HS-24, $7), headphones (GD-396, $3.50) and, of course, crystals are extra.

The transmitter section uses an 80-meter crystal for the 80- and 40-meter bands and a 40-meter crystal for the 40- and 15-meter bands. The receiver utilizes the entire dial to tune (multi-turn vernier) 250 kc from 3.5 to 3.75 mc, 7 to 7.25 mc and 21 to 21.25 mc.

Break-in keying is provided, as well as a built-in keying monitor. When your key is up the receiver is on. Press the key and solid-state electronic switching activates the transmitter, mutes the receiver and turns on the keying monitor (neon-lamp relaxation oscillator).



Transceiver consists of three sections: receiver is on circuit board at left, transmitter is in upper right corner, the power supply is at the lower right.

There are rear-apron jacks for the speaker, headphones (jack disables speaker), key, antenna (50 ohms), VFO input and VFO power. There are two front-panel sockets for type FT-243 and miniature crystals.

The receiver leads off with an RF amplifier, followed by a crystal-lattice filter, a VFO second converter (which does the tuning), a crystal-controlled BFO, a product detector and two stages of audio. The crystal-controlled first converter provides excellent stability which approaches that of receivers priced much higher. We found that the crystal filter's bandwith of approximately 500 cps at 6db down met Heath's spec.

The receiver's sensitivity is high and noise rejection was excellent (particularly on 80 meters). The sensitivity we measured for the three bands is shown in the chart at the end of this article. Note that this is not the usual signal-plus-noise to noise (S+N/N) rating because such a ratio is not particularly meaningful to CW reception. Instead, the sensitivity figures shown are for a 1.5-mw audio output with the receiver's AF and RF gain controls wide open. 1.5 mw is used as the reference since it produces a minimum usable output. In other words, if the level of the signal at the antenna terminals is at least equal to that shown in the chart you will obtain usable copy from the speaker.

The three-stage transmitter consists of an oscillator, buffer and final (6GE5) with the final running straight-through on all bands. A dual-purpose panel meter indicates either the relative RF output power or the final's cathode current. The final's input power is rated at 90 watts, but there's a 75-watt Novice-power reference mark on the meter

[*Continued on page* 115]

CB Corner

By Len Buckwalter, KQA5012

CB on TV

IT'S encouraging news that CB manufacturers are heating up plans to show off CB's good side. As reported in our Jan. '68 issue, a group of CB makers has banded together to help nurture and protect CB's future. Since then they have met several times and started a kitty to finance some CB image-boosting on radio, highway signs and in magazines.

First signs of the campaign should be appearing soon. If you happen to hear, "KXT 1990 calling with an emergency on Route 121," don't dash to the CB rig. It might well be CB's first commercial coming over your TV loudspeaker.

Setting the Trap . . . Do television sets for blocks around get sticky pictures when you go on the air? Could be you're also transmitting on TV channel 2. Though CB rigs supposedly transmit signals on 27 mc they also squeeze out waves at double that frequency. The extra signal is the second harmonic, a technical gremlin that can't be quashed completely before it reaches the antenna.

Trouble is that the second harmonic falls on 54 mc. TV channel 2 sends pictures on about 55 mc and sound on 59 mc. Pack those 54-mc signals into a TV receiver and you'll smother the Brothers.

The photo on the left shows a TV set reeling from CB's second harmonic. It appears as a hatching or herringbone pattern through the picture. When you speak into the mike, black bars may jump across the screen. Or your voice might be heard from the TV speaker. Some CBers try to cure the problem with a high-pass filter on the TV set. But since the harmonics is so close to the TV signal this approach is doomed to failure.

One answer is hidden inside the CB set. Most CB manufacturers build an adjustable trap inside the rig. Some fail to mention it in instruction manuals; others may tune it at the factory to a setting that won't agree with your antenna system. You may retune it yourself, as shown in the middle photo, with a small screwdriver or a hex-type tuning tool, depending on the model. With the CB rig near the TV set, press the mike button and tune for least interference while observing a picture on the afflicted channel (most likely channel 2). You may not be able to get rid of every last trace but the adjustment should help clear the air, as shown in our scene on the right.

More famous last words . . . Many are the coverup IDs of illegal operators. FCC officials recently intercepted one operator who variously used the identification Granny, Nobody and Pussycat.

What's new Pussycat? Well, Big Ben in Ol' Washington told Fox-Charlie-Charlie in the Big Marble Shack that Granny better surrender the ticket or be hustled off by Sneaky Sheriff.

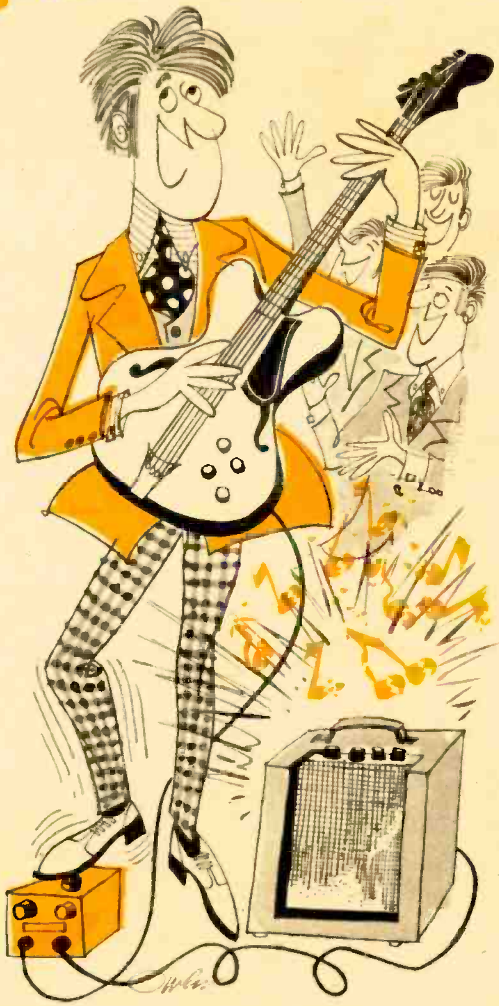
One curious postscript to Pussycat's adventures: Her real name is Richard.

Text explains how to adjust trap on CB (center) to clear hatching on TV caused by CB second harmonic.

Fuzz Box for Swingers

Fuzz your guitar and you'll have the biggest, roughest sound on the scene.

By HERB FRIEDMAN



ONCE upon a time just a plain old electric guitar could be the center of attraction at a musical happening. But a straight guitar wasn't enough. Soon reverb was added, some tremolo and finally a vibrato tailpiece. This still didn't do it. The latest extra which has been added to electric guitars is fuzz—a deliberate distortion which is added to simulate the sound of a sax.

All it takes to add fuzz to your electric guitar is our fuzz box. You connect it between the guitar output and the amplifier input to generate distortion—plain, simple distortion.

The fuzz box gives you full-range fuzz. Crank fuzz control R2 open just a little and you begin to get a real rough sound. Add a little more and with some slick fingering your guitar will sound like a bass or baritone sax. If you crank the control wide open, you'll drown out just about everything with noise.

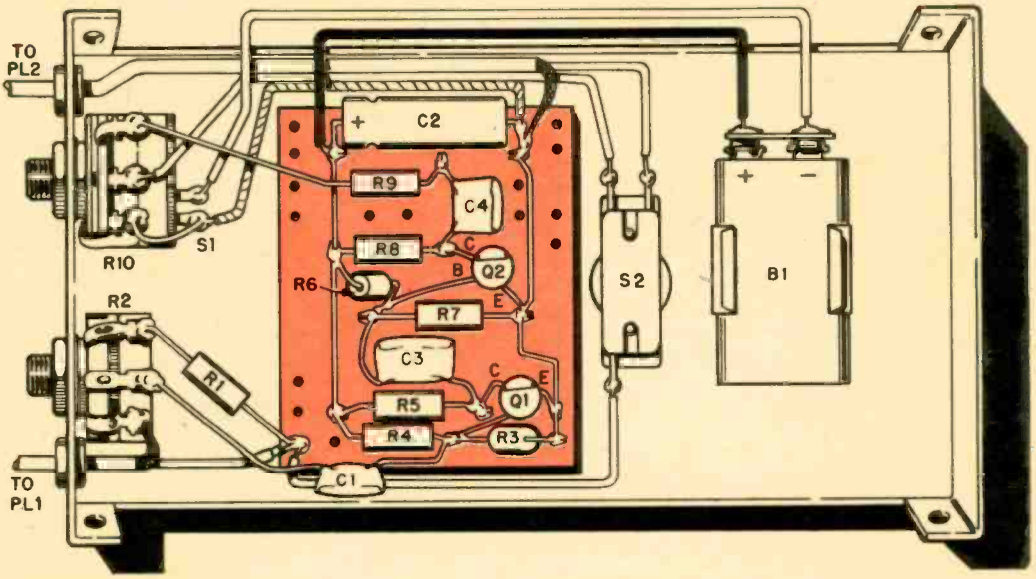
The difference between our fuzz box and commercial units is that ours doesn't produce the distortion at its input. The first amplifier stage, Q1, operates at low distortion. Amplifier Q2 also operates at low distortion, but by overdriving its base it produces almost symmetrical clipping. The greater the input signal to Q2 the greater the clipping, hence, the greater the fuzz. If R2 is almost wide open and Q1 is also overdriven by the signal from the guitar, the effect is very severe distortion—almost all noise.

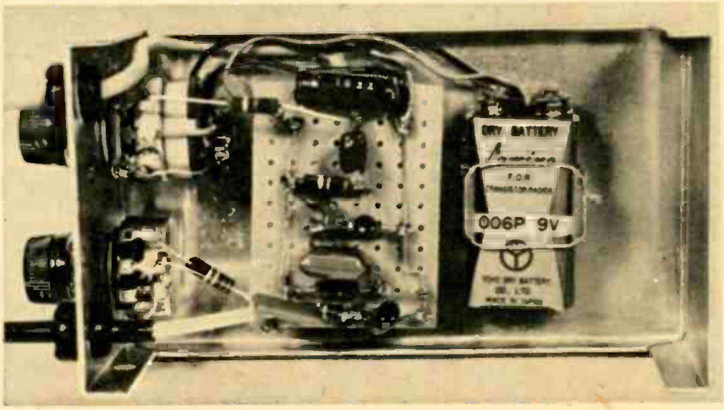
Bypass switch S2 routes the guitar's output signal around the fuzz circuits when you want normal guitar sound. Volume control R10 allows the fuzz-box output level to be made the same as the guitar's output level so when you turn the fuzz on there won't be big volume-level changes.

This allows you to both key the fuzz in and out to change the fuzz quality during a solo—with no break to reset the controls.

Although the fuzz is obtained primarily by

Our model has cables which plug into your guitar and amplifier. Step on push-button switch on top and you add fuzz; step again and you remove it.





In pictorial at top we have shown push-button switch to right of circuit board for clarity. Actually, it is under board and board is cemented to back of it. Wiring and parts placement is not critical and unit may be built in whatever cabinet or box is available.

Fuzz Box for Swingers

overdriving Q2, it is possible to control the effect by adjusting the guitar's volume control.

Construction

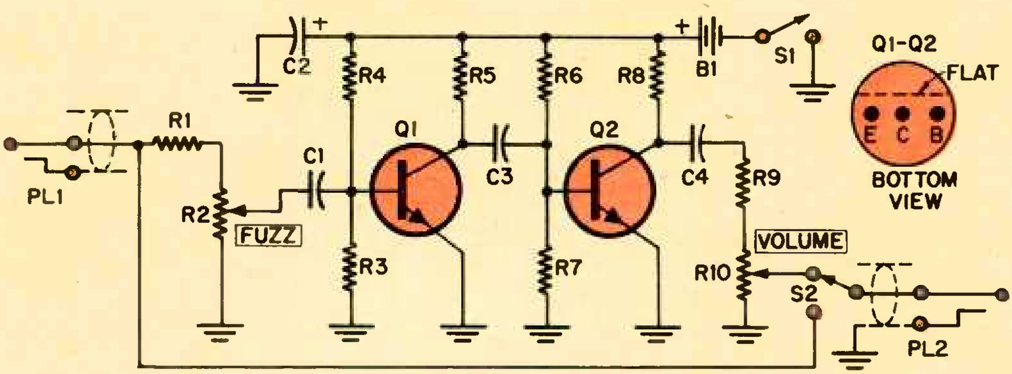
The fuzz box is built in the main section of a 5¼ x 3 x 2⅛-in. Minibox. Because the battery will have to be changed after about 50 hours (100 hours if the batteries are alkaline or mercury), use a Bud type CU-2106A cabinet because its cover snaps in place.

The layout is not critical but the component values are. With the exception of C1, C3 and C4, do not make substitutions. Capacitors C1 and C3 can be either .2 or .25 μf—whichever is easier to obtain. The .05 μf value for C4 will generally be adequate, but for a little more bass you can use the same value as for C1 and C3, though the larger value for C4 might result in a little crowding of the components.

Bypass switch S2 is a SPDT *push-push* type. The connections change and remain that way each time the button is pushed. (They remain that way after the button is released.) Do not confuse this switch with a momentary-contact type, which flips the connections back as soon as the button is released.

The input and output can be standard phone jacks or permanently-attached cables as shown. If you use cables, fasten them in place with a cord clamp or tie a knot in them and pass them through rubber-grommetted holes.

