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ELECTRONICS ILLUSTRATED

By the Publishers of MECHANIX ILLUSTRATED

MAY 1966 • 50¢

SPECIAL CB SECTION

CB's Biggest Boondoggle

Life With the New Rules

THREE 5-WATT CB SETS FOR UNDER $60!

Sun-Power Your CB Rig

What's New in Equipment

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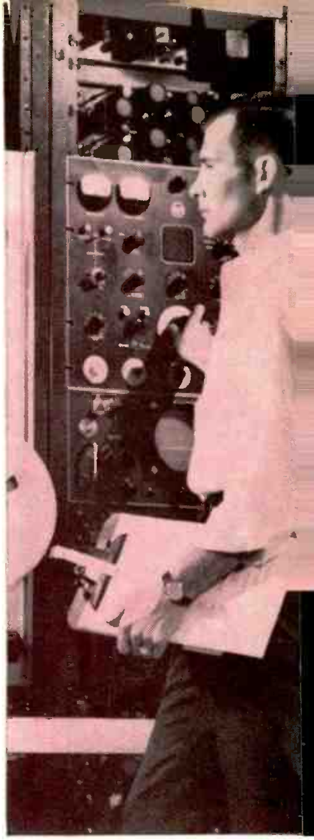
Installing a Tape Recorder in You[r]

The Truth About That UL Label!



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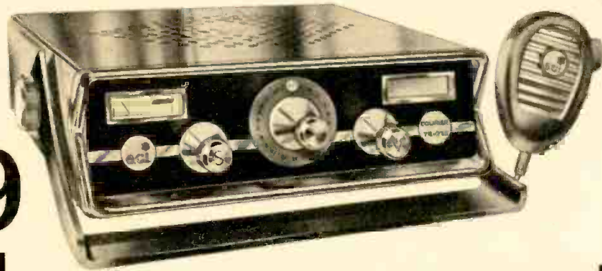

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ELECTRONICS ILLUSTRATED

MAY, 1966 A Fawcett Publication Vol. 9, No. 3

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ELECTRONICS

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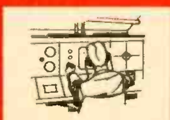
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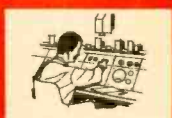
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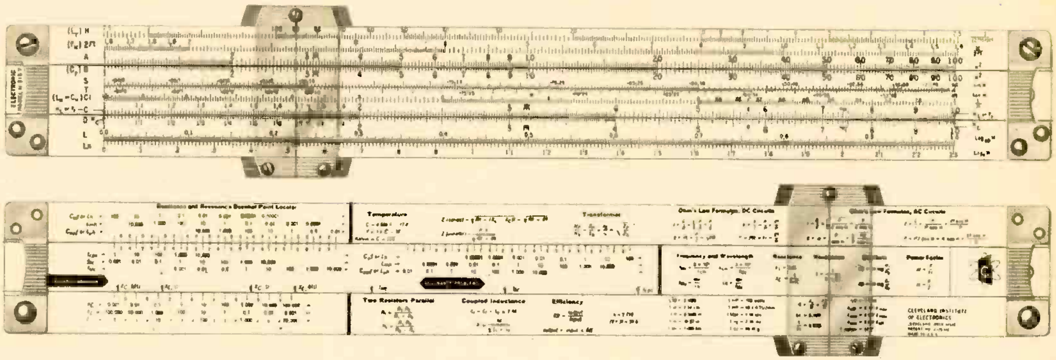

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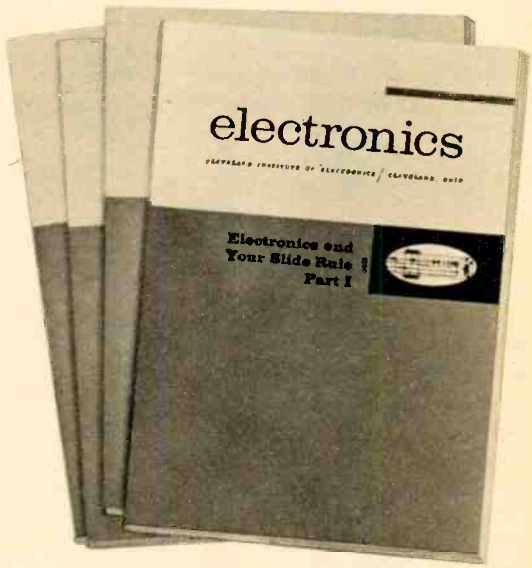

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FEEDBACK
from our readers

Write to: Letters Editor, Electronics Illustrated, 67 West 44th Street, New York, N.Y. 10036

ARF

Frankly, gentlemen, I would enjoy a resumé on a bloodhound with the unlikely name of Zelda much, much more than a run-down on your bearded Uncle What's-His-Name (UNCLE TOM'S CORNER, Mar. '66 EI).

K.K.
St. Louis, Mo.

Zelda got but passing mention when we introduced Uncle Tom because we felt that he, not she, deserved introducing. But since you've asked for it, here goes. Uncle Tom reports that Zelda's arrival on the New York metropolitan scene from her rural birthplace seems to have set the pace for her later adventures (she showed up a day late and at the wrong airport). Despite all efforts to instruct Zelda in the finer points of tracking and trailing, she acknowledges no odors of lesser magnitude than a 5-cent stogie and few sounds other than a call to dinner. Spending most of her time sleeping, she sometimes awakes silently to watch Uncle Tom at work (though she has remained awake long enough at various times to appear on a TV program). Content with such triumphs, Zelda scorns Hollywood and its inevitable name-change requirements (imagine a bloodhound named Kim or Lana) and seems resolved to let Lassie keep her lead. For companionship during Zelda's sleeping hours, Uncle Tom has Cindy, a second-hand pooch of dubious ancestry (Cindy mysteriously appeared one day in the front seat of Uncle Tom's parked car and has stayed on for the fun).

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I would reiterate my request to you that you should print a note in your magazine to the effect that FRIGISTOR® is the registered trademark of Frigistors Ltd., Montreal.

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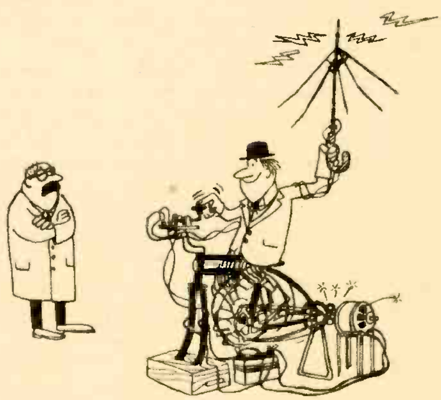
AOK



Can I hook up a speaker that has a 20- to 30-watt rating to an amplifier with an 8-watt output? They both have 8-ohm impedances.

Merrill Nelson
Eden Prairie, Minn.

Yes.

BIASED

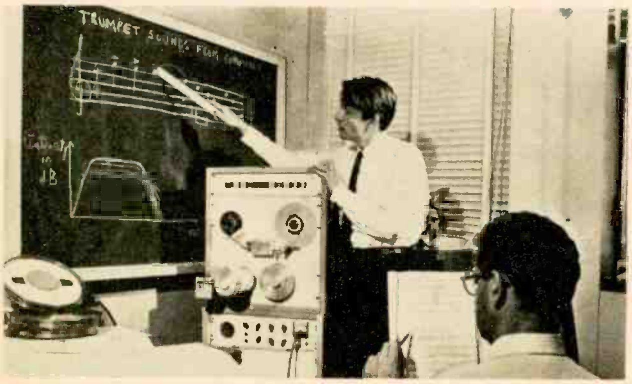
Re your LAST STAND FOR BRASS POUNDERS article (Mar. '66 EI), I say down with the soft life, up with the tough, rough (but winning). Call me Hardway Harry if you've a mind to, but life without brass pounders never will be the same.

H.H.
Newport, R.I.

..— ....— ....

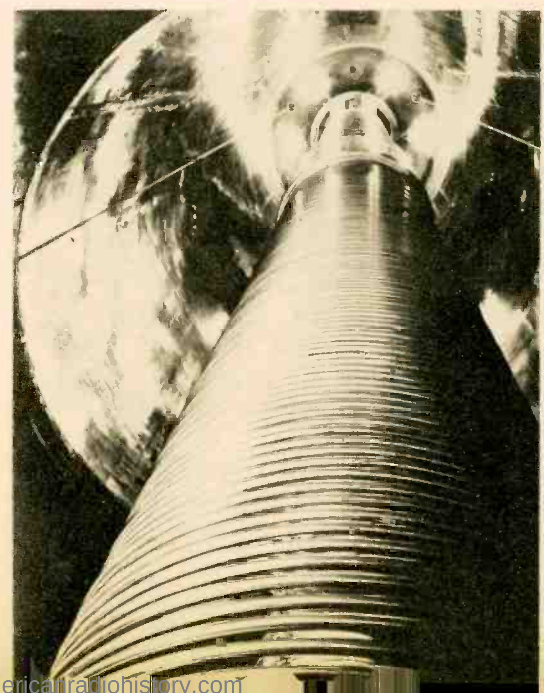
...electronics in the news

MASTER MAZE . . . Confronted with what looks like something from a behavioral science laboratory, the man in our photo well could be inspecting the floor plan of a new and more frustrating mouse maze. Thing is, the three-foot-square negative getting the once over not so lightly at RCA's Somerville, N.J., plant is a photomask for integrated circuits. Size of the letter *o* on a typewriter, the devices will be packed with up to 40 components.



Digital Trumpet . . . If the people at New York's Bell Telephone Laboratories are able to continue synthesizing the sounds of musical instruments, time may come when computers will make like symphonic ensembles. Impossible? So effectively have French physicist Jean Claude Risset (at blackboard) and his associates synthesized the tone of a trumpet that professional musicians can't tell it from the real thing. Next step: a violin, and then who knows? An orchestra, maybe.

Monster Blitz Machine . . . Most any electronic hobbyist well knows the hair-raising tricks and the lightning-like sparks Van de Graaff generators can create whenever they have half a mind to. The laboratory and classroom versions nearly everyone has ogled serve the highly useful (if solely decorative) purpose of revealing the way speeded-up particles act. But these junior-size, demonstrator-type, science-fair-style generators have built-in limitations. Much larger generators are needed to determine the effects high-energy particles have on matter, which explains why Toshiba of Japan has seen fit to come up with the monster blitz machine in our photo. Largest spark machine in all Japan, it generates a static charge of 10 megavolts and incorporates a number of improvements better to help it produce the white and crackly stuff that normally comes only from the heavens.