Most of parts are mounted on a 2¼ x



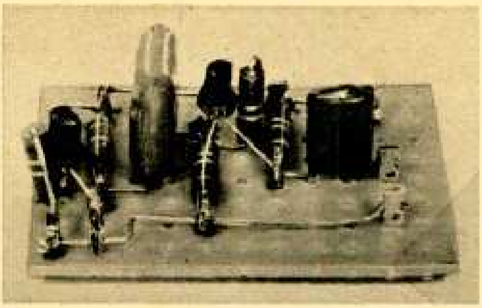
High signal level from Q1 will overdrive Q2, which clips the signal symmetrically and produces distortion.

PARTS LIST

B1—9 V battery
Capacitors: 15 V or higher
C1,C3—.1 µf ceramic disc
C2—50 µf electrolytic C4—.05 µf ceramic disc
PL1,PL2—Phone plug
Q1—2N3391 transistor (GE)
Q2—2N3392 transistor (GE)
Resistors: ½ watt, 10% unless otherwise indicated
R1—22,000 ohms
R2—50,000 ohm, audio-taper potentiometer
R3,R7,R8—10,000 ohms R4,R6—150,000 ohms
R5—6,800 ohms R9—1 megohm
R10—50,000 ohm, audio-taper potentiometer with SPST switch
S1—SPST switch (on R10)
S2—SPDT push-push switch (Carling 112P or equiv.)
Misc.—5¼ x 3 x 2⅛-in. Minibox, perforated board, flea clips
The Carling 112P switch is available for $2 plus 40¢ postage and handling, or a complete set of parts (except misc.) is available for $8.50 plus 50¢ postage and handling from Tridac Electronics Corp., P.O. Box 313, Aldon Manor Br., Elmont, N.Y. 11003. No foreign orders.

1¾-in. piece of perforated board. Vector T28 terminals can be used as tie points. Any component shown with both leads on the perforated board is part of the subassembly. However, do not install capacitor C2 until all other wiring is completed. Connect resistors R1, R9 and capacitor C1 after the board is installed.

The board has no mounting screws: it is cemented to the back of S2 with either silicon rubber adhesive or a strip of two-sided picture-frame adhesive. Battery B1 can be mounted in a holder or a U-clamp as shown.



Wiring is tight on 2¼ x 1¾-in. circuit board so wherever possible, mount parts standing up. Input is at the left and the output is at the right.

Using The Fuzz Box

Connect PL1 to the guitar and connect PL2 to the amplifier's input. Turn on power. Press S2 once or twice to get the guitar to feed the amplifier directly. Set the guitar's volume control(s) to the normal position and adjust the amplifier for the usual level. Set R2 to mid-position. Turn on the fuzz with S2, and then while playing, adjust R10 until the fuzz level is nearly the same as the level without the fuzz. Press S2 in and out to switch from normal to fuzz while setting R10. Now adjust R2 for the desired amount of fuzz; it may be necessary to reset R10's volume setting.

As you play you can increase or decrease the fuzz by adjusting the guitar's volume control. In effect, the guitar's volume control becomes a vernier for R2. Careful adjustment of the guitar's volume control should allow you to almost drop the fuzz out entirely, or increase it till the sound is shattering noise.

The Ham Shack

By Wayne Green
W2NSD/1

PERHAPS amateur radio can solve some of the puzzles raised by UFOs. As conviction grows that UFOs must be spacecraft visiting our planet it obviously behooves us to learn everything we can about them.

Poor communications have been a serious roadblock to UFO investigation. When something is spotted in upper Michigan there's no reasonable, fast way for people there to let those in lower Michigan and Indiana know that something is headed their way. If an amateur radio network were set up, covering the entire United States, it would be possible to pass the word instantly when something is sighted.

Those of you who have been reading books on UFOs know they behave oddly. They seem to defy the laws of inertia. This indicates to some that they may use some sort of gravity propulsion system that would act on every part of the craft and its occupants equally. Some sort of electrostatics or electromagnetics is present too, for radios and other electrical apparatus stop working when UFOs are in the vicinity. Measurable radiation is left behind where they touch down so there seems to be some nuclear action involved. And why are there no contrails or sonic booms from them? With adequate communications, detectors could monitor each of these factors as the UFO is tracked. And it would be possible to get good pictures of the craft.

The U.S. government is one of the few still poo-pooing UFOs. I'm afraid this adds to the old credibility gap. The Soviet government, never one to take up popular enthusiasms lightly, is giving UFOs serious investigation. An article in the February issue of Soviet Life gives details on many sightings by Russian astronomers and other scientists. They have set up the UFO Section of the All-Union Cosmonautics Committee with Air Force Major General Stolyarov as chairman. They will study UFO reports and set up systems for photographing and recording the radiation and magnetic disturbances UFOs cause.

Amateur radio probably is the only practical communications medium that could provide instant contact between any two spots in the U.S. We can cover both long and short ranges on our bands. Nets on 20 and 80 meters could cover the whole country.

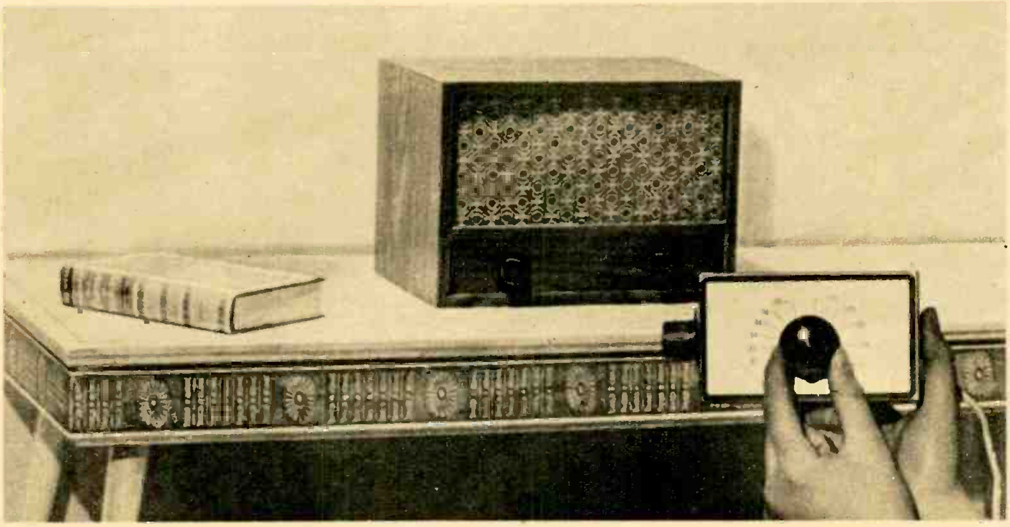
What I propose is that every interested amateur let his police and CD departments know they are to contact him immediately if a UFO is reported in the area. The amateur can then alert the net on either 80 or 20 meters and pass along information about the direction and speed of the UFO. I would suggest using easily remembered frequencies such as 14250 and 3900 kc as net channels. Someone around the middle of the country, with lots of time and an outstanding signal, could serve as net control on each band and send an alerting tone when a report comes in.

With a project like this, amateurs could do more than ever before to be worth their salt. And just think of the possibilities once we're set up to track UFOs around the country. Then we could attempt to communicate with them. We could have lights set up waiting for them, try various radio transmissions and other signaling means. Unless we have a system set up beforehand we can't attempt any of this.

Integrated circuits may be new enough so that I'm not beating an empty teakettle for everyone. Oh, you've been reading about them a bit and undoubtedly have been exposed to a few articles showing how to apply them but I wonder how much you've really indentified with them.

I think all of us that used to enjoy building our own equipment will remember the old days with nostalgia. So here we are in 1968 and gloryowski, Zero, have things changed! And what did it? Above all, the IC. Do you know they have a complete receiver now on two lousy little chips and in a few months expect to have the whole kaboodle on one?

Yes, the chips are starting to fall. Watch the catalogs and magazines articles for info on the wide range of circuits coming out. I expect we'll be seeing a whole new generation of hams and experimenters getting into the building game.



Automatic FM Radio

By C. GREEN

YOU tune in your favorite FM station, set the volume and sit back in your easy chair for a few hours of relaxation. It isn't long before some unbearably loud music comes on and you're up to lower the volume.

After a while you're up again to change stations. And so it can go all evening—up, down, up, down, up, down. Sometimes you never can just sit, relax and listen for an extended period of time.

EI's Automatic FM radio can make you into a long-term armchair listener. You turn on the radio and put its remote-control unit on the table near you. The remote has tuning and volume controls on it. Should you wish to change stations or volume you simply turn the knobs and the radio (which can be 20 ft. away) responds automatically. Only time you'll have to get out of the chair again is to turn the radio off before retiring.

The device which permits tuning from a distance without motors or flexible shafts is a varactor diode. This tiny silicon voltage-variable-capacitor diode has upstaged the old large multi-blade variable capacitor.

By varying the reverse-bias voltage across the diode with a potentiometer, the diode's capacitance will change, as does that of a variable capacitor when you turn its rotor plates. And the capacitance of several diodes can be changed simultaneously by one potentiometer. Because the potentiometer controls DC and not RF, it can be located a distance away from the diodes. We used two varactor diodes in our four-tube remote-control FM receiver. One tunes the antenna circuit and the other tunes the local oscillator. In addition, the receiver can be used as an FM tuner. The rig is not difficult to build but you must be careful about layout and wiring.

Construction. The receiver is built on a 7 x 11 x 2-in. aluminum chassis. First determine the position of the speaker along the front of the chassis then locate its brackets' mounting holes.

The antenna terminal strip is mounted on a 1 x 2-in. aluminum bracket at the back of the chassis. Position the output transformer away from the power transformer to prevent hum pickup. Determine the position of all tube socket

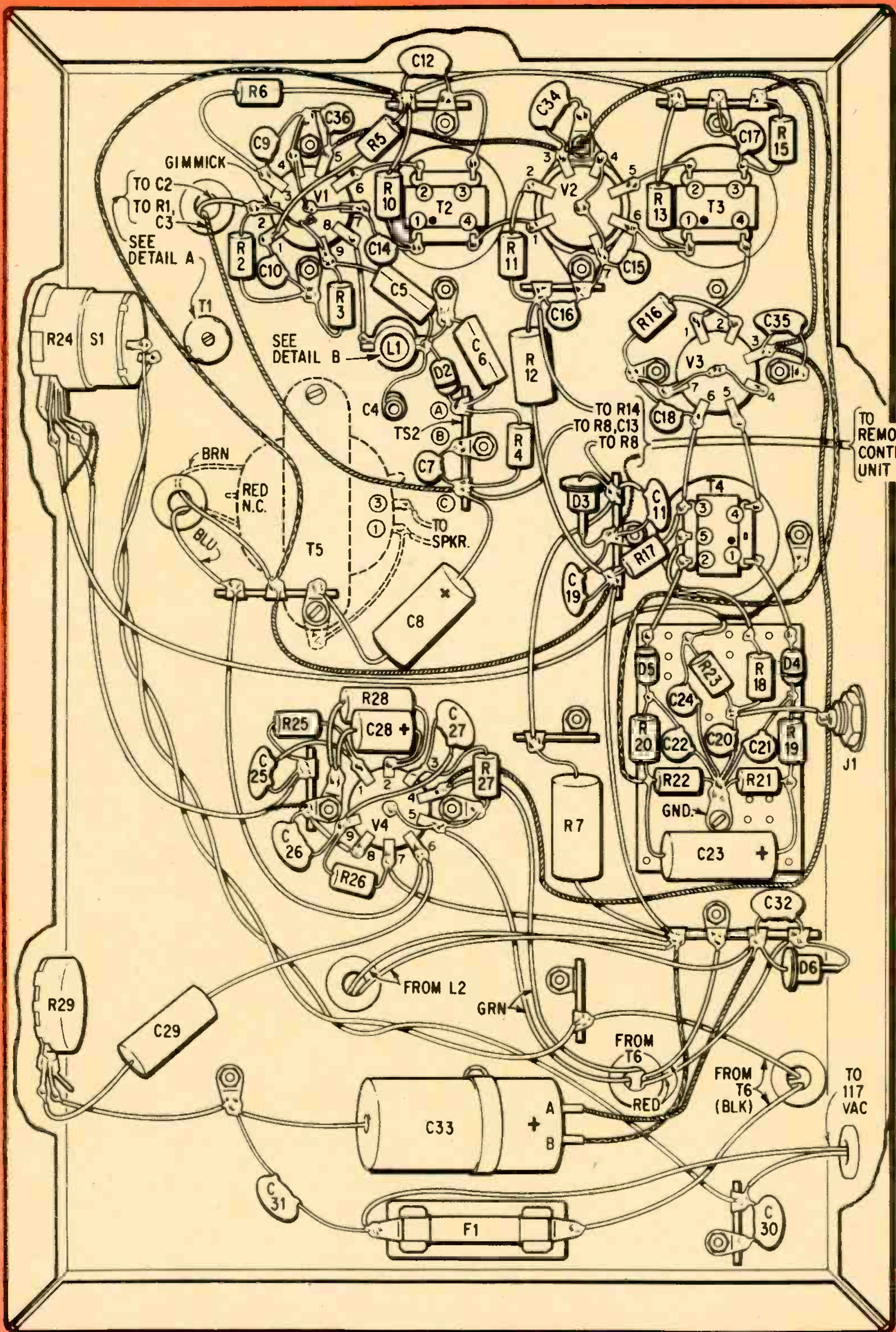


Fig. 1—Underside of receiver. Parts placement at top and down to T4 is critical. Ratio-detector circuit is built on 2¼ x 1½-in. piece of perforated board which is mounted on spacer at right. T5 is on top of chassis.

Automatic FM Radio

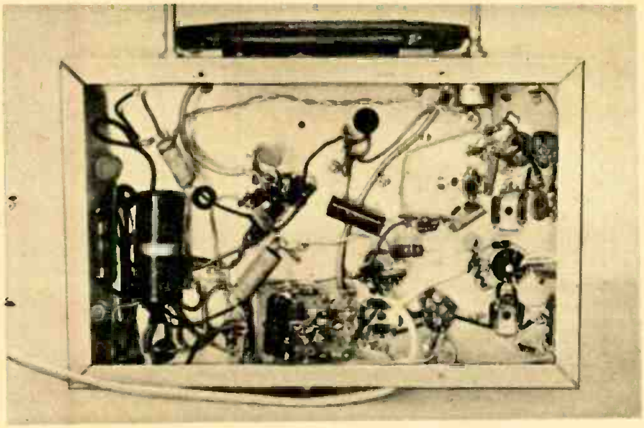


Fig. 2—Underside of receiver. The 5 x 7-in. oval speaker (top) is mounted on chassis with small angle brackets but it could be attached to cabinets.

and transformer holes from the pictorial in Fig. 1. Keep the tube sockets close to the IF transformers. Use rubber grommets in all chassis holes and through which wires pass, and use lock washer when mounting the terminal strips, transformers and tube sockets.

To make wiring easier, use No. 22 bus

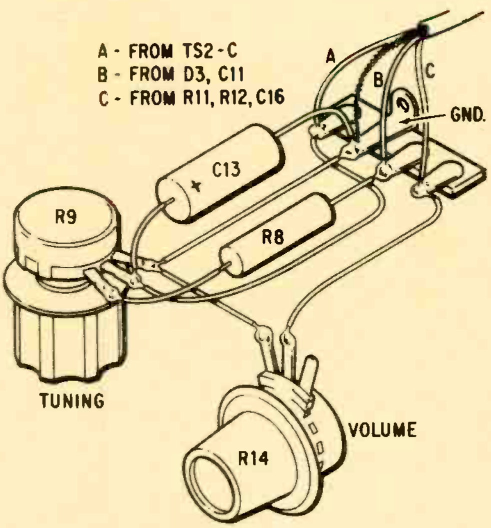


Fig. 3—Remote-control unit. Three-conductor wire must be shielded. Ours was Belden No. 8735 and was about 20-ft. long. Use spaghetti on part leads.

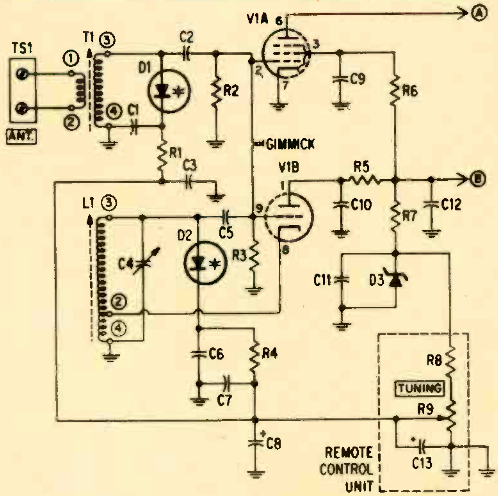


Fig. 4—Front-end. Signal from antenna is tuned by D1,T1. Oscillator is tuned 10.7-mc above by C4,D2. IF signal is fed to the IF strip in Fig. 6.

covered with spaghetti sleeving for all the short leads. Note that the ratio-detector circuit components are mounted on a 2¼ x 1½-in. piece of perforated board with flea clips. Position the board ½ in. away from the chassis with a spacer on the mounting screw to prevent shorts. The wiring and layout are critical in the areas around V1, V2 and V3.

The gimmick capacitor is made from two pieces of No. 22 hookup wire soldered to pins 2 and 9 on V1 and twisted together 3 turns. Mount the remote-control box components as shown in Figs. 3 and 5. For a dial, we put a heavy piece of paper on the box.

Alignment and Operation. You'll need a signal generator and VTVM to align the receiver. Plug in the tubes, turn on power and

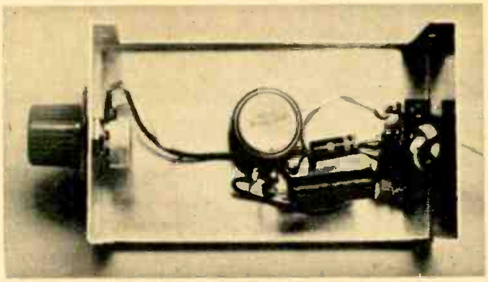


Fig. 5—Inside of remote-control unit. Box may seem large for number of components, but this is because we installed a large, easy-to-read dial.

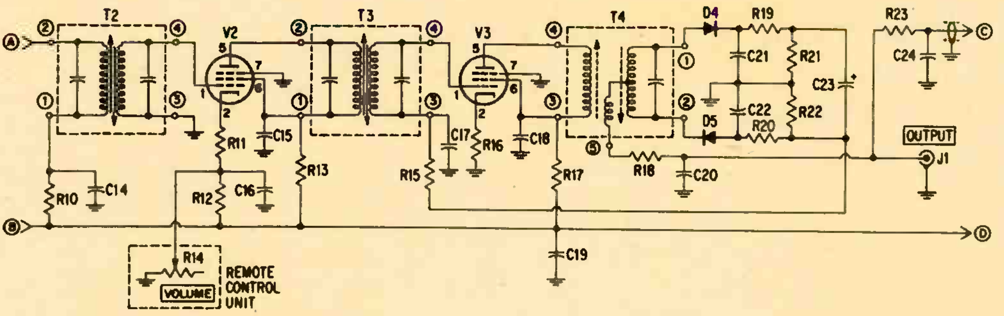


Fig. 6—IF strip/ratio detector. Output at C goes to audio amplifier. (Fig. 7). Tuner output is at J1.

Automatic FM Radio

let the unit warm up a few minutes.

Connect the VTVM to measure negative voltage between the junction of C23/R22 and the chassis. Set up the generator for a 10.7-mc modulated output and connect it to the junction of C2/R2 (pin 2 of V1A) and the chassis. Adjust the top and bottom slugs of T2 and T3, and the bottom slug of T4 for maximum indication on the VTVM. Keep

PARTS LIST

Capacitors:
C1,C6—39 µµf, 500 V, 5% silvered mica
C2—47 µµf, 1,000 V ceramic disc
C3,C7,C10,C20,C21,C22—470 µµf, 1,000 V ceramic disc
C4—1-6 µµf tubular ceramic trimmer (Centralab 829-6. Allied 43 B 1402)
C5—30 µµf, 500 V, 5% silvered mica
C8,C13—4 µf, 50 V electrolytic
C9,C14,C15,C16,C17,C18,C24,C36—.001 µf, 1,000 V ceramic disc
C11,C19—.005 µf, 1,000 V ceramic disc
C12,C25,C27,C30,C31,C32,C34,C35—.01 µf, 1,000 V ceramic disc
C23—10 µf, 25 V electrolytic
C26—100 µµf, 1,000 V ceramic disc
C28—8 µf, 12 V electrolytic
C29—.05 µf, 400 V tubular
C33A,B—40/80 µf, 150 V dual electrolytic
D1,D2—1N3182 varactor diode (Amperex, Newark Electronics Corp., 500 N. Pulaski Rd., Chicago, Ill., 60624. 68¢ plus postage. $2.50 minimum order)
D3—18-V zener diode (International Rectifier 1ZM18-T10, Newark Electronics Corp., 90¢ plus postage)
D4,D5—1N34A diode
D6—Silicon rectifier; minimum ratings: 600 ma, 400 PIV
F1—½-A fuse and holder
J1—Phono jack
*L1—88-108 mc oscillator coil (J.W. Miller 1449)
L2,—5 h, 65-ma choke (Triad C-6X or equiv.)
Resistors: ½ watt, 10% unless otherwise indicated
R1,R4,R6—15,000 ohms
R2—470,000 ohms
R3,R23—47,000 ohms
R5—1,800 ohms
R7—15,000 ohms, 5-watt wirewound
R8—6,800 ohms, 2 watt
R9—30,000 ohm potentiometer (IRC-CTS Snaptrol CF49T or equiv. Taper: right-hand for TV contrast circuit)
R10,R19—1,000 ohms
R11,R16—100 ohms
R12—100,000 ohms, 1 watt
R13,R17,R20—1,600 ohms
R14—25,000 ohm, linear-taper potentiometer
R15—1.5 megohms R18—75 ohms
R21,R22—10,000 ohms
R24—1 megohm, audio-taper potentiometer
R25—4.7 megohms
R26—225,000 ohms
R27—1 megohm
R28—220 ohms, 1 watt
R29—50,000 ohms, audio-taper potentiometer
S1—SPST switch on R24
SPKR—4-ohm speaker
*T1—88-108 mc antenna coil. (J.W. Miller 1447)
*T2,T3—10.7-mc IF transformer (J.W. Miller 1457)
*T4—10.7-mc ratio detector transformer (J.W. Miller 1459)
T5—Output transformer; primary: 5,000 ohms, secondary: 3.2 ohms (Allied 54 E 2064 or equiv.)
T6—Power transformer; secondaries: 125 V @ 50 ma, 6.3 V @ 2 A (Allied 54 B 1411 or equiv.)
TS1—Two-screw terminal strip
TS2—Three-lug terminal strip
V1—6KE8 tube
V2,V3—6BJ6 tube
V4—6BM8 tube
Misc. 7 x 11 x 2-in. aluminum chassis and bottom plate, 5¼ x 3 x 2⅛-in. aluminum Minibox, tube sockets, knobs
*A kit of coils consisting of L1,T1,T2,T3 and T4 is available for $9.00 plus postage from Tridac Electronics Corp., Box 313, Aldon Manor Br., Elmont, N.Y. 11003. N.Y. State residents include sales tax. No foreign orders.

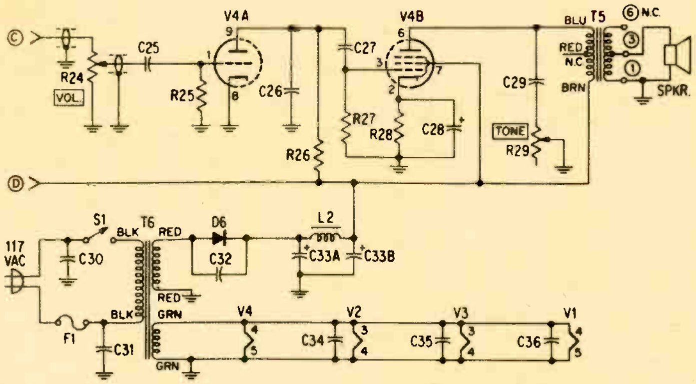


Fig. 7—Audio stages. Potentiometer R24 is master volume control and establishes maximum volume of receiver. Tone control R29 attenuates highs. Output transformer T5 has several secondary taps (only two are shown) for different-impedance speakers. Receiver's output power is about 3 watts.

the RF voltage as low as possible (so the indication will be on the 1.5-V scale) to prevent overloading of the IF amplifiers.

Set up the VTVM for zero-center indication and connect it to the junction of R18/-C20 (jack J1) and the chassis. Adjust T4's top slug for zero indication on the VTVM. Connect the VTVM to the junction of C23/R22 and chassis and readjust the bottom slug of T4 for maximum meter indication. Repeat the steps we've just gone through several times until there is no further change in the zero indication.

Disconnect the meter. Set up the generator for an 88-mc modulated output and connect it to TS1. Turn R9 almost full counterclockwise and adjust L1's slug until you pick up the signal; peak-up T1 for maximum signal. Turn R9 almost full clockwise and set the signal generator for 108 mc. Adjust C4 until you hear the signal near the high end of the dial. Repeat the adjustments for T1 and L1 at 88 mc.

The remote-control unit dial can now be calibrated with the signal generator. Transfer type makes for a neat appearance and can be easily applied. Turn the volume control on the receiver to maximum volume and control the volume with R14. Disconnect the signal generator and connect a TV antenna (outdoor or rabbit ears) to TS1.

It will take a little practice to operate the receiver with the remote-control unit and you may have to change the tuning slightly when the volume is changed. This is due to a slight narrowing of the receiver IF bandpass caused by a change of the bias on V2.

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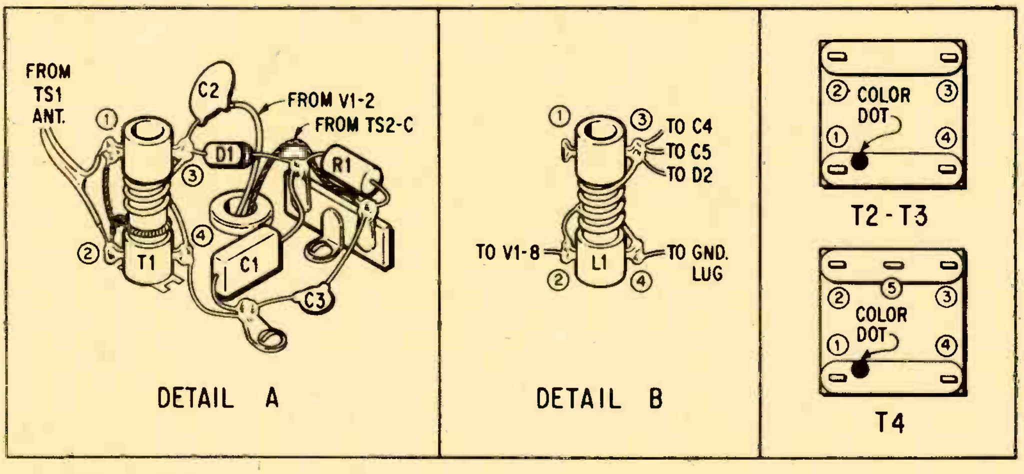


Fig. 8—Front-end parts shown in Detail A are located on top of receiver's chassis in the right, front corner.