...electronics in the news

Abacus Beads . . . When the people at IBM string these ferrite cores on wires about two thirds the thickness of human hair, the baby-flea-size doughnuts become the basic building blocks of one of the most compact computer memories

yet devised. Like abacus beads of old, these cores represent digits but differ from their ancient counterparts in that they are packed 4,000 to the square inch and are capable of being magnetized. Each of the 17,000 cores nestled in the center of the candy Life Saver in our photo can tell a computer to register a one or a zero. A further advantage of these compact cores is that the distance an electrical signal must travel to store or retrieve information is shortened substantially. Fact is, they perform at roughly twice the speed of earlier ferrite memories.

ITEMS . . . Mailing or carrying exposed film to photo-processing centers after just 20 to 30 exposures may become a thing of the past if a camera developed by Aeroflex Laboratories of Plainview, N.Y., catches on. The unique camera makes use of a system called multiplex-recording photography and is capable of capturing up to 500 full-size pictures on a single negative. Though processed in the usual way, the film must be viewed on a special device.

Demonstrations recently performed the aid of a human subject and a dog at the New York University Medical Center show that it now is possible to induce sleep and even to anesthetize with electricity. (Technicians simply placed electrodes over the eyes and on the backs of the necks of the participants.) Though it is not known why such stimulation produces its effects, the demonstration verified that the procedure for anesthetizing requires less voltage and more current than that for sleep inducement.

ELECTRONIC MARKETPLACE

SPEEDY . . . For the ham who likes the mental challenge of a high-speed CW contact but finds it physically a bit wearying on the fist, the HD-10 electronic keyer well may fill the bill and save him some green stuff to boot. Going together in about eight hours, the HD-10 will key a transmitter at speeds from 10 to 60 wpm. A built-in generator and speaker let the operator hear what's going out on the air and also permit the HD-10 to double as a code-practice oscillator. The length of the dash is fixed at three times the length of the dot throughout the keyer's speed range. Handling up to 105 volts at currents to 35 ma, the HD-10 sports solid-state switching and sealed contacts that never need cleaning. External connections permit use with straight keys as well as headphones. $39.95. Heath Co., Benton Harbor, Mich. 49023.

All Channelled . . . Valuable feature of the CB-14 transceiver is its frequency synthesis circuit. This means that CBers who want 23-channel operation can have it with fewer crystals—a real money saver. Only 3⅝ in. high and weighing 4¾ lbs., the CB-14 totes easily between car and house. An optional AC power supply permits the solid-state rig to be switched from mobile to base operation with a minimum loss of operating time. Other features include a meter that measures RF output or modulation at the flick of a switch. $259.95. Hallicrafters Co., 5th and Kostner Aves., Chicago, Ill. 60624.

MARKETPLACE

Prognosticative . . . The information dispensed by this little converter well could make it standard equipment for most anyone who drives a car and wants to be a hop, skip and jump ahead of surprise changes in the weather. Fliers and skiers, for example, often must place long-distance calls to obtain vital pre-flight forecasts and ski information. Thing is, the Spasors converter supplies it free of charge. Nestled beneath the dashboard and connected to the car radio, the 200- to 400-kc converter keeps drivers and passengers in touch with the latest regional forecasts and important flight information from the nearest station in the FAA's Transcribed Weather Broadcast network (TWEB). A plug-in connector and simple mounting procedures make the compact 5- x 3- x 1½-in. unit easy to install. $29.95. Spasors Electronics Corp., 1090 Morena Blvd., San Diego, Calif. 92110.

Companionable . . . Barked shins and blinking electrical-system idiot lights—sometime reminders of mobile CB-rig installations—likely won't trouble the CBer who puts an Escort II in his car. This compact, solid-state rig is a mere 2¾ in. high and draws only 1.5 amperes in the transmit mode. But size notwithstanding, the Escort II boasts an input of 5 watts on 11 channels. The superhet receiver section sports dual conversion, automatic noise limiter and adjustable squelch. Operating with one crystal per channel, the Escort II helps cut crystal costs. Further, a built-in TVI filter is intended to keep the smiles on the faces of the nearby idiot-box watchers. $239.90. Pearce-Simpson, Inc., Box 800, Biscayne Annex, Miami, Fla. 33152.

Who makes the only <u>great</u> amplifier for $99.50?

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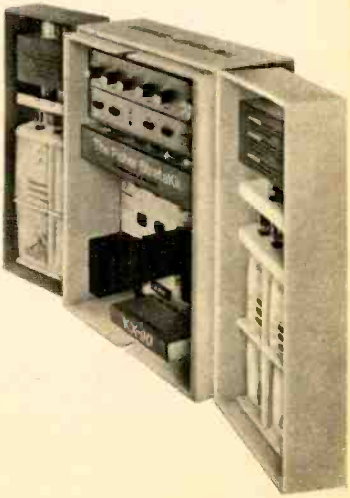

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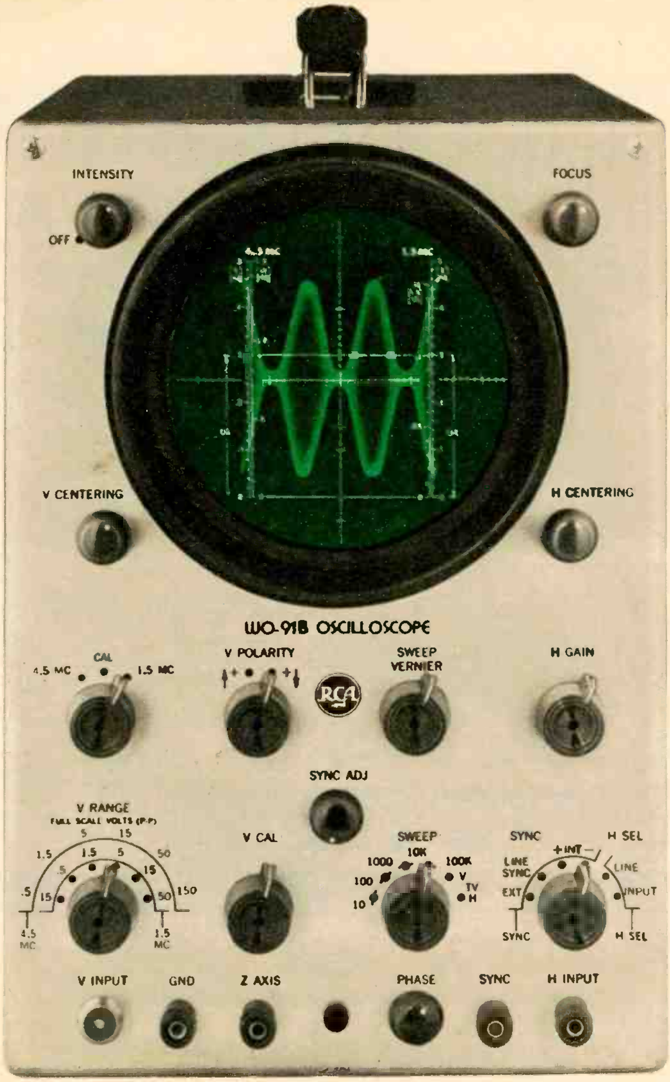
A glance through the thousands of **science items** in the new Edmund catalog 661 likely will spark the imagination of any junior scientist or electronic hobbyist. Items like crystal-growing kits, science fun chests and large-size magnets are only a few of the listings. A free copy can be yours by writing Edmund Scientific Co., 107 E. Gloucester Pike, Barrington, N.J. 08007.

In addition to providing data on Jensen's entire line of hi-fi speakers and headphones, catalog 165-L orients the novice to the hi-fi facts of life and advises how a monaural system most economically can be converted to stereo. And as an additional bonus, money-saving information on how to build your own **speaker enclosures** appears on the closing leaf of the 24-page catalog. For your free copy, write Jensen Mfg. Div., Muter Co., 6601 S. Laramie Ave., Chicago, Ill. 60638.

Most hobbyists realize the virtues of **wire-wound resistors** for certain critical low-noise audio and RF applications, though even a wire-wound can turn some strange tricks. Catalog 14-RG takes the guesswork out of how these resistors perform under a wide range of conditions. For your free copy, write Hi-Q Div., Aerovox Corp., Cinema Plant, 1100 Chestnut St., Burbank, Calif. 91502.

Wading through the multiplicity of solid-state components that perform similar or identical functions can be bewildering as design-it-yourself color TV. Thing is, the **Semiconductor Replacement and Interchangeability Guide** and Price List by Semitronics maps the way to quick and correct replacements for solid-state components. A copy can be had for 25¢ from Semitronics Corp., 265 Canal St., New York, N.Y. 10013.

Quick and easy introduction to meters and electronics can be had by reading **Best Ways to Use Your VOM and VTVM.** A copy can be yours for 50¢ from Allied Radio Corp., 100 N. Western Ave., Chicago, Ill. 60680.



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By TOM KNEITEL, K2AES/KBG4303

★ *Are you for real with that facial fuzz? I've noticed that everyone who resorts to wearing a beard just to get attention is either an oddball or a creep, or both.*

Sal Venetucci
Evanston, Ind.

You would notice that, you little devil.

★ *I've been wondering why nobody ever has thought of TV with stereophonic sound. It seems like the next logical step.*

Ronald Cardiff
Frankfort, Ky.

The FCC already has been asked by Philco and General Electric to permit stereocasting on TV. Uncle Sammy is trying to figure out how stereo will affect picture and sound quality, also stereo bandwidth requirements, cost and complexity of equipment, etc. I'm trying to figure out whether stereo will make TV twice as good or twice as bad.

★ *Thought you'd be interested in this. When I moved to the sticks from the big city, I took my TV antenna with me, installing it on the roof. My neighbors all laughed and told me that I would need a special deep-fringe anodized million-element monster, such as they all had. I was the one with the last laugh because my beat-up old city-dweller antenna brings in Bullwinkle as well as their super-duper specials. Any comments?*

R. Van Praag
Islip, N.Y.

Bully for Bullwinkle!