Hi-Fi Today • * Bombs and the Conspiracy of Silence

By John Milder

NOT long ago I noted in this column that the traditional bomb—the product that didn't work when you took it home, didn't work when you fixed it and didn't have a prayer ever of working as advertised—had passed (almost) from the audio scene. But it's time to make clear that what I was talking about then was essentially the *badly conceived* (sometimes hopelessly conceived) product. I wasn't trying to intimate that modern products don't break down.

They do. Do they ever! The failure rate of some hi-fi products is disgracefully high and the disease affects manufacturers big and small, respected and fly-by-night. I don't think anyone is being well served by the present silence on this subject in the hi-fi monthlies and other publications. It is a real problem. Ask anyone who's bought an electronic component recently.

The souce of the problem isn't mysterious. Pressure to incorporate the newest technology in audio products is making more and more manufacturers rush things to market. So they use the consumer—instead of their own R&D departments—as the testing facility for what amounts to the pilot run of a new product (in some cases, a product so quickly superseded by a new, improved model that it never even makes it out of the pilot phase). This practice got its real start with the arrival of transistors in audio a few years ago and it has accelerated with the use of ICs and other sophisticated circuitry.

What makes matters worse—and what certainly drives most consumers up the wall when something needs repair—is that solid-state components present far more sophisticated service problems than did tubes. They are highly susceptible to mishandling by a service facility and they are by no means guaranteed proper care even at the factory stations. There the problem often is threefold: the manufacturer hasn't kept the station up to date on products and circuitry, it hasn't supplied the station with the most likely of his latest parts (let alone the unlikely ones), it has dragged its feet in diagnosing and correcting problems reported from the field.

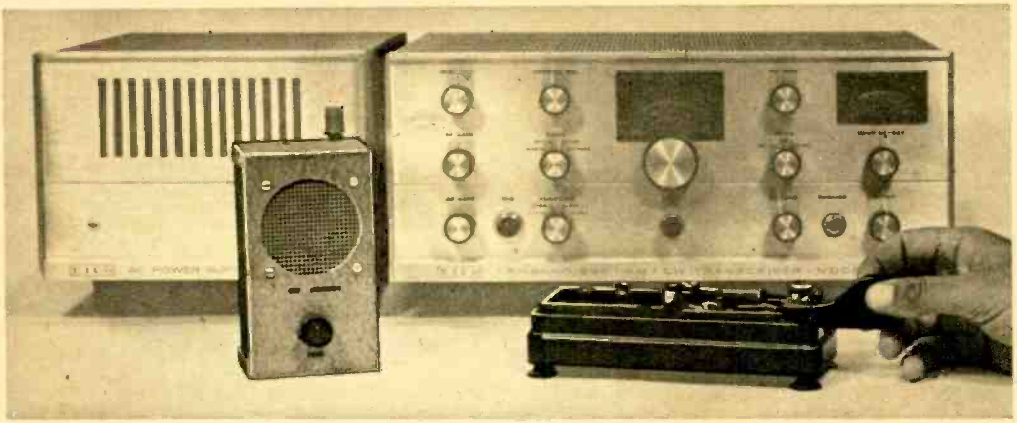
There's another factor that works against adequate warranty servicing. Service stations compete with each other for appointments as warranty repair centers because the apparent manufacturer's endorsement helps bring in non-warranty business. Manufacturers, with an eye to customer relations, try to get the best possible warranty stations. But, knowing the desirability to the station of that warranty appointment, they usually pay next to nothing for warranty work.

The result, naturally, is that the serviceman tends to push the warranty work to the back of the bench and concentrate first on the jobs that will give him a living wage—using warranty cases only to take up the slack or rushing them out when the backlog gets unbearable. So the original aim (taking care of new, in-warranty equipment) goes down the drain.

As things stand, until you, the reader and buyer, realize a few things the problems are likely to continue and even get worse. First, of course, you must be aware that practically any kind of failure you experience with a new product isn't a one-in-a-million case. Secondly, you have to let the manufacturer know directly about your troubles. (What you have to say is much more compelling than those anonymous reports from warranty stations which tend to hide basic problems under heaps of bookkeeping entries.) But, most important, you have to recognize, once and for all, that newness in an electronic product is not necessarily a virtue.

I don't mean that you should wait until a product's been around for a while before you buy it. The important thing in the long run—especially in a hobby industry where manufacturers often feel they *must* titillate you with something new, new, new—is to get to the point where you're not nearly as impressed with newness as with goodness. When the manufacturer knows you're at that point, things will change.

Until then, if you're really enraged by product breakdowns, consider a job in the audio servicing industry. If there's anything needed, it's knowledgeable people who get angry.



Wireless CW Monitor

By HERB FRIEDMAN, W2ZLF

IT doesn't take long to develop a good case of frustration when you send dozens of CW CQs and end up with only one or two replies. Reason for the poor response is that you probably have a bad fist. Few operators will reply to or even bother to listen to uneven dots, dashes and spaces.

Prime reason for a poor fist is that you don't have a keying monitor—a device which enables you to hear exactly what you're sending, not just the click-click sound of a key. Use a monitor and you'll have a swinging fist and may even sound like an old-timer in two or three weeks.

Is it difficult to connect a keying monitor? Not at all. Just use our Wireless CW Monitor and you'll have a no-connection installation because the rig is triggered by the transmitter's RF output. There is no direct connection to either your key or the transmitter. You set the monitor anywhere you please, run a wire lead near the transmitter or transmission line, and it's ready. Everytime you hit the key the monitor will produce a moderate-level tone.

How it Works. Take a look at the schematic. Transistors Q3 and Q4 form a feedback oscillator whose frequency is controlled by R2. When there is no RF signal being fed to binding post BP1, Q2 appears as a high impedance between the negative terminal of B1 and ground. This cuts off the supply of current to Q3 and Q4.

When RF is applied to BP1 it is rectified by D1, filtered by C1 and fed to Q1. Q1 conducts and causes Q2 to conduct. This connects B2's negative lead to ground through Q2. Each time RF is fed to BP1 the oscillator is keyed.

The model shown costs about $10 and will work with transmitters having an output power of 30 watts or more. Transmitters whose output power is less may require a sampling loop near the final amplifier.

Construction. The monitor is built on the main section of a 5¼ x 3 x 2⅛-in. Minibox. Most small parts go on a 1¾ x 2 in. piece of perforated board: flea clips may be used for tie points. Because a heavy RF field may block the oscillator, the subassembly must be installed in the cabinet as shown, with diode D1 as close as possible to BP1. (RF must be rectified and filtered before it gets loose inside the cabinet.)

Use the transistors specified or their direct equivalent. Do not substitute a general-replacement type for Q1 and Q2; if the internal leakage is high, the oscillator will stay on permanently. When soldering D1 and the transistors, use a heat sink, such as an alligator clip, on each lead.

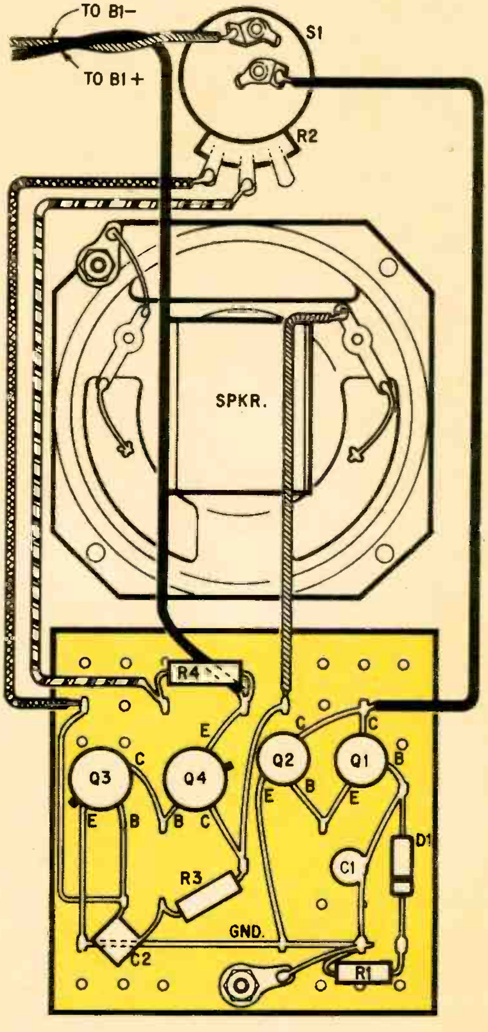
The circuit board is held to the cabinet with a single mounting screw. Since the underside of the perforated board faces the cabinet, put a ¼ in. spacer or stack of washers between the perforated board and the cabinet at the mounting screw. This will prevent the flea clips, which protrude through the perforated board. from shorting to the cabinet. The two penlight cells are held inside the cover by a dual battery holder.

Checkout. Open the negative battery lead and connect an 0-100 ma DC milliammeter in series. Apply power by turning R2. If the meter indicates reverse, swap the meter leads. If the meter indicates in excess of 100 ma quickly disconnect the power and look for a short. If you hear a slight tone in the speaker either D1 or a transistor has been damaged by excessive heat.

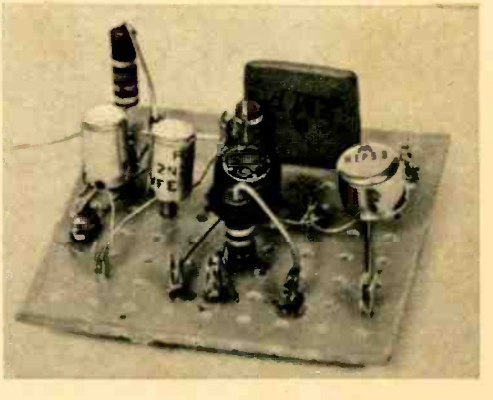
If the unit checks out, as indicated by no tone and a very low meter indication of about 0.5 to 1.5 ma check the oscillator. Temporarily connect (with clip leads) a 47,000-ohm resistor from Q1's collector to its base. If all is well you should get a tone in the speaker whose pitch can be changed by R2. Note that the best sound is between 500 and 1,500 cps. If R2 is set for too high pitched a tone the meter will indicate in excess of 60 ma. Try to avoid tone frequencies that require more than 60 ma. The best tone is produced between 30 and 50 ma. When everything checks out, disconnect the meter and close the cabinet *with screws.*

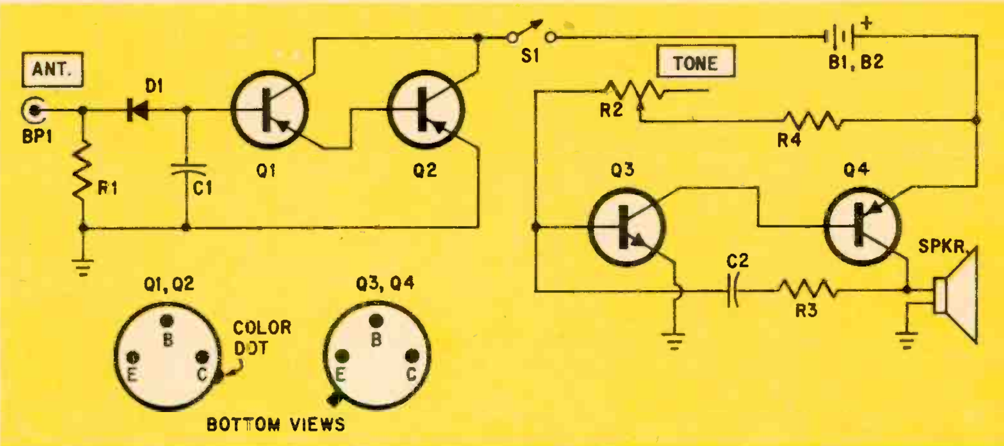
Using the CW Monitor. Connect about 15 in. of wire to BP1 and place the wire near your transmitter, transmission line or antenna tuner. At some point you will find an RF hot spot that will key the monitor when the transmitter is keyed. If necessary, you can use more than 15 in. of wire.

When the transmitter is keyed the monitor's tone should be absolutely clean. If it breaks out at a high pitch and rapidly drops in frequency during the first few code char-

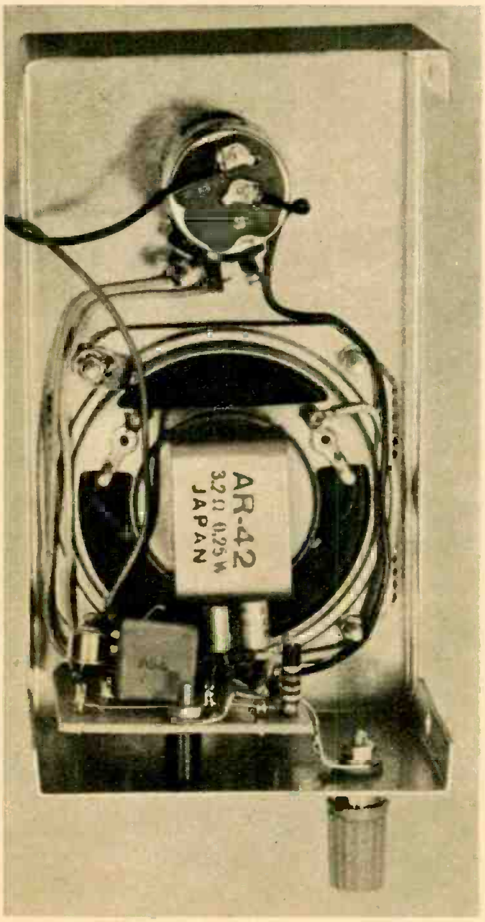


Mount all components on a 1¾ x 2-in. piece of perforated board where shown. Input from binding post connects to junction of D1 and R1. To avoid a parts jam, mount parts standing up as shown in photo below. Use flea clips for the tie points.