★ *I'm a Novice ham operator and would like you to pass along the word to any lid who may be reading your column, especially one who lives down the street from me. The word is that it's bad operating practice to bone up on CW techniques over the air, especially with 10-minute CQs followed by an endless rendition of your call-sign. Novices, because of their inexperience, generally are very bad operators. Why not read them the riot act to get them all in line?*

R. Radke, WNØMUD
St. Paul, Minn.

Once, in the remote past, I undertook the assignment of a magazine article which berated Novices for certain poor operating practices. As soon as the publication went on sale, I was greeted by a delegation of Novices who had come to protest my stand. There they stood, hollow-eyed, silently clutching pictures of Wayne Green. If you think that I'll ever knowingly let myself in for something like that again, you're crazy.

★ *Can you give me any information on a mobile CB transmitter which can be used with a receiver converter?*

Stan Rondrian
Red Lion, Pa.

The only mobile CB transmitter I ever saw was made years ago by Philmore Mfg. Co. It was a dandy little unit but never seemed to catch the fancy of CBers. Maybe some manufacturer will take another whack at one someday.

★ **Ladies Take Notice Department.** Just so the ladies won't think that it's completely a man's world, here's one male who stands

[*Continued on page* 24]

UNCLE TOM'S CORNER

Continued from page 23

with them in their universal gripe that line cords on household appliances are too short. Apparently, it's just about impossible to operate an iron without an extension cord, and countless electric clocks, lamps and table redios also seem to fall in this category. Placing a heavy-duty line cord on an iron is a wasted safety measure if the line cord has to be plugged into an extension cord to reach the wall outlet.

★ *After pioneering broadcasting, TV and even color TV, General Sarnoff (head of RCA) should hang his head in shame at the sad state of broadcasting today.*

Charles Soldaro
El Paso, Tex.

Probably sulks all the way to the bank.

★ *I'm confused about all the talk of the advantages of the various types of single- and double-sideband CB rigs on the market. Can you give me a nutshell summary of which I should buy?*

Ken Felcher
Rogers City, Mich.

Briefly, only someone else with similar equipment will be able to decipher a single-sideband CB signal—and since there aren't enough of these sets around to fill a bread-box, you'd be talking to yourself most of the time. Double sideband looks great on paper, but it might just as well have been omitted from most of the CB set designs I've seen. Stick with plain, unadulterated AM, and suffer along with the rest of us.

★ *There's a pirate CB station I keep hearing on my CB rig and I wonder if anybody else has heard them. I heard him on Channel 23 using the call-sign KDZ768—obviously a phoney since it doesn't even conform to standard CB type calls. How do I report this bootlegger to the FCC?*

Lawrence Vajic
Union, N.J.

Don't be too hasty about turning in this bootlegger—he's legal. When your letter came in, I checked FCC records and found that KDZ768 is a station in the Business Radio Service, owned by a radio and TV sales company in Paterson, N.J. They're licensed to operate on 27.245 mc, which is not a CB channel (it's between CB channels 22 and 23, though). Better get your receiver calibration corrected and leave the CB policing to Uncle Charlie (that's the FCC to you, Gramps).

★ *I've got a broadcast radio with a ground on the chassis but nothing hooked to it. I got the idea to use it for a ground on my antenna and was surprised to find that if you plug the set in one way, it's a ground. With the plug reversed in the power outlet, it's hot. What do you think?*

W. Martin
Limestone, W.Va.

About what?

★ **Colorful TV Dept.** With the big push to unload color TV sets on the public, you'd think that TV stations would exercise a little more effort in standardizing the quality of the color they transmit. Sometimes there's barely enough color involved to make the thing worth the effort; other times the color is so out of whack you wonder if we've been invaded by green Martians. Anybody for blue cucumbers?

★ *Seriously, what about the names of some of the recordings you'd suggest as best bets to show off a high fidelity sound system?*

Arthur Dollinger
Chevy Chase, Md.

If you really want to know, the last recording to give me a jolt was by Harry Horlick and his A & P Gypsies.

★ *This isn't in the realm of electronics, but I did notice in the March EI that you were a coin collector. In your opinion, what is the most overpriced and overrated American coin? What about the most underrated?*

Jerome Wratten
Tucson, Ariz.

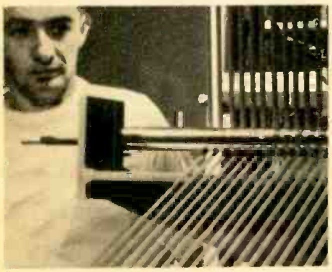
By far the biggest swindle ever pulled on coin collectors was the so-called 1960 small-date penny. Dealers and speculators have run up the price on the coin far past its true value. Another coin which the speculators created is the 1955-S penny. I think that Mercury dimes (before 1940), 1943 (steel) pennies, silver war nickels and Walking Liberty halves are the ones to watch for in the future. They're all underrated today but quietly are getting scarcer by the minute.

Kodak
TRADEMARK

Some Plain Talk from KODAK about Tape:

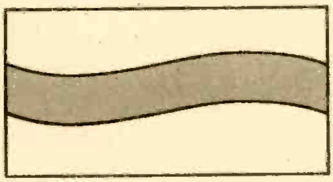
Sobering thoughts about slitting... and making the best basically better

A wise man once said, "Baloney's basic worth is unaffected by the manner in which you slice it." Maybe so for baloney . . . but certainly not for sound recording tape. Slicing, or to be technically correct, slitting quarter-inch ribbons of tape from the 42-inch-wide master web in manufacture takes a pretty sharp eye. This slitting operation is important to your pleasure since the closer the tape comes to being



dimensionally perfect, the better is the azimuth relationship between the recorded signal and the reproduce head. Like it in plainer English? Then consider some examples of poor slitting . . . and what they sound like.

"Drunken" slitting and others. Variations from the ideal occur if tape is too wide, too narrow, or if its width varies. If the tape is too wide, it may actually override the guides on your tape deck. If the tape is too narrow, it may see-saw as it passes by the head. Either way, you're in trouble. Variations also occur if the edges are not straight. One such variation goes by the name of "drunken" slitting. Sound bad? You bet. The edges snake even though the width is constant (see drawing). As a result, on playback the output varies as the tape weaves past the reproduce head . . . causes a warbling of the signal. This is a type of distortion the human ear is most sensitive to. You wouldn't like it.



Drunken slitting, a dramatization

Quality-control makes the difference. Standard industry specification calls for a tolerance on width of ± .002 inches. To start, we hold ours to ± .001 inches. And to make things more interesting we make our test over a twelve-inch span to equal or exceed guide spacing on most tape recording equipment. Next, not relying on eyeball tests as others do, we test for drunken slitting or fluted edges by actually running the tape with a recorded short wavelength signal through a tape recorder. This "drunkometer" test helps us spot any tape that's had even one beer. The slightest whiff, and out it goes. Lastly, Kodak Sound Tapes have to go under the microscope where we watch for rough or dirty edges. When you buy Kodak Tapes, you know they're clean.

Best base better? Strength and toughness sound like they mean the same thing . . . but they don't quite when it comes to a tape base. Take a piece of spaghetti. It's stronger when it's dry . . . but tougher when it's wet—harder to break, that is, and not just because it's slippery. Designing a tape base, you're always up against the problem of making it strong so it doesn't stretch . . . and tough so it doesn't break. Today's DUROL base, the best there is, is now more resistant to shock abuse and carelessness. It's even tougher than before while it still retains the strength that made it famous.

Kodak tapes—on Durol and Polyester bases—are available at most electronic, camera, and department stores. To get the most out of your tape system, send for free, 24-page "Plain Talk" booklet which covers the major aspects of tape performance. Write: Department 8, Eastman Kodak Company, Rochester, N. Y. 14650.

EASTMAN KODAK COMPANY
Rochester, N. Y.

THE FANTASTIC FLIGHT OF THE BLUE EAGLE

A memorable EI Special Report proving that in Washington you always color the tape red and the tax money gone.

IT ALL started in the early summer. There was unexpected music from the sky and unaccountable voices were heard on radio. "This is the Voice of the Blue Eagle relaying the Blue Eagle Radio Network," said the mystery station. Then came jazz music it called the Blue Eagle Blues.

The strange transmissions were interfering with commercial broadcast stations. Scores of people who heard the signals wondered about them, a few were worried and some even were alarmed. Were these the voices of an unseen enemy? Of a foreign power plotting against the country? Of the saucer people from outer space?

Though the Blue Eagle's voices and music were heard in many communities they seemed to center on Baltimore, a location that would appear grimly suitable since, more than a century before, it had seen part of the life and the macabre death of master haunter Edgar Allan Poe. And, just three decades back, the phantom invaders from Mars had been landed not far away by Orson Wells. It was spook territory, all right.

What does an aroused citizen do when he's being haunted by a radio spook that has no rational explanation? In the case of at least one Baltimorean, a young DX radio enthusiast, you write to the Federal Communications Commission. Are they not the police of the airwaves, the masters of the ether? Who is the Blue Eagle, this chap asked the FCC, and what's going on?

Back came the answer on official FCC stationery: "The station which you intercepted was unlicensed. Engineers from field offices of our Field Engineering Bureau located the station and while not actually observing the station in operation, contacted the suspected operator and warned him of the possible results and penalties of such unlicensed operation."

It was a straight enough answer and seemingly explained away the mystery. An unlicensed operator. Probably somebody getting his kicks out of knowing people were hearing his voice. Certainly not an unheard-of event. So the embarrassing episode was buried.

Only it wouldn't stay buried. Within days after the letter arrived in Baltimore the Blue Eagle was on the air again, sounding just as mysterious as ever and causing just as much interference.

And, in view of later developments, the content of the letter was odd, indeed.

It was not until late last fall that anyone was able to piece together even a major part of the Blue Eagle story, though the episode had begun in June. The whole story still is not known and no official account of what really happened ever has been released. The nearest thing to an official explanation is a second FCC letter, written two months later in response to a query about the Blue Eagle from a Canadian: "Regarding 'The Voice of the Blue Eagle,' what has been observed [heard by you] was U.S. Government intermittent testing of broadcasting operations and related facilities for world-wide use. Because it is a Government operation, it is not licensed by the Commission and the identification 'The Voice of the Blue Eagle' is used in lieu of a call sign."