RF at BP1 is detected by D1, fed to base of Q1. Q1 conducts and causes Q2 to conduct. Q2 now becomes low-resistance path from negative end of B1 to ground, causing power to be fed to tone oscillator Q3,Q4.



Note very short lead from binding post to board, single mounting screw and standoff. Ground to case is made via solder lug under mounting nut.

acters, RF pickup is insufficient. Move the pickup wire slightly until you get a clean monitor tone on every code character.

Some transmitters are so well shielded and so perfectly matched to the antenna system that there are no RF hot spots in the room. If such is the case, slip the end of the *insulated* pickup wire into the transmitter cabinet through a ventilation hole.

If you can't find an RF hot spot in the room, and if you can't get pickup through a ventilation hole remove some of the coax's outer insulation and slip about 6 in. or less of the pickup wire under the shield.

PARTS LIST

- B1,B2—1.5 V penlite cell
- BP1—5-way binding post
- C1—.001 µf, 15 V or higher ceramic disc capacitor
- C2—.2 or .25 µf, 15 V or higher ceramic disc capacitor
- D1—1N60 diode
- Q1,Q2—2N2613 transistor (RCA)
- Q3—HEP-53 transistor (Motorola)
- Q4—GE-2 transistor (GE)
- R1—4,700 ohm, ½ watt, 10% resistor
- R2—50,000 ohm, linear-taper potentiometer
- R3—470 ohm, ½ watt, 10% resistor
- R4—22,000 ohm, ½ watt, 10% resistor
- S1—SPST switch (on R2)
- SPKR.—2¼ or 2½-in, 3.2-ohm speaker
- Keystone type 140 battery holder
- Misc.—5¼ x 3 x 2⅛-in. Minibox, perforated board, flea clips.

A set of parts, except those listed under *Misc.*, is available for $7.95 plus 50¢ for postage and insurance from Tridac Electronics Corp., P.O. Box 313, Aldon Manor Branch, Elmont, N.Y. 11003. N.Y. State residents add appropriate tax. No foreign orders.

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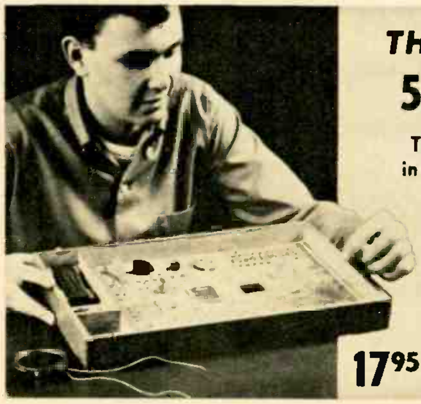

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CIRCLE NUMBER 38 ON PAGE 11

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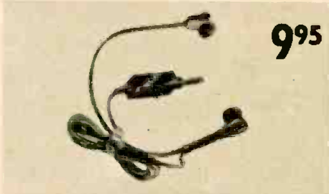

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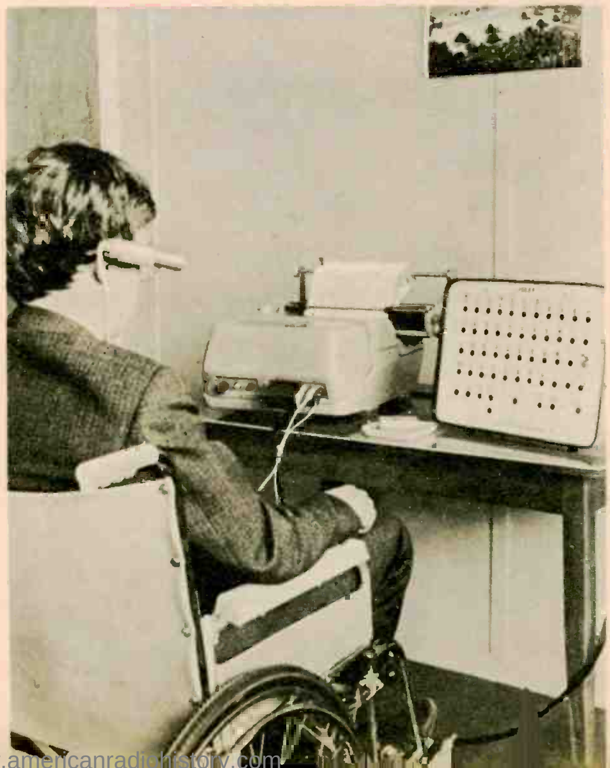
CIRCLE NUMBER 38 ON PAGE 11

MUSEUM PIECES. . . The 1927 TV tubes above are part of a collection given by Dr. Philo Farnsworth, pioneer of television invention, to the Smithsonian Institution. At top is the first oscilloscope tube with internal deflection plates. Below it (left to right): first image dissector, first projection oscilloscope, primitive image orthicon with electron multiplier, first flat oscilloscope.

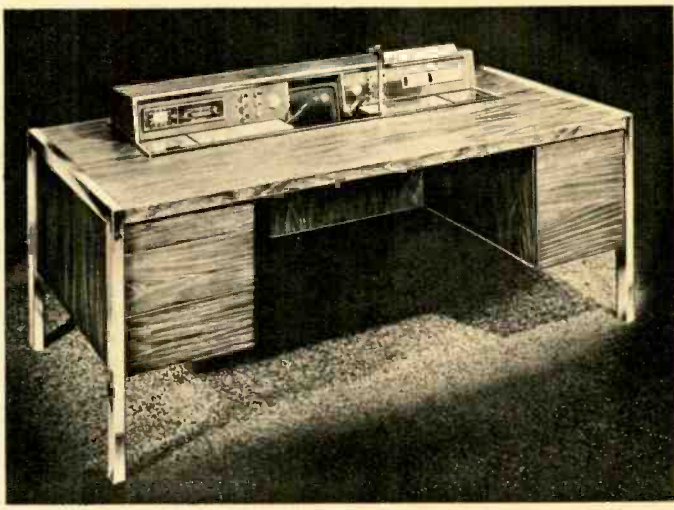
Electronics in the News

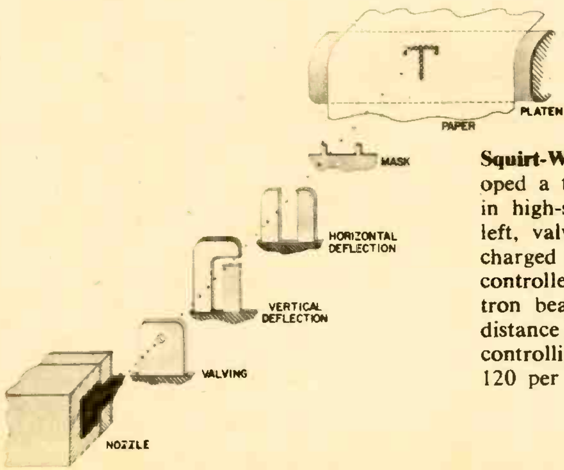
Look-Type Method. . . A way of controlling a typewriter by means of a beam of light has been developed in England to offer new capabilities to the handicapped. Light source is object attached to right side of patient's head. The bank of photocells next to the typewriter will respond to beam only if it remains on a single letter long enough to trip time-delay circuits, reducing errors from random motion as patient moves his head to aim beam. For patients familiar with typewriter, photocell bank is arranged like standard keyboard; for others it has most-used letters near the center to minimize head motion. Photocells may be ceiling-mounted for bedridden patients. Rolls (rather than sheets) of paper minimize assistance patient will require. System costs about $1,320 from Hugh Steeper, Ltd., London.



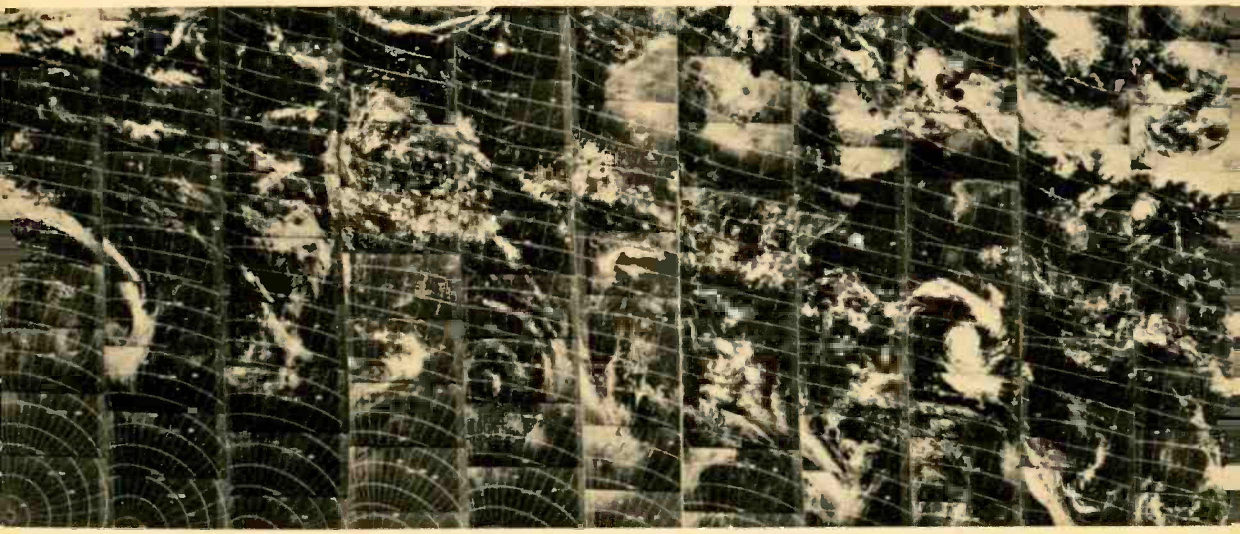
Miro-Light. . . Latest in the Would-You-Believe department is a lamp so small it can be held in a draftsman's ruling pen. As shown, it is 0.375 in. long and 0.15 in. in diameter; without base it is 0.325 in. long and 0.11 in. across. Its life-expectancy rating is also impressive: 40,000 hours. It is available from IEE, Van Nuys, Calif., in several voltage ratings.

Gadgets for Execs. . . The VIP Electronic Desk, they call it. And it should make you feel like an office baron even if it keeps you from getting any real work done. It has a built-in TV for broadcast reception and closed-circuit monitoring, an alarm clock that can be set to turn on the AM/FM radio, a removable cassette tape recorder, a high-intensity light and a digital calendar—all clustered around a master control panel. It's made by Interstate Industries of Chicago and costs $1,295. Oh yes—it also has a pen and pencil set.





Squirt-Writer. . . Teletype Corporation has developed a typewriter mechanism without type for use in high-speed data communications. In diagram at left, valving electrode passes squirts of negatively-charged ink from nozzle. Charged droplets are then controlled by deflection electrodes (much like electron beam in oscilloscope) to form letters. Actual distance from nozzle to paper is ⅝ in. Memory unit controlling deflection holds 64 characters, squirts out 120 per second.



WHAT HAVE SATELLITES DONE FOR WEATHER FORECASTING?

By J. K. LOCKE

FOR eight years now we've been hearing about weather satellites. The pictures they take—mostly showing huge white swirls and splotches that weathermen assure us are clouds as seen from space—are published in newspapers and magazines and shown on TV. But are weather forecasts any better than they used to be? Ask a random group of your friends and chances are they'll reply with a resounding *no*.

What has happened? We've spent hundreds of millions of dollars to design weather satellites, launch them and build the ground stations to collect the information they send back. But what do we have to show for it all?

To find out, I recently visited the National Environmental Satellite Center in Suitland, Md. (a suburb of Washington, D.C.), hub of our present weather satellite activity. I also talked to meteorologists, engineers, space authorities and other experts around the country.

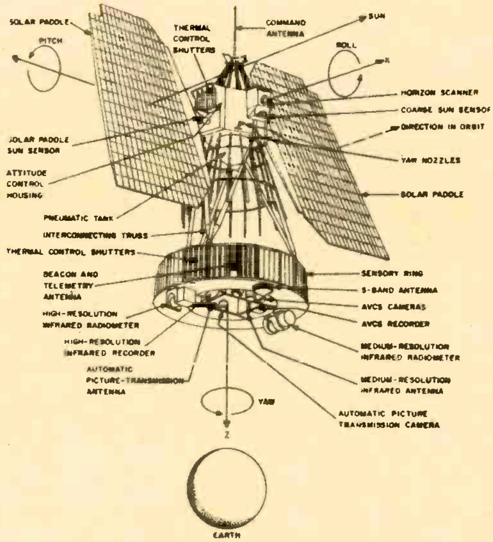
By their tally we've managed to get 18 weather birds into orbit since 1960—10 TIROS, 2 Nimbus, 6 ESSAs. More will be launched soon. From these orbiting picture-takers we've received millions of weather pictures. This monster photo album has accomplished three things:

- Improved weather forecasting tremendously in some parts of the world (doing relatively little, however, for much of the U.S.—more of that later).
- Taught weathermen a lot about the basic mechanism of weather.
- Helped space experts develop the hardware for a fantastic system (now in the planning stage) that will ultimately give us accurate forecasts for up to two weeks in advance.