A comparison of the two letters might make one wonder whether the FCC really did know what was going on. Especially in view of the fact that both were signed by the same member of the FCC staff.

To make things trebly confusing, the Baltimore DXer, after receiving the first letter, called the FCC field engineer in his city and told him what had happened. Reported he: "Though I was engaged in conversation for about ten minutes I didn't find out much. He told me that the person who first wrote me at the time was not aware that the Blue Eagle was authorized."

Since when does an engineer in the field have more up-to-date information on a policy matter than a member high on the FCC staff (he was that) at ground-zero in Washington? The answer, it appears, is when eagles turn blue.

As with most mysteries, there was a rational explanation of the Blue Eagle phenomenon.

The story, to be sure, starts in Washington, where good, dedicated public servants sometimes appear to be spending most of their time coloring the tape red. And the eagles blue. The idea evidently originated in the Pentagon—the idea of taking a large aircraft and outfitting it with generators and broadcast, short-wave and television transmitting equipment. The result would be a truly mobile radio-TV station that could become an instant Radio City anywhere in the world. The exact mission would depend on what missions might be available. If the need arose it could be met immediately. A somewhat similar plan had been used successfully by the Voice of America when it equipped

a Coast Guard cutter, the Courier, with broadcast gear and anchored it in the Agean Sea between Greece and Turkey.

The scheme in time was farmed out to the Navy, which rounded up one of its available Constellations, a four-engine semi-antique with three tails, and set about converting it into a Radio-TV Central with wings. Two broadcast transmitters, two short-wave rigs and a UHF television station went into the fuselage. It was quite a load, as tests proved in short order.

Though the Navy and the others in the Defense Department and other government departments that became involved in the project presumably had no desire to bamboozle the FCC, the possibility probably didn't cause them to lose any sleep. The FCC has charge of radio and television frequencies and of licensing stations to operate on them but, it develops, the agency does not license other government departments under the theory that, as one FCC staffer put it, "we're all working for the same Uncle, anyway." The agency does try to establish frequencies for other government departments and also tries to keep their stations in the slots they're supposed to be in. As a courtesy, or perhaps just in theory, other departments let the FCC know about which frequencies they are using or intend to use. Trouble is, bureaucrats sometimes are jealous of others of a feather and guard their independence zealously.

Once the Navy got its prize project together it had a problem of giving it an identification. A licensed station would have a call sign. But this one wouldn't be licensed. It had to have a name. To some unknown and unheralded worker came the idea of calling it the Blue Eagle, presumably because there is a bird of that description in the Navy's seal. One could assume it had nothing to do with the only other famous blue eagle, the one flown by the National Recovery Act of the Depression.

Now the fun began. Testing was required and, since the various stations would be transmitting on the wing, that was where the tests would have to be conducted. Up went the Blue Eagle. And up and down the East Coast it flew, transmitting all the while. The programs may have been put together before the plane took off but, from the way things went, it seems doubtful—more like material improvised high in the sky. Crewmen evidently took turns making like disc jockeys. There was jazz, popular songs, country and western ditties, even relays of the British Broadcasting Corporation and the programs of two nearby commercial radio stations, WLDB and WMID, in Atlantic City, N.J. Signals from the latter apparently were picked up off the air and simply retransmitted.

The Blue Eagle first was heard at 19.1 mc, usually fixed-station territory. The signals were of fair strength in the Washington-Baltimore area, though they tended to fade from time to time and the so-called programs had a maddening way of disappearing right in the middle of a musical selection. The 19-mc signals were a puzzle to short-wave listeners but caused no trouble. The trouble started when the Blue Eagle began squawking in a new place in the spectrum. This second signal came on at 532 kc, just 3 kc below the bottom edge of the broadcast band, and it was what made the Blue Eagle into an outlaw station because it caused interference with commercial stations, mainly those in Baltimore. (The role of Baltimore in the flights of the Blue Eagle apparently was just that of innocent bystander; the Connie, based in the Washington area, simply happened to fly toward Maryland.)

It was after these instances of interference (due to harmonics) that the FCC was queried and, having been told little, could explain little. The exact meaning of that account wherein FCC field engineers located the station, contacted the suspected operator and warned [*Continued on page 117*]

GOOD READING

By Tim Cartwright

ABC'S OF TELEMETRY, by Alan Andrews. Howard W. Sams & Bobbs-Merrill, New York & Indianapolis. 95 pages. $1.95

Astronauts who rocket their way into the heavens leave most of us fascinated by all those esoteric measurements that get back to darkest Texas from outer space. Just how *do* they know all those things (including intestinal reactions to space lunches)? Answer is to be found in this slim and interesting volume on telemetry—the science of getting a measurement *here* of something going on out *there*.

As it happens, the subject is one that hasn't been discussed a great deal in print, and the introduction here is a good one. True, it doesn't explore and detail *all* of today's immensely complex applications of telemetry. But it does provide a good basic familiarity with both hardware and theory, including uses of time-division multiplexing. Anyone who wants to keep up with today's—and tomorrow's—communications can read it profitably.

PHYSICS CAN BE FUN. By Wilhelm H. Westphal. Hawthorn Books, New York. 207 pages. $3.95

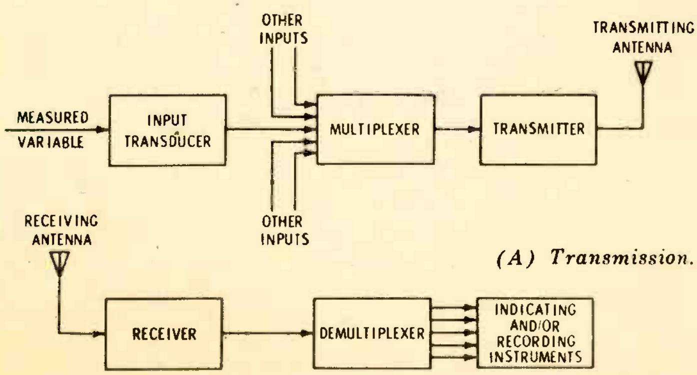
Let's begin with the premise that none of *us* needs this book. *We* understand all about energy and inertia, don't we? And friction, sound, buoyancy, heat, time—all those things? Point is, each and every one of us knows someone who didn't, or never will, make it through high-school physics with much success. This book is for just such a soul, for it really delivers on the promise in its title.

In sprightly style, it tells you why all kinds of things happen: why a raw egg doesn't spin as easily as a hard-boiled one, why soup cools when you blow on it, why that perpetual-motion machine you've been concocting won't work too well. Only thing it doesn't explain is why people have trouble with physics courses. Answer, presumably, is that most physics texts aren't written nearly as well, let alone as entertainingly, as this volume. Give this book to someone deserving—even if that someone is you.

SCR EXPERIMENTER'S MANUAL. Radio Corporation of America, Harrison, N.J. 80 pages. $.95

Organized around RCA's KD2105 experimenter's kit, this little book offers a baker's-dozen-plus-one of easy-to-build SCR projects that many will enjoy building. The projects include timers, battery chargers, light-operated switches and a speed control for model trains and cars. Well put together, this should be a welcome spare-time companion.

Taken from The ABC's of Telemetry discussed above, our illustration shows the necessary gear for a basic telemetry system. Input transducer in drawing A also is referred to as a signal conditioner, sensing device, pickoff and end instrument.



(A) Transmission.

(B) Reception.

SOUP-UP FOR AC/DCs

By HERB CENAN

ANYONE looking for a *good*, cheap table radio—one with decent sound quality, reasonable sensitivity and a fair number of operating conveniences—doesn't have to go far. True, you couldn't find such a set on the market for under $30. But hike up to the attic or down to the basement, dig out that old All-American 5 and you've got the makin's of a darn good table radio. All it takes is an evening's work and a few bucks' worth of parts.

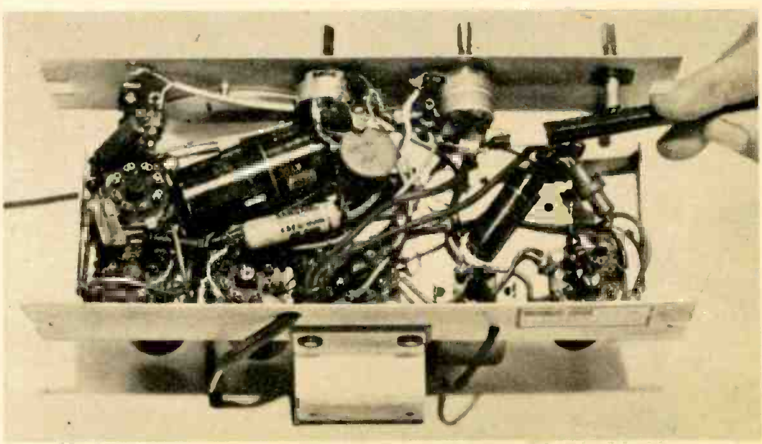
In its day the AA5 was a major breakthrough in consumer electronics. It used but five tubes and about as many resistors and capacitors as you have fingers. And, thanks to a relatively large cabinet and a 4- or 5-in. speaker, the AA5 delivered pretty good sound.

What's more, it was built to last and last and last. Even that old squawker you've held onto just for spare parts can be rebuilt for like-new performance. Or you can go all-out and add a tone control, instant-on, extra sensitivity for DXing, even extra selectivity to untangle howls and groans when night-time DX rolls in.

A new lease on life for the AA5 starts with capacitors. Years of high ambient temperatures probably have caused the capacitors to leak like washerless faucets so the first job is to replace all paper capacitors. But only *paper* ones. Ceramic or molded capacitors in the oscillator circuit could foul up the alignment if replaced so leave them alone. Also replace the filter capacitors with new ones having at least the capacitance ratings of the originals. If your radio sports a value not commonly available—such as a dual 70/40 μf—substitute the next highest rating, an 80/40, say.

Since you will be dropping solder blobs in the chassis, this also would be a good time to add *instant-on* and a tone control. Instant-on idles the heaters at reduced current with the plate voltage off. Within a second or so of turning on the power switch the radio comes on, just like a transistor portable. And don't worry about shortening tube life; it's clicking tubes on and off that burns them out.

To add instant-on, simply connect a silicon rectifier rated at 200 PIV, 500 ma (or higher) across the power switch as shown in Fig.