You can't predict tomorrow's weather until you know what's happening today. Until satellites came along weathermen knew what was happening over only about five per cent of the earth's surface with any regularity.

That changed at dawn on the morning of April 1, 1960, when TIROS I rocketed into orbit from Cape Canaveral. TIROS was supposed to be strictly experimental. But within 48 hours excited weathermen were beginning to use its pictures in making up forecasts

Mosaic at left is pieced together from pictures of the world's entire surface photographed at the same hour (solar time) in one day by weather satellite in sun-synchronous, near-polar orbit on successive passes over daylight side of earth. Latitude and longitude are filled in by computer at receiving station, as are continental outlines (too fine to be seen here). Sands of North Africa and Arabia can be seen at top center. Most prominent storm center is over Indian Ocean. Most complex of weather satellites are Nimbus series (right). Nile is visible at left in detail of Nimbus daylight photograph of the area bordering the Red Sea (right, center). At night it uses infra-red sensors that can detect temperature difference between Gulf Stream and surrounding waters of Atlantic Ocean (bottom).

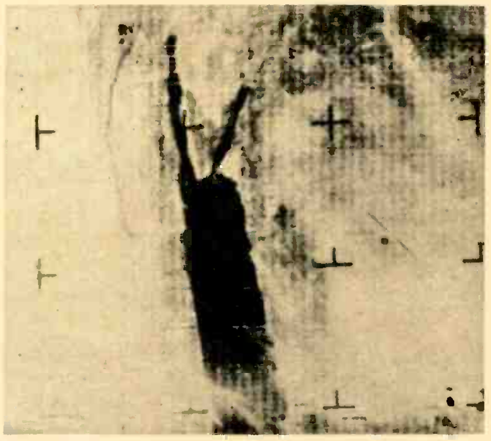


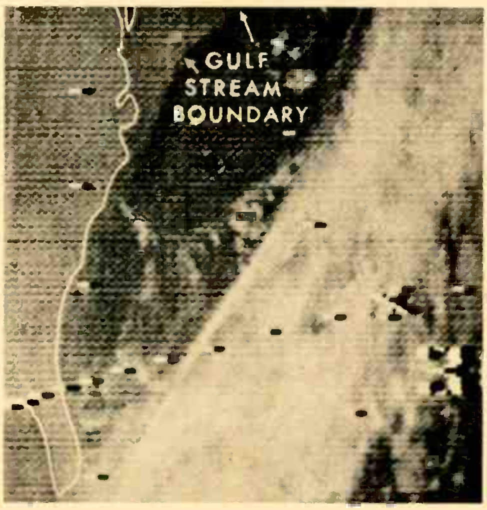
—particularly for regions, such as the Pacific Ocean, where there wasn't much other data. A TIROS satellite spotted Hurricane Carla in 1961, two days earlier than she would have been seen using regular methods. Based on satellite warnings, 350,000 people had time to evacuate in the largest operation of its kind in history.

NASA itself (which put up TIROS I and nine successors) began using the telemetered weather information almost immediately—and frequently in important ways. In August, 1965, for example, as Peter Conrad and Gordon Cooper were ready to end their historic eight-day mission, a special Weather Bureau unit checked TIROS pictures and found a tropical storm brewing in the splash-down area. So the mission was stopped one orbit early and the men landed in a safe area.

Despite such dramatic uses these space-traveling weather stations haven't made much difference in weather forecasting within the U.S. "A forecaster in Chicago or St. Louis," says Dr. Clifford A. Spohn, operations director of the National Enviromental Satellite Center (NESC), "is surrounded with conventional observations. But take the man in an island location—say Hawaii. We're suddenly giving him data when he had almost none."

Most of the helpful data so far has come from the TIROS satellite series. Despite the early success of the program, though, most experts were agreed by early 1960 that Tiros was much too unsophisticated a bird to be





a permanent part of the meteorological network. So work began on Nimbus.

The contrasts between TIROS and Nimbus are striking. TIROS spun like a top to keep itself stable in space. As it circled the globe its camera pointed at earth only about half the time and out into space the other half. Nimbus has a complex stabilization system to keep it pointing earthward. TIROS had a fairly simple picture-taking system; Nimbus has TV cameras, infra-red scanning equipment and a system called APT (Automatic Picture Transmission) that allows users anywhere in the world to get pictures of their own area directly from the orbiting bird.

To perform these wonders, Nimbus has to be far bigger (830-1300 lb. in various versions as compared to about 300 for TIROS) and more than twice as expensive. And the appearance is radically different. TIROS looks like a bass drum 4 ft. in diameter and studded with jewels (solar cells). Nimbus, with its two wings and cylindrical body, looks like a big-bottomed butterfly, 10-ft. tall.

By 1964 Nimbus was in orbit and weather men were jubilant. For one thing, it was in a polar orbit and photographed every square foot of the earth's surface twice a day. On the daylight side it used its regular vidicon camera as had TIROS. On the night side its infra-red scanners got pictures with almost as much detail.

But, despite the success of Nimbus, the Weather Bureau had already decided against it as a second-generation operational satellite even before its maiden voyage. There were several reasons for the paradoxical decision. First, the complexity of Nimbus made the chances of failure too great. Second, it cost too much. And third, the earlier TIROS had proved to be far better than anyone had anticipated.

Besides, some of the original problems with TIROS had been overcome. Take that business about pointing out into space half the time, for example. Spacecraft designers shifted the spin axis of TIROS IX by 90 degrees so the drum rolled along its orbit like a wheel rolling down a highway. The camera, on the curved outer surface of the wheel, points straight down once a revolution (about once every 6 sec.). It's simple to snap the shutter at that moment. Thus TIROS could take pictures continuously (as could Nimbus). The path of TIROS was changed, too, to a near-polar, sun-synchronized orbit. That means that the orbit was calculated so that the satellite always passes overhead at the same local time—say 9:00 a.m.—everywhere

on the sunlit side of the globe.

With these changes made, weathermen decided that the system was no longer experimental. In January, 1966, after ten consecutive successful TIROS shots, the meteorological satellite program became operational. Control and data acquisition were transferred from NASA to NESC. The new bird launched that month, which would have been TIROS XI, became ESSA 1 for the Environmental Sciences Service Administration, the division of the Commerce Department that contains both the Weather Bureau and NESC.

The ESSA satellites, of which there are now five flying, are of two basic types. One is a stored-data bird. It snaps pictures all through an orbit, putting them on tape as it goes; on command, it plays back the 12 photos it has recorded. The other is APT. It takes a picture every six minutes, transmitting it to the ground immediately. Anybody who wants to tune in, can.

The stored-data satellite transmits its data to ground stations in Wallops Island, Va., and Gilmore Creek, Alaska. I was on hand when a relay from Gilmore Creek was to be received at NESC headquarters.

When Dr. Spohn and I entered the control center a technician was checking the line to Alaska. Green waveforms danced on oscilloscopes. Tape transport mechanisms stood ready to record data and send commands. Elsewhere around the large, low-ceilinged room stood facsimile transmitters grinding out pictures to weathermen across the country. And lining the walls were the computers —small ones for routine chores, a Control Data 6600 for the main data-handling job.

The pass itself had all the excitement of the morning milk delivery. The tape transports turned. The waveforms on the oscilloscopes changed. The technicians made occasional adjustments of the equipment.

What was really going on, Dr. Spohn explained, was considerably more interesting. Some 3,000 miles northwest of where we stood in Maryland, the satellite came rolling up over the Alaskan horizon. A signal shot from the 85-ft. dish at Gilmore Creek, asking the bird what was new. The satellite examined itself, checked temperatures at various critical points, power levels of the batteries, the positions of all switches. Then, in a few seconds of furious telemetry, it spewed out more than 80 specific pieces of information. The signals entered the dish in Alaska and were piped directly to headquarters in Suitland. There, a pen traced out a series of peaks on a roll of moving paper, a tape recorder captured the same information in magnetic form and a computer began analyzing the data and printing out a report of the bird's health and current operating conditions.

Weather Bureau office at Kennedy International Airport receives photos directly from APT (Automatic Picture Transmission) satellite on facsimile printer (far left). Separate shots are then pieced together to make a comprehensive picture of weather over Atlantic Ocean (center) and, with analytic notations, given to pilots heading overseas (this page). Information on weather at sea was almost non-existent before the program began.

WHAT HAVE SATELLITES DONE FOR WEATHER FORECASTING?

Then the orbiting picture-taker got down to business. Within two minutes, it played back the 12 stored pictures from its tape. Finally, for the remaining six minutes of contact with the antenna, Maryland control sent its commands. ESSA was told how many pictures to take and where to take them on the next orbit.

The satellite keeps track of time and its location by counting its own spins. Each time it rotates, earth sensors notify the computer aboard and it ticks off one more revolution. Obviously, precision of the spin rate is critical. Ground control computes the exact area covered in each picture by knowing exactly what spin it was taken on. The system is so accurate that when the pictures show landmarks (such as islands or continents) they're invariably within a half degree of latitude or longitude of where the computer says they should be.

To keep the spin rates accurate (5.5 to 6.5 seconds per revolution, depending on function), ground control adjusts both spin and attitude every day. Three coils are built into the satellite, one oriented along each of its three axes. When the proper switches are closed by command from the ground the coils, spinning in the earth's magnetic field, act like a DC motor and produce torque to readjust the satellite's motion. Without correction, the spin rate would be a fraction of a second slower each day.

While all the chit-chat between ground control and satellite was going on, Dr. Spohn explained that after the run the taped data are played back to make pictures. The picture strips are developed and added to those that came in previously to build up a portrait of the entire earth.

As the pictures accumulate, analysts pore over them to spot storms. When they find one, they immediately send storm warnings (hundreds of them each year) to all countries that may be affected. Then the pictures go to the National Meteorological Center in the building next door. There experts analyze them, add information they derive from the photos and send out complete analyses of world weather patterns to forecasters and weather bureaus around the globe.

ATP satellites are used differently. Anybody who wants an instant picture of the weather for several thousand miles in all directions can tune in as the APT passes overhead. ATP was designed so that its signal can be picked up on relatively cheap, simple equipment. One company now sells a complete setup (antenna, receiver and facsimile printer) for $6,000. Many amateurs have put together their own. One ham used an old TV set, slightly modified, as the receiver. He built his own facsimile printer around a motorized rolling pin. For some of the contents of his junk box plus about $30 in cash he gets a fairly good picture. (By the way, if you write to NESC they will send basic instructions on the kind of system it takes.)

NESC knows of at least 200 stations that tune in on APT transmissions. There undoubtedly are more. Weather-Bureau and military forecasters use it widely. So do at least 42 known foreign governments. Universities have rigs. The weather forecasters at Kennedy Airport give pilots bound overseas complete pictures of the weather ahead, directly from the APT. And TV stations in many U.S. cities use APT daily to bring their audiences bird's-eye views of the weather.

More important in the long run, though, is another product of the weather satellite program—a better understanding of the basic mechanism of the weather itself. "For example, we notice a curious clear band associated with cold fronts that we didn't know was there," says Dr. Spohn. "When we figure out why it's there, we'll know a good bit more about the flow pattern that produces it. And that will lead to a greater overall understanding of a storm of this sort." Scientists have also discovered strange parallel lines of clouds along each side of the equator, peculiar doughnut-shaped clouds, and other mysterious phenomena.

"We're like a fisherman who has a net with holes of a certain size," says Dr. Spohn. "As far as he is concerned, the smallest fish in the sea are the ones that are bigger than the holes in his net. But when he gets a net with a finer mesh, all of a sudden he's got a lot of new fish that he has to explain. We've got a lot of new weather phenomena. When we explain them we'll know a lot more about weather than we do now."

Scientists are now working on new ways to get far more information from our orbiting weather stations. For example, a Nimbus scheduled to fly soon will have facilities for sampling infra-red energy at various wavelengths. (Nimbus satellites are now used for developing experimental equipment and techniques.) If the experiment works, weathermen will be able to determine air temperature at a number of different levels in the atmosphere.

One of the most dramatic advances came with the launching of ATS (Advanced Technology Satellite), a vehicle designed to carry a number of experiments including some in the weather field. With this synchronous satellite on station over a single spot in the Pacific, NASA controllers had it snap a picture every 20 minutes. At NESC, the individual pictures were put together into a movie. "Talk about understanding the atmosphere!" says Dr. Spohn. "You actually see the weather developing before your eyes. We're seeing things we just never knew happened."

More recently, ATS 3 turned in a spectacular advance by increasing the rate at which pictures can be taken and by producing the first weather pictures in color. ATS 3 is positioned farther east so it can keep an eye on hurricane spawning grounds in the Caribbean, providing an early warning system and more basic research on the way weather forms and how it can be evaluated.

Today's scientists are designing buoys they hope to spot around the ocean to read surface winds, temperatures, humidity, and other factors. Satellites would pick up the information and relay it to forecasting centers.

Investigators from the National Center for Atmospheric Research in Boulder, Colorado, have been sending constant-altitude balloons into the sky for a year, testing a technique they hope will furnish (via satellite) still more data on wind direction and velocity, temperature, pressure and other variables.