New capacitors, new tubes and careful alignment are all it takes to give most any All-American 5 a new lease on life. Pencil points to silicon diode which can be connected across power switch to provide AC/DCs with instant-on operation much in the manner of modern all-transistor sets.

SOUP-UP FOR AC/DCs

1. Make certain the SR's cathode—the end marked with a + or band—is connected to the line side of the switch. The SR's anode connects to the side of the switch that feeds the heaters and rectifier plate (if the SR is reversed the whole radio stays on).

Addition of a tone control—actually a high-cut (low-pass) filter—allows you to get a more balanced tone from the speaker. Further, since you now can reduce your set's high-frequency response, it often makes copying DX stations a little easier. The necessary components appear in color in the circuit in Fig. 2. A .05 µf capacitor usually is adequate for C1, but if you want a little more bass you might try a .1 µf.

Capacitor C2, a .001 µf, 500 V ceramic disc, is needed only if adding the tone control causes a buzz. Whether you get the buzz or not depends on the wiring layout of the radio. First try just C1 and R1 (a 20,000-ohm, linear-taper potentiometer); if the sound is clean forget about C2. Potentiometer R1 is installed on any clear spot on the front apron; if the chassis is too crowded you may find it necessary to use a miniature pot.

So long as you have a wooden cabinet you'll have no trouble cutting the hole for the tone control's shaft. If the cabinet is Bakelite or plastic, use a sharp, high-speed drill.

With all the drilling and soldering completed, vacuum the solder blobs and metal chips from the chassis; then blow the dust off. If the tuning capacitor originally was noisy—if you got Rice Krispies (snaps, crackles and pops) every time you tuned in a station—spray the tuning capacitor's plate with No-Noise, Contact-Kleen or similar product and rock the capacitor back and forth several times. Should the noise persist, repeat the procedure.

The foregoing will result in a good-sounding table radio; but you now can move on to a real soup-up in sensitivity and selectivity. Let's tackle sensitivity first.

If your radio is equipped with a loop antenna—many turns of wire on the back panel—you can't improve sensitivity for local reception by removing the loop and substituting a loopstick. To be sure, there are advertising claims to the contrary but they're not necessarily true.

On the other hand, if your radio has an antenna coil with a short wire antenna trailing out the back you can eliminate the wire and possibly pick up a little extra sensitivity by removing the coil/wire combination and installing a ferrite-rod loop antenna such as the Miller 705A. Use the largest rod you can fit on the back of the radio—the larger the rod the greater the sensitivity (an itsy-bitsy rod delivers an itsy-bitsy signal).

For real DX work you need an outdoor antenna and this is no problem if your set is equipped with a rod. Just wrap a few turns of the antenna's free end around the rod as far as possible from the rod's coil. Tune in a weak signal, slide the antenna coil toward the rod's coil, then tape it in the position that results in maximum sensitivity. If your radio is equipped with a loop and you need extra sensitivity for DXing, replace the loop with a rod antenna and, similarly, wrap the antenna around the rod. The increased sensitivity immediately should be apparent, with even local stations coming in much stronger.

For extra selectivity you can install a gimmick which will regenerate the IF amplifier. Explanation is that regeneration will cause an IF amplifier to be on the verge of self-oscillation. Circuit Q rises sharply at this point and selectivity, therefore, is increased many-fold. The circuit in Fig. 3 shows how

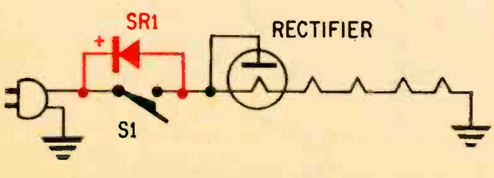


Fig. 1—A single component, a 500 ma, 200 PIV diode (SR1), brings instant-on to any AC/DC radio.

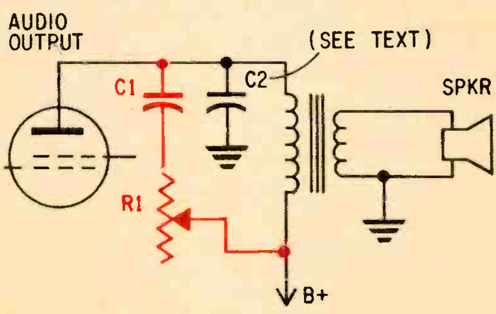


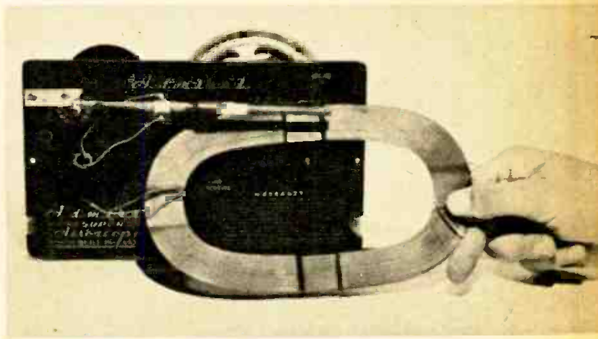
Fig. 2—Simple tone control consisting of C1 and R1 improves audio quality, helps in DX work.

simple it is to pull off this trick. Just connect a short length of solid, insulated hookup wire to the plate of the IF amplifier and a similar wire to the grid, then twist them together two or three times to form a gimmick.

Turn on the radio (if you've replaced the antenna coil align the receiver first). If you can't hear any signals or if you get squeals cut off a small section of the gimmick. Keep repeating the cut-and-try until the signals suddenly boom in without squeals. A properly trimmed gimmick can turn a jumble of stations into individual, in-the-clear signals. Don't forget to *pull the plug* before snipping away at the gimmick; high voltage is present. When you have the right length, tape the ends of the insulated wires.

Final step is to install a complete set of new tubes and align the radio. And to do the job right, buy or borrow a signal generator. First, connect one lead of a 150-V AC voltmeter to a ground, such as a cold-water pipe, and the other lead to the chassis. Insert the radio's plug in the outlet and turn the power on. If the meter indicates full line voltage reverse the plug to put the chassis at ground potential.

Next, set the tuning capacitor's plates to full open, connect the signal generator's ground lead to the radio chassis and connect the generator's output lead through a .01 μf capacitor to the mixer's input grid—the grid which connects to the antenna coil. Set the generator to the radio's IF frequency and adjust the generator for minimum output. If you have a VTVM, connect it to the radio's AVC buss (usually across the volume control), set the generator for *no-modulation* and align for maximum negative voltage. Lacking a VTVM, you can turn the receiver's volume control full on, set the generator for



Replacing old-style loop antenna with modern ferrite rod permits addition of external long-wire.

internal modulation and align for maximum speaker volume. In either instance, be certain the signal generator is at its minimum usable level.

Alignment chiefly consists of using an insulated alignment tool to adjust the IF transformers for maximum output. Unless junior has screwed the loose screws tight, even an old radio should require just a slight trimming for peak alignment. On the other hand, addition of the gimmick may have thrown the alignment off considerably.

Now disconnect the generator's output lead and set the generator to 1000 kc for RF alignment. If you have a loop antenna it's a single adjustment. Place the generator's output lead near the loop or clip it over the loop. Set the radio dial to 1000 kc and adjust the oscillator trimmer for maximum output. (The oscillator trimmer is the one for the small set of tuning capacitor plates.) Then adjust the antenna trimmer (the one for the larger plates) for maximum output.

If you are using an adjustable rod antenna, place the generator's output cable near the coil or clip it to the rod. Adjust the oscillator as previously described. Then, pushing the rod's coil with an insulated alignment screwdriver, position the coil for maximum output at 1000 kc. This done, set the dial and generator to 1600 kc and adjust the antenna trimmer for maximum output.

The receiver now should exhibit reasonably linear sensitivity over the entire BC band. For extra sensitivity at some particular frequency, just peak the antenna trimmer for that frequency. Such adjustment may give little effect on loop or fixed rod antennas, but it can increase sensitivity appreciably with an adjustable rod antenna.

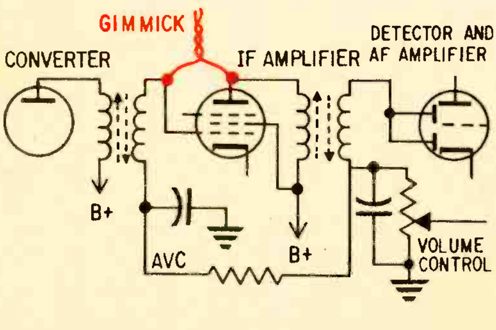


Fig. 3—Gimmick causes IF amplifier to be on verge of oscillation, increases selectivity significantly.

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

NOW! TWO NEW PROGRAMS!

- Industrial Electronics for Automation
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HI-FI TODAY

By John Milder

✓ *Sizing up silicons*

✓ *The felicific FET*

THE germanium-vs-silicon argument raging in the transistor world (with Scott and Sherwood plumping for silicon and Harman-Kardon for germanium) reminds me just a bit of the triode-pentode hassle in the days when tubes were king. That olden-day dispute was resolved not by a victory for either protagonist but by the appearance of new circuits (like Dave Hafler's and Herbert Keroes' ultra-linear hookup and a whole new breed of superior output tubes (e.g., the EL34, 6550 and KT88). This one well may meet like fate.

From the best information I can get from engineers not emotionally involved in the current set-to, silicon vs germanium is no more pertinent than triode vs pentode. Both types have strengths and weaknesses, each belongs in different applications and neither is a do-all-and-end-all. So let others fend and feud. Simply choose your equipment on what always has been the only reasonable grounds —on the basis of what sounds and stands up best.

The noise from the silicon-germanium hassle may have obscured the important arrival in audio of the field-effect transistor. As you may be aware, the FET sports an almost perfect square-law characteristic, which is another way of saying it makes a good tuned RF amplifier.

With previous RF transistors, designers had to back off a bit from theoretically maximum sensitivity to prevent overload and cross-modulation. But with the FET it's possible to achieve both maximum sensitivity and selectivity—assuming only that the circuits men have the time, patience and brainpower to figure out how to use it properly. (I tack on this last because the field-effect device, though around for a while now, is just beginning to appear in tuner circuits. Scott is using it in a couple of its receivers, KLH in a tuner and receiver as well as complete music systems.)

The so-called modular music system (a space-age term for what once was known as a component setup) continues to gain in popularity. Benjamin and Harman-Kardon have joined Fisher, KLH and Scott in the modular field and now we have a new wrinkle—the modular system built around tape and only tape with no provision for record-playing.

Ampex offers several tape-only combinations (one of which, the 865/815 combo, is shown in our photo). And Wollensak (3M) is marketing the 5300 combination, with others in the offing. It will be interesting to watch their progress since the new reel-to-reel entries at this point look more promising commercially than the home cartridge machines. Prices on the new tape modulars, incidentally, range from roughly $280 to $440.

It's still a bit early for predictions but it looks as though the FCC's recent edict that

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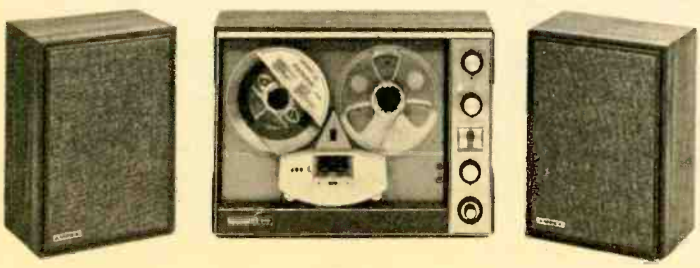
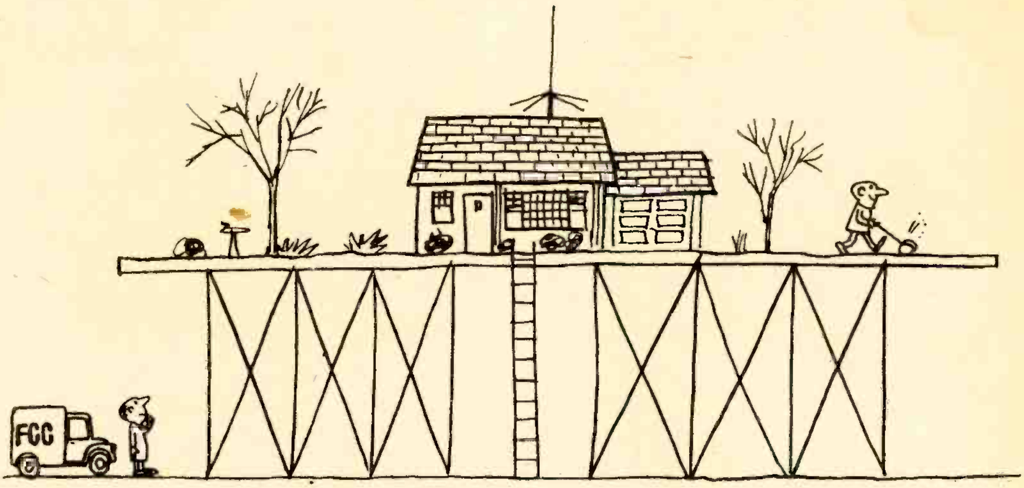


Ampex's 865 tape recorder ($309) can be paired with two 815 speakers ($65 the set) for a completely disc-less stereo system. Recorder employs dual capstan for foolproof, fingertip tape reversal.



Life With the New Rules

By LEN BUCKWALTER, KBA4480

SPECIAL CB SECTION

El again presents what has proven to be one of its most popular bonus features—a Special Section on Citizens Band Radio. For added convenience, an index to our Special CB Section appears below.

THREE years of club-house controversy are over. Washington lawyers have put away their briefs. And a million CB signals never again will hop, skip and jump with the old abandon. The end came on April 26, 1965—the day when tough, toothy new CB regulations became the law of the land. Where 23 channels existed, there now are seven or 16, depending on whom you talk to. Silent periods are 5, not 2 minutes. Further, there now are crystal-clear definitions of what you can and cannot do on the band.

Have the new rules killed the mass of heterodynes heard nightly in the Bronx? Or grounded the skip specialists in the South, perhaps cut down some California kilowatts? In talking to FCC officials, club presidents, equipment makers and CB operators we got answers on both sides of the line. Some argue there's not one whit of difference on the band. Others speak of swift, sudden changes. Who's right? In something so vast and seething as Citizens Band Radio, both observations are proving correct.

As this is written, a live CB transceiver sits nearby. The antenna, high on a hill, picks up signals from dozens of towns within a 30-mi. radius. As we search the 23 channels we encounter CB at its best—and worst. The worst usually is during evening hours. An example is what just came in on channel 15.

By uttering less than a dozen words, one operator has just violated at least six regulations. He said simply, "This is Captain Kidd in Halifax, N.S.; can anyone hear me?" There are plenty of takers, plus one youngster who follows the Captain's lead, goes to another channel and solicits calls under the name Big Red from Sydney, N.S.

Away from the band's mid-section, even during nighttime activity, we note plenty of room for any station wishing to communicate with its own units. But not all are within the limits set down by the rules, including the following exchange between a Unit 1 and a Unit 2.

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Male voice: "I thought I'd talk to you while I did the dishes."

Female voice: "Come on over and do mine when you're through."

A substantive message? You decide. In any case they're on a proper channel using proper identification.

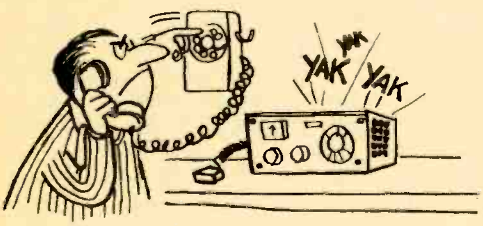
During the day (in this area, anyway) CB shines with virtue. It buzzes with people going about their business, all the while enjoying solid benefits of two-way radio. We can hear a gas station dispatching a repair vehicle to a stranded customer, a delivery truck reporting to its office, a TV serviceman being directed to his next call by his wife. No conflict, plenty of channel space, no rule-twisting.

Another tack is to look at CB license applications and what happened to them when the new rules took hold. Our chart (see last page of this article) shows a sharp fall in license activity during that critical period. But to get an interpretation of what the drop means we asked the FCC's William Grenfell, who heads CB from Washington, what he thinks.

"Applications are averaging a little lower than a year ago," he said, "but I think it would be speculation to conclude that the new rules have caused the change."

Others suspect that the curve downward was affected strongly by a seasonal, year-to-year fluctuation. Thus CB has held up nicely under fire —much as it did back in March 1964 when struck by an $8 license fee.

But as U.S. citizens merrily continued to plunk down cash for licenses, CB manufacturers braced for trouble. Not only did they face a predicted dip in sales, they also were on the verge of the economic doldrum that occurs every summer. Four of CB's leading manufacturers relate a near-identical story of what happened.



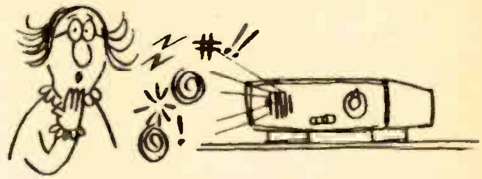
"In June and July of last year," reports one, "we think the new rules caused a sizable dip. But now everything's on the upswing. There's no reason to believe the comeback won't continue."

Another remarks, "We noticed an effect from the beginning of May up until September. There was a drop-off in our business but it was coupled to the normal summer slump. We're completely out of it now and, in fact, have added many new dealers."

The two other CB makers echo the pattern: temporary fall-off, then a return to brisk sales.

Sharpest difference of opinion concerns what's happening on the air. One club president roundly denounces the new system for dividing the band. He thinks it's created what he labels the Horrible 7—meaning channels 9 through 14 plus 23, which are set aside for stations of different call-signs. Ramming stations into a tight space, he argues, raised a screaming mass of heterodynes few can penetrate. Worse yet, since club members operate under different call-signs, they're stuck on the Horrible 7.

That club president eloquently supports his case by relating what happened after a recent mid-air collision that caused a commercial airliner to crash-land in the club's area. To contact rescue officials and offer his four-wheel-drive vehicle he had to transmit on normally-forbidden channel 2.



One report from Florida tells of a CB operator working, in rapid succession, stations in Texas, New York and Illinois. Skip talk, of course, was illegal even under old regulations. But this character added insult to injury by conducting skywave contacts on channels 15, 17 and 19—numbers not assigned even for interstation use under the new rules.

Whether such blatant disregard of the law has diminished under tighter rules still is open to speculation. In the months following the rules change, however, there has been no major increase in the number of violation notices issued by the FCC. This suggests that, by and large, there is compliance with the channel-dividing provision.

"It's a lot quieter on the band," reports R. W. Drobish of Hallicrafters in Chicago. Richard Lehman of New York's ECI makes an observation that could hold true for much of the country: "The main thing that's changed is selection of channels"—implying that there's still chit-chat between different stations but that they at least are not interfering with serious operators on the other 16 channels. Up in New England, FCC engineer-in-charge N. A. Hallenstein cautiously notes: "There's been *some* improvement but not a *marked* one."

CB Chief Grenfell sums it up: "If you use the number of violations as a barometer, then little difference is reflected. I've had people tell me that 'In my town there has been a lot of changes.' Others say they couldn't notice any change at all." Mr. Grenfell stresses that the number of violations depends on how many man-hours are spent in monitoring. And this activity is not significantly different from what it was in the past. One CB operator makes this dry comment on the subject: "Everyone *knows* the new rules are in effect. The problem is that there are a lot more CBers than FCC monitors."

Since some band inhabitants believe any new rule is made to be broken they've revived a scheme for defeating the tightened version. It's not a new trick but one that has enjoying increased use in many sections of the country. It goes something like this:

Let's say KXXX wants to get on the air and gas about anything with anybody. He hits the mike and says, "This is KXXX, Unit 1." (Pause.) Anyone out in radioland who hears the come-on and wants to join the fun gets on and says, "This is Unit 2. . ." To a third party listening, this might sound like a legal exchange between two units of the same call-sign. What's more, they can do it on any of the 23 channels since they're units of what passes for the same station.

Whether lawbreakers now are running greater risks goes back to the

Life With the New Rules

monitoring problem. An important function of the new regulations is to aid FCC men in spotting offenders. And this job is getting easier since most violations tend to occur in two-station contacts (the ones now confined to the seven prescribed channels). But it will take more men and equipment to handle the job. It really boils down to more money.