By the mid-1970s, if present plans work out, the real payoff of the entire system should begin to appear. Synchronous satellites 23,000 miles up will snap pictures and collect and relay information from thousands of balloons, buoys and automatic weather stations. Polar-orbiting satellites will view the poles (not visible from the synchronous birds) and may also peer into the various layers of the atmosphere to collect still more data through their infra-red eyes. Huge computers, far larger than any now available, will digest these mountains of information and pour out their forecasts.

"When these elements come together in a final operational system," says David S. Johnson, director of NESC, "we'll see a very significant improvement in weather forecasting. We expect to be able to forecast the weather 10 to 14 days in advance with the same accuracy we are achieving with our present 24-hour forecasts."

When that happens, if the weatherman tells you it will rain tomorrow you'd better believe it.

Good Reading

Continued from page 60

lowing. Richard Dorf, who runs the Schober Organ Company, is probably the most articulate expert on the theory and practice of the instrument. I seriously doubt there will be a more thorough treatment than this one. By the way, don't confuse electronic instruments with electrified ones. This book is strictly about electronic organs.

And Make Note Of . . .

WIRELESS WORLD GUIDE TO BROADCASTING STATIONS. Gilfer Associates, Park Ridge, N.J. 136 pages. $1.95

101 WAYS TO USE YOUR SQUARE WAVE AND PULSE GENERATORS. By Robert G. Middleton. Howard Sams, New York, Indianapolis. 160 pages. $2.95

The Listener

Continued from page 58

14500 kc down to 100 kc. The transmitter is activated by ground command and then turns itself off 13 minutes later. The sounder is on the air four or five hours a day.

Your best bet for logging Alouette II (operated by the Canadian Defence Research Telecommunications Establishment in Ottawa) is, of course, on 14500 kc where its signals most often will penetrate to the earth. An ionospheric sounder makes a swishing sound as it passes over the frequency but you will have to be careful because several other sounders also sample 14500. Pulses from Alouette II will appear on the channel once every 30 seconds. Reception always will be brief—never more than 13 minutes.

A Career In Airline Electronics

Continued from page 70

Other airlines that have indicated they would consider a likely applicant without an FCC license are Northwest and Continental. They have no formal programs at present and judge each case on its own merits. But as Phil Leach, Northwest's District Manager of Maintenance at Kennedy International Airport, says: "The feeling in general among airline officials is that within the next four or five years there won't be any avionics technicians on tap unless we start doing something about the problem now."

Just what they may have to do was voiced by E.H. Brown, American Airlines Manager of Electrical Equipment at La Guardia Airport in New York: "The airlines may have to set up training programs for avionics technicians similar to those they already have for pilots and stewardesses. As a fact of life, airlines will have to be prepared to train men who may then go out and look for better-paying jobs. But training programs are necessary if the airlines are going to get the needed personnel."

There are two categories of avionics technicians. Line technicians do routine checks on all arriving aircraft and perform minor repairs or adjustments to equipment. If a piece of gear can't be repaired on the aircraft they replace the defective unit and send it to the radio shop. This is where testing, calibration and extensive repairs are carried out.

The most extensive radio shops are located at airline overhaul bases such as that of Trans World Airlines in a former cornfield outside Kansas City, Mo. Since airlines' equipment and maintenance practices are similar, a facility like this can trade off overflow work with those belonging to other lines. Here, the giant jets periodically are brought in and stripped of every piece of equipment from seats to the most complex navigational gear. Each unit is rebuilt completely. With over 6,000 items, the men naturally become specialized. Prime area of interest is the navigational field.

About 30 hams work at the TWA base. Several we spoke to indicated how valuable their hobby had been as a foundation for their careers. But you don't need to be a ham to consider this kind electronics work with an airline. All you need is the aptitude and an eye to the future.

And fly.

If you have the skills (or even just the aptitude), we have the opportunity. An opportunity for you to turn a talent for electronics into a career in aviation navigation and communications equipment maintenance. And move up fast in a fast-moving industry.

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Continued from page 51

This reminds me of one hilarious (to Beason and myself) incident in connection with that supposedly secret government organization. According to a lot of people who seem to know what they are talking about, including the authors of a book on the CIA, the Rolex wristwatch is supposed to be some kind of secret identification amulet for CIA agents. Rolexes are quite expensive and seldom seen but *two* of the half-dozen RA engineers we got close to were wearing them. That's quite an average for such a small population. Furthermore, *I* happened to be wearing one at the time and on two occasions I turned my head sharply and found the same chap staring intently at my watch.

Life on Swan Island can be quite attractive if you are not easily bored, want to stash away some money and don't mind a monastic life. The place is as quiet and removed from the cares of the workaday world as some Himalayan palace. There's no rush-hour traffic, no crime, no police, no TV, no door-to-door salesmen, no telephone company. There also are no women (except for the wives of two laborers). All Swan offers is plenty of good beaches, surf and deep-sea fishing, skin diving, short work hours with minimum pressure and recreation facilities which include a bar for the RA crew (called the Iggy Club for the iguanas on the island), a pool table, card tables, regular movies, plenty of sunbathing and even a player piano (currently out of service).

A little PX-like company store peddles everything from Baby Ruth candy bars to name-brand liquors at fantastically low prices (would you believe Johnny Walker Red Label for $2.20).

And the Iggy Club is not all. Swan probably sets some kind of world record, saloon-wise, because there is yet another bar on the island, making one joint for every 20 residents. The second bar is called the Swan Island Playboy Club and is located on the federal compound, which is another clearing with a fence around it that lies a bit more than a quarter of a mile from the RA digs. The Playboy is done up in the true island manner, the walls and roof being palm thatch as put together by Caymanian laborers. The latest records blast forth from the club's phonograph and slightly mildewed Playmate pictures adorn the walls. Both bars are open 24 hours a day and are run on the honor system. You help yourself and drop a quarter in a can.

Which brings us to the most popular sport of all on Swan Island. Drinking, it is called. When work is done there is not a whole lot else to do for a bunch of men who tend to be gregarious, happy-go-lucky types. It is not that the island is populated by a bunch of drunks. Far from it. All no doubt drink in moderation, but with enough consistency that a rattlesnake would die of frustration on the island.

There is another possible pursuit. That would be going stark, raving mad. As the army found out on Pacific islands in World War II, it takes an unusual man to adapt to a life of the same boring weather and the same boring scenery and the same boring faces day after day.

The weather is typically tropic. Our day on Swan (Feb. 7) was in the middle of a cool snap and the temperature got up only to 80°. Usually it hits 85° to 87°. During the course of a whole year the lows almost never drop below 70° and the hottest summer day seldom shows 90°, partly because of constant southwesterly winds which, besides cooling the island, help keep mosquitoes away.

One last recreation is offered by the presence of a complete Collins ham station in an old panel truck parked on the RA compound. Hams from both compounds operate the station any time they desire—and have never been known to fail to get answers on a CQ call. KS4 cards are so rare that one call usually creates a six-deep pile-up.

We had heard that RA personnel and the people from the government compound did not mix but found quite the opposite to be true. Although each outfit has separate buildings the island population seemed to be a large and happy family. In fact, it sometimes is hard to tell which people work where.

Of the two compounds, the federal one is the better looking, having freshly painted white concrete block buildings arranged neatly around a well-manicured hunk of lawn, and it also is thinly populated in comparison with Radio Americas. The FAA staff consists of exactly one man, a nice chap by the name of Carr. The Weather Bureau staff consists of four people, and then there are a couple of laborers around.

The federal people normally do Swan tours of two to six months and then are sent to some other station. But Radio Americas people have no definite rotation and some have been on Swan as much as two years. Surprisingly, requests for second tours are not at all unusual.

Radio Americas does not have its own direct radio communications to headquarters in Miami. If an emergency arises they use the FAA's teletype facility. Indeed, while we were in the area the FAA's two-way voice equipment was used to contact the motor vessel Daydream, which calls at the island every couple of weeks with RA supplies that cannot be flown in.

These favors are reciprocated by RA's permitting licensed Weather Bureau and FAA people to use their ham station.

Curiously, while Radio Americas has no FCC license to operate its 50,000-watt broadcast transmitter and 5,000-watt short-wave rig from this little patch of U.S. territory, the ham station is licensed and so are all of its operators. We were told that an FCC broadcast operator's license is not a requirement for getting a technician's job at RA.

After returning northward we contacted the FCC and asked how this monster-size station could operate on American land without a license. Three days later the lad in Washington said there was nothing in the files on the subject, which did not surprise us. Once upon a time that question, asked on the phone, was answered by a man who said, "Government stations don't have to be licensed—no, forget I said that!"

As the day drew on we got to take a motor tour around the perimeter of Swan Island, with most of the trip requiring the vehicle to be driven with the four-wheel drive in low range to plow through the dense foliage. There were parts of the island which were so overgrown that all attempts to cut a road through had failed.

Among the exotic sights along the way were the remains of the United Fruit radio towers, now lying twisted and broken in skeleton-like sections along the beaches.

At the northeast corner of Swan lies Short Cove, a narrow inlet from the sea where a white foamy surf continuously rages. This is the nesting area for the island's booby bird population and is a dandy spot for picking up the ingredients for a big egg breakfast (the man-of-war birds nest only on Little Swan, boobies only on the larger island.)

When it came time to leave late in the

afternoon, one of the Honduran workers from RA asked if he could return to Cayman with us to get some emergency dental work done. He wanted to bring his wife, his brother and two small children along. If he went by boat it would mean a 48-hour sea trip to Cayman after it left Swan. When we agreed to take him we were surprised to learn that many of the people on Swan seemed to have something or other for us to take back.

The result was that before we could take off we stood by and watched our plane loaded with an endless stream of boxes, bags, and crates. Someone even sent along a big batch of frozen wahoo fish, which gave more than a little consternation to the customs inspector on Grand Cayman, who looked with some suspicion on our whole trip to begin with. Leaving with three people in a chartered airliner to mysterious Swan Island was bad enough, but to return that same day with extra passengers, two babies and crates of dubious content, topped off with a bunch of frozen fish, no doubt confirmed his suspicions about what was going on at Swan.

Our suspicions, at any rate, were confirmed. That's where it's happening. If the station we saw on Swan Island *isn't* Radio Americas then someone went to a heck of a lot of trouble just to put us on.

Although no new evidence was obtained (or sought) as to CIA ties, neither did we have reason to alter previous concepts of the station's ownership, motives or financing. Many questions remain unanswered but the biggest one, the one which has caused the most controversy, can be put to rest.

EI was honored at being the first and only publication permitted on Swan and we are grateful to those Radio Americas, Weather Bureau and FAA people who made the visit possible, informative—and enjoyable.

For the benefit of DXers, Radio Americas reception reports should be addressed to 6123 SW 68th St., South Miami, Fla. 33143 (for Swan). The notation after the zip number assures a fast relay to the island from headquarters. RA is an excellent verifier, by the way. The FAA beacon on 407 kc can be picked up in a good part of the States. The ID is *SWA* in Morse, sometimes sent with a short space between the W and A. As is usual with federal stations, this one will verify if you make out the card for them to sign. The address is Box 2014, AMF Branch, Miami, Fla. 33159 (for Swan).

CB Band Scanner

Continued from page 68

holes; two holes for J1 and J2, the line-cord hole and a hole for the motor's leads.

Mount the power transformer, power switch, sweep switch, the line cord and the pilot light. Solder a 1/8 in. I.D. x 1/4 in. O.D. bushing on the motor shaft.

Remove the sweep switch and bracket from the cabinet. Solder the 21 10,000-ohm resistors to the front deck (S3B) of the switch as shown in the pictorial. Carefully solder the 22 wires from the display lights to the rear deck (S3A). Before mounting the rotary switch, put a 1/4 in. dia. x 3/4-in. long coupler on the shaft.

Build the power supply/voltage regulator on a 3 x 2¾ in. piece of perforated phenolic board and mount it with two spade lugs. Install J1 and J2 and finish the wiring.

The last step is the plug-in RF sweep module, which is built on a 1⅜ x 9/16 x 1/16-in. thick piece of plexiglass as shown in Figs. 4 and 5. Drill very small holes for the component leads and 1/4 in. dia. hole for L1.

The form for L1 comes with fiber collars and mounting lugs on each end. Remove the collars by bending gently until the cement breaks. Close-wind 11 turns of No. 26 enameled wire on one end of the form and coat with coil dope. Mount the other end of the coil form in the plexiglass and cement it in place. The two pins are cut from No. 19 finishing nails and are cemented in place. Cut off the shield in the shielded wire from PL1 at the RF module.

Alignment. Remove all the crystals from the HE-210A transceiver and plug in the RF sweep module where shown in Fig. 2. Feed 9-V power from jack J1 to the external power jack on the HE-210A. Switch the HE-210A's channel-selector switch to *C*. Turn on the Sweeper and transceiver. Allow the Sweeper to run until it reaches channel 11 then turn the sweep off. Adjust R4 so that there is 6.3 V between its wiper and ground. Set up a transceiver to transmit on channel 11. (You'll find the correct alignment point more easily if the transmitter is tone modulated—whistle or sing into your mike.) Insert a plastic alignment tool in L1 and slowly turn the slug while listening for the signal from the transmitter. The signal will be picked at two positions of the slug. Only the first one (slug almost entirely out of the winding in our coil) is the correct one. Alignment is now complete. Put a drop of wax into L1's form to keep the slug from moving.

A Transceiver for Novices

Continued from page 77

scale. (A front-panel control permits you to set the input power level.) We found the average output power into a 50-ohm load with 90-watt input power was 60 watts.

The rig consists of three sections: the receiver is assembled on a printed-circuit board with a wide-open layout. There were no assembly problems. The transmitter is wired on a well-shielded chassis and the power supply occupies the remaining space. Extreme care is required when soldering around RF chokes. The chokes are close to connections which require extra soldering heat. A slip of the iron will mean a new RF choke.

Alignment is not difficult but you must do it carefully to prevent leakage from the transmitter oscillator when you are in the receive mode. A good alignment job results in no leakage. (A small amount of leakage is provided when the key is closed to allow you to spot your operating frequency.)

The only alignment difficulty we had was during neutralization of the transmitter's final. Several components must be disconnected and things can be messy if you've installed the parts too firmly. Best bet is to read ahead in the manual and lightly solder those parts which later will be disconnected. After neutralization the parts can be soldered.

Construction time for our man, a beginner, was 20 hours, with another two hours for alignment. The manual doesn't suggest you use a signal generator for receiver alignment—it recommends you align with a tuned-in station. But a lot of worry and cursing are avoided if you use a generator.

The HW-16 is one of the greatest values and most imaginative ham products to come down the pike in years. You can't beat it as a starter to complement a Novice ticket.

Antenna Terminal Sensitivity For 1.5-mw Output Into a 4-ohm Speaker									
Freq. (mc)	3.5	3.6	3.7	7.0	7.1	7.2	21.0	21.1	21.2
Sens. (μv)	.32	.21	.22	.22	.18	.18	.32	.22	.25

Guide to Unknown Transformers

Continued from page 57

black). With the filament transformer plugged in, turn the pot so you read 1 VAC at the power transformer primary. After this adjustment, shift the meter to the secondary and measure the voltage. The reading quickly provides secondary voltage with an easy mental calculation: move the decimal two places to the right. For example, we measured 2.4 VAC at a secondary so the winding's actual value is about 240 V.

This system does not work for precise measurement of filament voltages since 1 V on the primary barely produces a reading at the filament secondary. But you can use it to isolate, and temporarily tape up, dangerous high-voltage secondaries. Then it's safe to plug the primary into 117 VAC and check actual filament voltages with a meter.

Power Ratings. Without the manufacturer's specs, you'll have to use some crude (but surprisingly effective) guesswork on how much power you can draw from the transformer. Begin by checking the transformer section in an electronic parts catalog. Find the transformers that most closely resemble yours in terms of voltage ratings and number of windings. After you've narrowed it down to a few model numbers, compare physical dimensions and, if possible, the weight. The ampere values in the catalogs for a similar-size transformer will probably be very close to your unknown unit.

Then there's the brute-force method, based on the heat given off by the operating transformer. After running it in a circuit, cautiously touch the case with your fingers. If you can say "Anaheim, Azusa and Cucamonga" before removing your hand, chances are the transformer is within its rating. If it sizzles or fumes, you're not even close.

Impedance. Direct measurement of an audio transformer's impedance requires elaborate equipment. But here's a method that tells the impedance of one winding if you known the other, based on the fact that the impedance ratio in an ideal transformer equals the square of its turns ratio. You can determine the turns ratio with the test setup of Fig. 4. The pot, however, should be a 1,000-ohm wirewound.

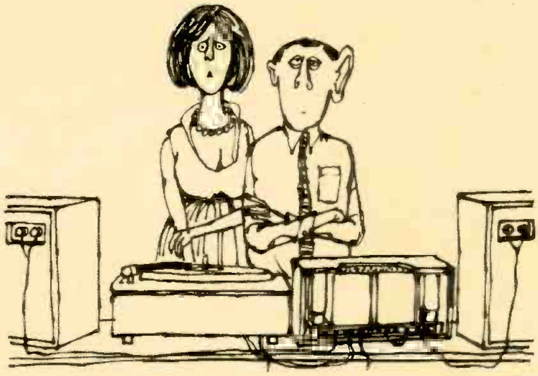
Let's say you have a small transistor audio

[*Continued on page* 119]

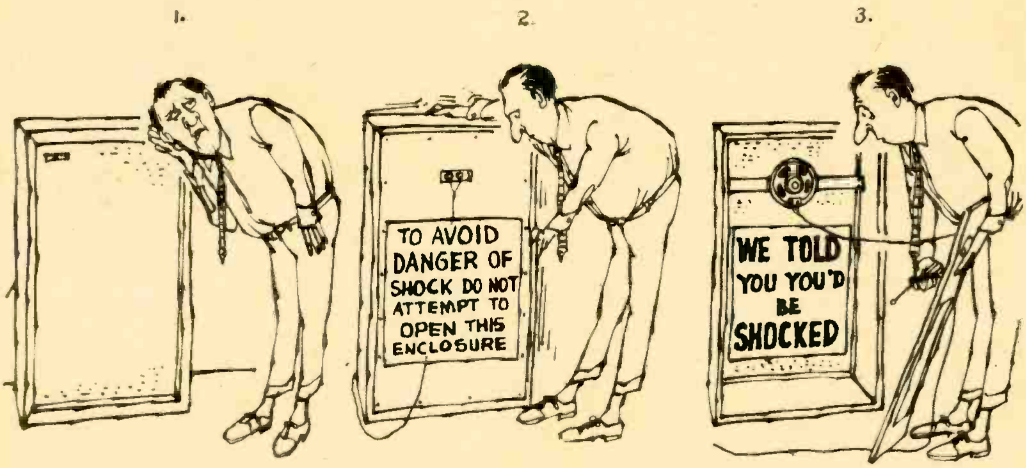
Over and Out

rodrigues

". . . but he can't stand her high notes."



"The stereo doesn't sound balanced to me."



output transformer and measure less than 1 ohm across one winding. This almost always is the voice coil, or secondary winding. With your test set-up, apply exactly 1 VAC to that winding, using the pot and a meter for adjustment. Shift the meter leads and measure the voltage at the primary, or other winding. We'll assume it measures 3.5 VAC, as shown in Fig. 5. Multiply this voltage by itself: 3.5×3.5, or 12.25. Now multiply this by the impedance marked on the secondary or speaker side. If it's still in a circuit use the speaker impedance. If it is 10 ohms, you would get 10×12.25, or 122.5 ohms as the impedance of the primary.

It's often possible to operate the same transformer at a different impedance. If you want to use a 4-ohm speaker, just substitute 4 for 10 in the problem above to determine the effective (reflected) impedance of the primary with the new speaker. Output transformers for tube equipment have primary impedances running from about 1,000 to about 8,000 ohms, but the method is the same.

Automatic FM Radio

Continued from page 91

How It Works. Take a look at the schematic which starts at Fig. 4 and continues in Figs. 6 and 7. Signals from the antenna are tuned by T1 and varactor diode D1. Potentiometer R9 varies the voltage to D1 and another varactor diode, D2, which tunes local oscillator V1B. Oscillator V1B is tuned 10.7 mc *above* the incoming signal's frequency; its output is coupled to mixer V1A's grid by the small capacitance of the gimmick capacitor (3 turns of insulated hookup wire).

Zener diode D3 regulates the voltage to R9 and subsequently D1 and D2. The resultant 10.7-mc IF signal at the plate of V1A is fed to T2 and amplified by IF amplifiers V2 and V3. Remote volume control R14 controls the gain of V2.

The ratio-detector circuit consists of D4, D5, T4 and other components. The detector's audio output is fed to tuner output jack J1 and master volume control R24. The audio is amplified by V4A, V4B and is coupled via T5 to the speaker. The B+ and tube heater power are supplied by T6, D6, L2 and C33A,B.

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Absolutely no previous knowledge of radio or science is required. The "Edu-Kit" is the product of many years of teaching and engineering experience. The "Edu-Kit" will provide you with a basic education in Electronics and Radio, worth many times the low price you pay. The Signal Tracer alone is worth more than the price of the kit.

THE KIT FOR EVERYONE

You do not need the slightest background in radio or science. Whether you are interested in Radio & Electronics because you want an interesting hobby, a well paying business or a job with a future, you will find the "Edu-Kit" a worth-while investment. Many thousands of individuals of all ages and backgrounds have successfully used the "Edu-Kit" in more than 79 countries of the world. The "Edu-Kit" has been carefully designed, step by step, so that you cannot make a mistake. The "Edu-Kit" allows you to teach yourself at your own rate. No instructor is necessary.

PROGRESSIVE TEACHING METHOD

The Progressive Radio "Edu-Kit" is the foremost educational radio kit in the world, and is universally accepted as the standard in the field of electronics training. The "Edu-Kit" uses the modern educational principle of "Learn by Doing." Therefore you construct, learn schematics, study theory, practice trouble shooting—all in a closely integrated program designed to provide an easily-learned, thorough and interesting background in radio.

You begin by examining the various radio parts of the "Edu-Kit." You then learn the function, theory and wiring of these parts. Then you build a simple radio. With this first set you will enjoy listening to regular broadcast stations, learn theory, practice testing and trouble shooting. Then you build a more advanced radio, learn more advanced theory and techniques. Gradually, in a progressive manner, and at your own rate, you will find yourself constructing more advanced multi-tube radio circuits, and doing work like a professional Radio Technician.

Included in the "Edu-Kit" course are Receiver, Transmitter, Code Oscillator, Signal Tracer, Square Wave Generator and Signal Injector Circuits. These are not unprofessional "breadboard" experiments, but genuine radio circuits, constructed by means of professional wiring and soldering on metal chassis, plus the new method of radio construction known as "Printed Circuitry." These circuits operate on your regular AC or DC house current.

THE "EDU-KIT" IS COMPLETE

You will receive all parts and instructions necessary to build twenty different radio and electronics circuits, each guaranteed to operate. Our Kits contain tubes, tube sockets, variable, electrolytic, mica, ceramic and paper dielectric condensers, resistors, tie strips, hardware, tubing, punched metal chassis, Instruction Manuals, hook-up wire, solder, selenium rectifiers, coils, volume controls and switches, etc.

In addition, you receive Printed Circuit materials, including Printed Circuit chassis, special tube sockets, hardware and instructions. You also receive a useful set of tools, a professional electric soldering iron, and a self-powered Dynamic Radio and Electronics Tester. The "Edu-Kit" also includes Code Instructions and the Progressive Code Oscillator, in addition to F.C.C. Radio Amateur License training. You will also receive lessons for servicing with the Progressive Signal Tracer and the Progressive Signal Injector, a High Fidelity Guide and a Quiz Book. You receive Membership in Radio-TV Club, Free Consultation Service, Certificate of Merit and Discount Privileges. You receive all parts, tools, instructions, etc. Everything is yours to keep.

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- SOLDERING IRON
- ELECTRONICS TESTER
- PLIERS-CUTTERS
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- CERTIFICATE OF MERIT
- TESTER INSTRUCTION MANUAL
- HIGH FIDELITY GUIDE • QUIZZES
- TELEVISION BOOK • RADIO TROUBLE-SHOOTING BOOK
- MEMBERSHIP IN RADIO-TV CLUB: CONSULTATION SERVICE • F.C.C. AMATEUR LICENSE TRAINING
- PRINTED CIRCUITRY

SERVICING LESSONS

You will learn trouble shooting and servicing in a progressive manner. You will practice repairs on the sets that you construct. You will learn symptoms and causes of trouble in home, portable and car radios. You will learn how to use the professional Signal Tracer, the unique Signal Injector and the dynamic Radio & Electronics Tester. While you are learning in this practical way, you will be able to do many a repair job for your friends and neighbors, and charge fees which will far exceed the price of the "Edu-Kit." Our Consultation Service will help you with any technical problems you may have.

FROM OUR MAIL BAG

J. Stataitis, of 25 Poplar Pl., Waterbury, Conn., writes: "I have repaired several sets for my friends, and made money. The "Edu-Kit" paid for itself. I was ready to spend $240 for a Course, but I found your ad and sent for your Kit."

Ben Valerio, P. O. Box 21, Magna, Utah: "The Edu-Kits are wonderful. Here I am sending you the questions and also the answers for them. I have been in Radio for the last seven years, but like to work with Radio Kits, and like to build Radio Testing Equipment. I enjoyed every minute I worked with the different kits; the Signal Tracer works fine. Also like to let you know that I feel proud of becoming a member of your Radio-TV Club."

Robert L. Shuff, 1534 Monroe Ave., Huntington, W. Va.: "Thought I would drop you a few lines to say that I received my Edu-Kit, and was really amazed that such a bargain can be had at such a low price. I have already started repairing radios and phonographs. My friends were really surprised to see me get into the swing of it so quickly. The Trouble-shooting Tester that comes with the Kit is really swell, and finds the trouble, if there is any to be found."

UNCONDITIONAL MONEY-BACK GUARANTEE

Please rush my Progressive Radio "Edu-Kit" to me, as indicated below:
Check one box to indicate choice of model.

- ☐ Regular model $26.95.
- ☐ Deluxe model $31.95 (same as regular model, except with superior parts and tools plus Radio & TV Parts Jackpot worth $15.)

Check one box to indicate manner of payment.

- ☐ I enclose full payment. Ship "Edu-Kit" post paid.
- ☐ Ship "Edu-Kit" C.O.D. I will pay postage.
- ☐ Send me FREE additional information describing "Edu-Kit."

Name ______________________

Address ______________________

City & State ______________________ Zip ______

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PRINTED CIRCUITRY

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

A Printed Circuit is a special insulated chassis on which has been deposited a conducting material which takes the place of wiring. The various parts are merely plugged in and soldered to terminals.

Printed Circuitry is the basis of modern Automation Electronics. A knowledge of this subject is a necessity today for anyone interested in Electronics.

CIRCLE NUMBER 10 ON PAGE 11

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