At one time it was believed that the $8 license fee would supply these funds. Congress, however, shows no sign of letting the FCC have the needed money, which now resides in the U.S. Treasury.

Despite its under-funded condition, the Commission has scored one spectacular victory since the new rules went into effect. It happened in the courts. For the first time an operator was tried, convicted and sentenced to one year in prison on a charge of transmitting obscene, indecent and profane language. This in itself is not news, since there have been similar cases. What is significant is that it was the first time the sentence wasn't suspended immediately in a case of this type. (At this writing the man is out on $5,000 bail, still faces the sentence.)

There's no question but that there's been a frightening impact on many CBers who've heard of the case. They'd almost believe that uttering gol-dang-it on the air well could bring the feds crashing through the door. But there's no reason for this feeling and a closer look shows why. Richard Everett, FCC attorney who worked on the case, supplies the background.

The man was no ordinary CB operator. He left a tattered trail that ultimately led to a five-count indictment. At no time did he hold a license in his own name. He used his wife's call. And her ticket was revoked because of improper operation by both parties. A fine, too, was levied. Then he filed for his own license—following it up with filings by his mother, father and two brothers. The Commission designated all five members of the family for a hearing but no one showed and the applications were dismissed.

One thing that really disturbed FCC men in the Boston area, where this happened, was that the man also duped a lot of otherwise innocent CB operators into violating the law. He twisted the rules and tried to create loopholes.

The case has its share of irony, too. After the offender had been sentenced to jail on the obscenity charge, his lawyer withdrew from the case. The judge had to file the man's appeal. Though this case sent shock waves through CB, it must be emphasized again that this was no average CBer trapped in some minor transgression. The case was long and

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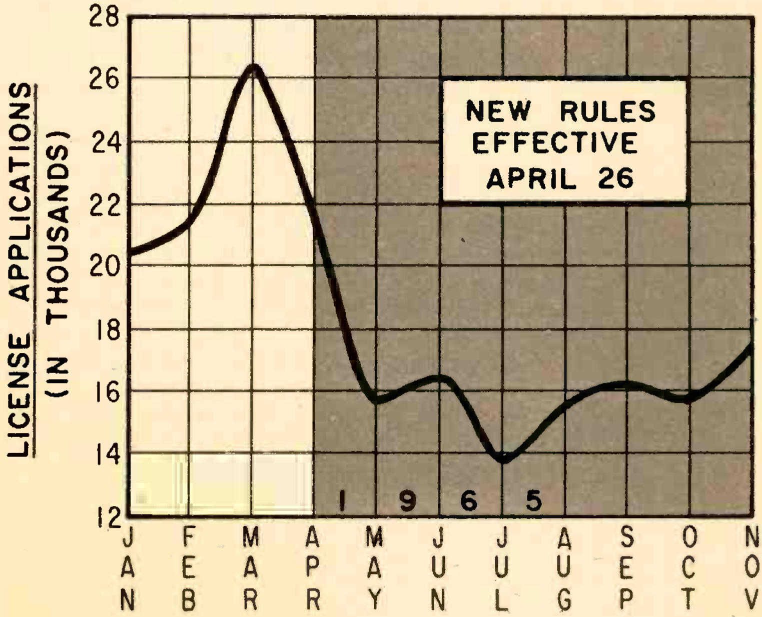
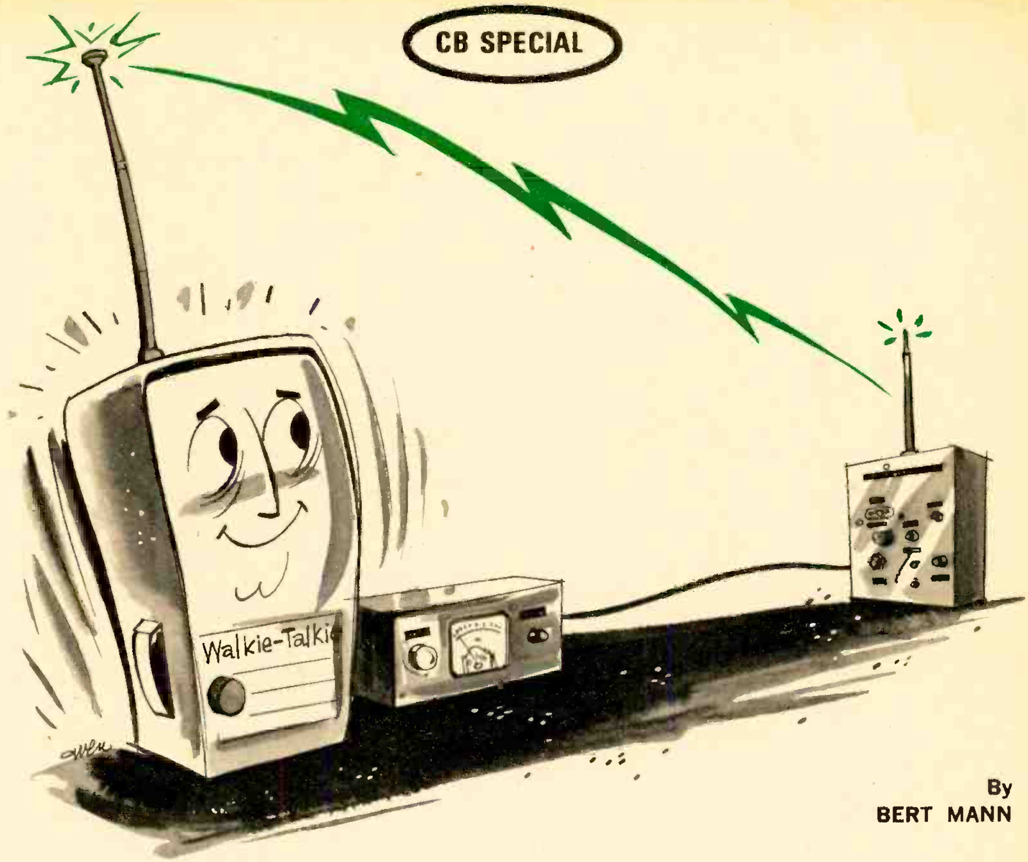
Though number of license applications dropped drastically when new rules became effective back in April of 1965, cautious observers stress that seasonal fluctuations may have accounted in part for the decline. Current outlook: onward and upward.





By
BERT MANN

Walkie-Talkie Tester

Put punch back in your transceiver with this all-in-one service instrument.

SO long as it's working, a walkie-talkie is an extremely reliable, rugged electronic device. But when it gives up the ghost it becomes a giant migraine headache.

When it comes to servicing walkie-talkies, you'd think a conventional signal generator would be the answer. But a generator has only rough calibration at 27 mc and it's useless for alignment. And a 5-watt rig, more often than not, will overload the walkie-talkie rather than provide a useful test signal.

What you need for alignment is a *crystal-controlled* signal generator with an adjustable low-power output. You also need an audio signal for testing the modulator and speaker/mike. A remote indicating field-strength meter (FSM) for measuring the walkie-talkie's RF output *at a distance* also is a must.

The Walkie-Talkie Tester sports all these features. It's a *modulated* crystal-controlled RF generator whose signal you use to align the walkie-talkie's receiver. It also puts out an audio signal at just the right level so you can check if the walkie-talkie's modulator is working or if its speaker/mike is defective. Finally, it's a sensitive remote-indicating FSM.

Construction. Component values are critical, therefore, make no substitutions. The Tester is built in the main section of a 4 x 5 x 6-in. Minibox. A large cabinet is needed to prevent the whip antenna from tipping over the cabinet.

First, build the modulator/AF oscillator, on a piece of 2 7/16 x 3⅜ in. (stock size) perforated board, following the pictorial in Fig. 1. Cut off the yellow and green leads on T1's secondary and use only the white and brown. Set the board aside and go on to the oscillator.

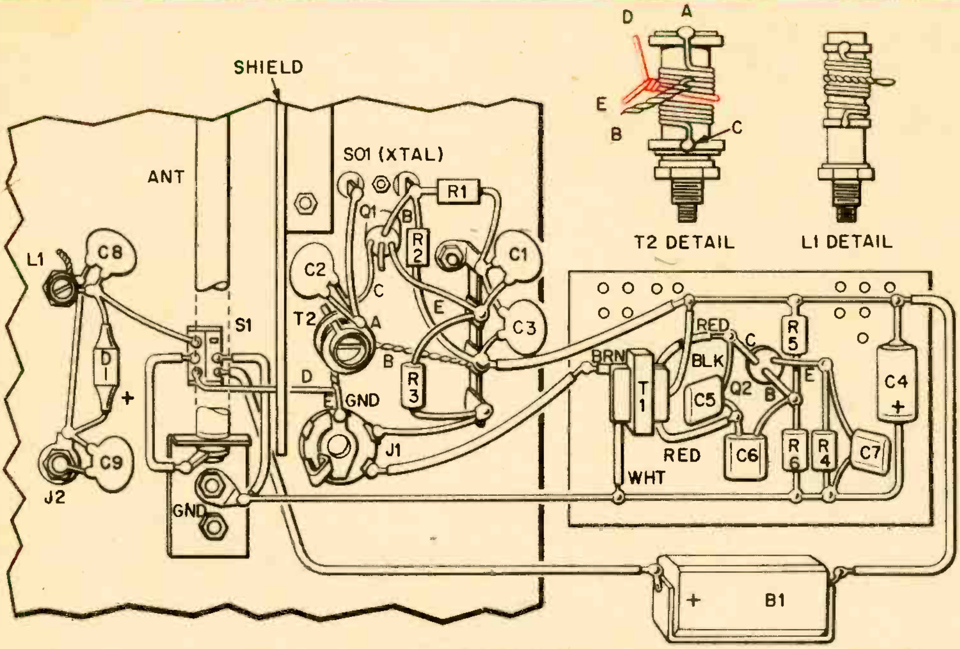


Fig. 1—Mount the antenna on home-brew L-bracket using fiber shoulder washers to insulate it. Shield between FSM at left and RF oscillator at right is made of scrap aluminum.

Walkie-Talkie Tester

The construction of coil T2, which is wound on a stock form, is critical so take care when winding it. If it isn't a neat job, start over again. First, tensilize a 2-foot length of #22 enameled wire by clamping one end in a vise and pulling the wire until it goes dead slack. If the wire is not tensilized it will unwind after you wind the coil. Scrape about ¼-in. of insulation from one end and solder it to lug C near the mounting screw.

Run the wire along the form for ⅛ in. and then wind 5 closewound turns. Bring the wire away from the form to make a loop, bring the wire back to the form, twist the loop once at the form and then wind 6 more turns. Solder the wire to Lug A. Scrape away the loop's enamel insulation, twist it tightly and tin it with solder.

In the center of the coil right over the loop, wrap a single turn of #22 wire as shown in the detail sketch in Fig. 1. Twist the loop's leads on the side opposite the form's lugs. The single-turn link should have 6-in.-long leads. Cover the coil with coil dope or radio service cement and set it aside to dry for about 24 hours.

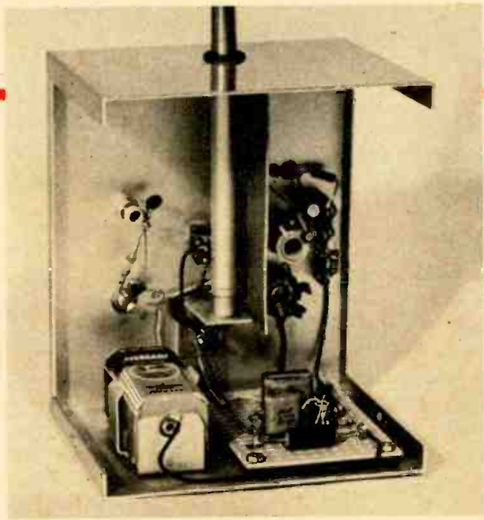


Fig. 2—Antenna hole is 1⅜ in. back from front of cabinet. Put grommets between board and bottom of cabinet. Put tape on cabinet under board.

Now build the oscillator on the front of the cabinet. Connect all leads, except the lead from J1, to the modulator board and connect the battery. Install a 2¼-in. wide by 4-in. long shield, cut from a section of scrap alumi-

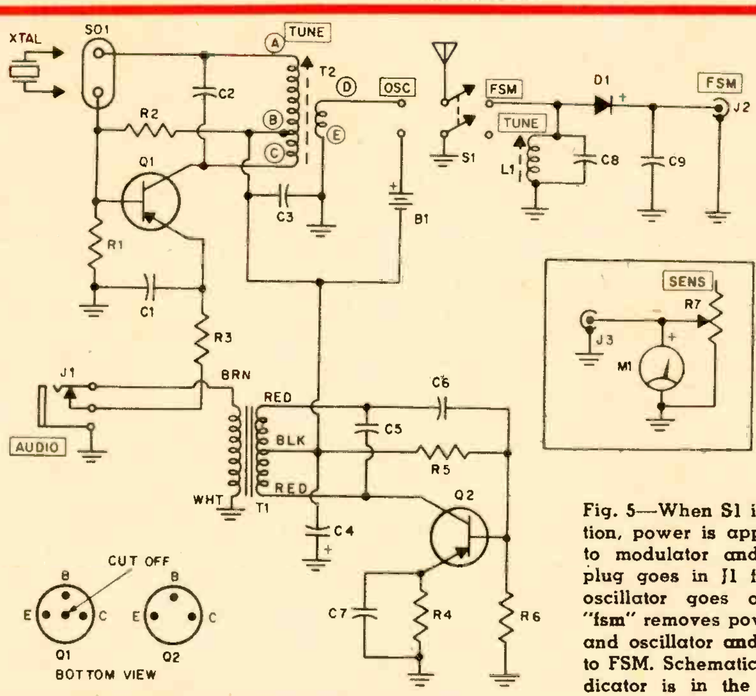


Fig. 5—When S1 is set to "osc" position, power is applied automatically to modulator and oscillator. When plug goes in J1 for audio tests, RF oscillator goes off. Setting S1 to "fsm" removes power from modulator and oscillator and connects antenna to FSM. Schematic of FSM remote indicator is in the box at the right.

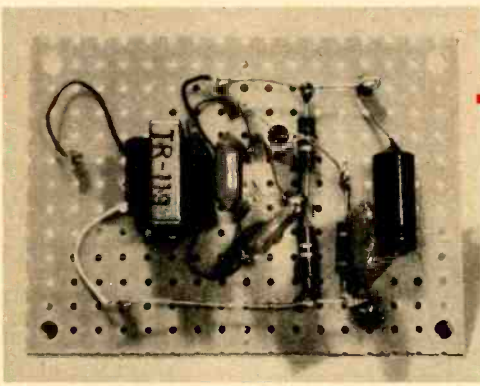


Fig. 3—Modulator is built on a 2 7/16 x 3⅜-in. piece of perforated board. Drill holes in corners and mating holes in cabinet bottom for mounting.

num, from the top of the cabinet to the antenna L-bracket. Drill a ⅛-in. hole in the shield, as shown in the pictorial, pass one lead from the single-turn link (D) through the shield and solder it to S1. The remaining link-lead (E) connects to the ground lug on normally-closed jack J1. Make certain that the lead from R3 to J1 is connected to lug that's *lifted* when a plug is inserted.

Next, install the FSM section (at the left of the antenna in Figs. 1 and 2). No problems here as L1 is a stock coil; just push its tap out of the way. Complete all wiring, install the collapsible antenna using a grommet in the top of the cabinet. Finally, connect the antenna to S1.

The FSM's remote indicator is built in the main section of a 2¼ x 2¼ x 4-in. Minibox as shown in Fig. 6. Any layout will do.

Checkout and Operation. Plug a third-overtone CB transmit crystal into SO1, extend the antenna and set up your 5-watt rig or a walkie-talkie nearby. Either should be tuned to the same channel as the crystal in the Tester. Put a knob on T2's slug-adjustment screw. Set S1 to *osc* and from the full counter-clockwise position, adjust T2's slug until you hear the Tester's signal on the 5-watter or the walkie-talkie. If necessary a slight adjustment of T2's slug will rubber (shift) the oscillator's frequency slightly. This will be indicated by a fall in the 5-watter's S-meter indication or by distortion of the tone in the walkie-talkie.

The Tester is deliberately designed to shift the crystal frequency as many walkie-talkies are not exactly tuned to the channel frequency. And it is important that the walkie-

Walkie-Talkie Tester

talkies be aligned to *each other's* operating frequency, regardless of what it is.

Before you attempt to do anything to the walkie-talkie, be sure to get hold of a copy of its schematic. In addition to the schematic, try to obtain a diagram showing the physical location of all parts so you can quickly find the RF and IF transformers and coils.

To align a walkie-talkie set-up the Tester across the room from the walkie-talkie. Then extend both the walkie-talkie's and Tester's antennas. Adjust T2's slug if necessary, to get the oscillator working. Then adjust T2's slug again for maximum S-meter indication on the 5-watter or for undistorted tone on the walkie-talkie. Collapse the Tester's antenna until the signal received by the walkie-talkie being aligned is just audible.

Now, align the walkie-talkie receiver's RF and IF transformer for maximum audio output. Keep the Tester's signal at the lowest readable level by collapsing the antenna or moving the Tester farther away to prevent the walkie-talkie's AVC from masking the alignment adjustments.

If the walkie-talkie just produces an unmodulated carrier, disconnect its speaker and connect it to J1. If the speaker is okay you'll hear a weak but clean tone. If the speaker checks out, connect the leads that went to walkie-talkie's speaker to J1. If the walkie-talkie's modulator is defective there will be no modulation of the carrier (as received on another walkie-talkie or the 5-watter).

You can then signal-trace as you'll have a steady tone feeding into the walkie-talkie. If you can drive the tone through the modulator—even if it sounds distorted—the defect is probably in the speaker or switching leads.

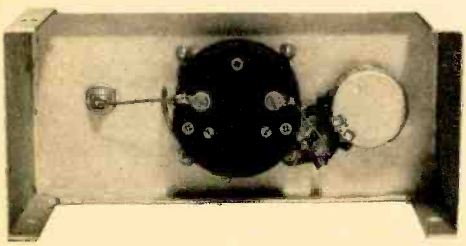


Fig. 6—FSM remote is built in a 2¼ x 2¼ x 5-in. Minibox. Parts placement is not critical. Connect it to Tester with RG174/U coax cable.

The remote FSM is used to tune up the walkie-talkie's transmitter. Extend the Tester's antenna all the way, set S1 to *fsm* and plug the remote indicating meter into J3 using shielded cable. Set R7 to about mid-position and activate either an operating 5-watt transceiver or a walkie-talkie. Using a plastic alignment tool, adjust L1 for maximum meter indication. Use R7 to keep the pointer on-scale.

To peak the walkie-talkie's transmitter, place the Tester as far as possible from the walkie-talkie. Stand the walkie-talkie upright—away from metal objects—and peak-up the transmitter for highest meter indication.

After the transmitter is peaked, check to make sure it starts by pressing the push-to-talk button. The FSM should indicate as soon as you press the button. If it doesn't, slightly detune the oscillator, tuning first on one side and then the other until the oscillator starts each time the button is pressed.

PARTS LIST

ANT.—12 section, 54½-in. collapsible antenna (Lafayette 99 R 3008 or equiv.)
B1—6 V battery (Eveready 724 or equiv.)
C1, C3, C9—.001 µf, 500 V ceramic disc capacitor
C2—25 µµf, 500 V ceramic disc capacitor
C4—30 µf, 15 V electrolytic capacitor
C5, C7—.25 µf, 75 V ceramic capacitor
C6—.1 µf, 75 V ceramic capacitor
C8—62 µµf, 500 V silver mica capacitor
D1—1N34A diode
J1—Single closed circuit phone jack (Switchcraft 12A or equiv.)
J2, J3—Phono jack
L1—CB transceiver oscillator coil (1,650 kc IF) Lafayette 32 R 0909
M1—0-50 µa DC microammeter
Q1—2N274 transistor
Q2—2N217 transistor
Resistors: ½ watt, 10% unless otherwise indicated
R1—33,000 ohms
R2—22,000 ohms
R3—2,700 ohms
R4—82 ohms
R5—270,000 ohms
R6—10,000 ohms
R7—1,000 ohm, linear taper potentiometer
S1—Miniature DPDT toggle switch
SO1—HC6/U crystal socket
T1—CB modulation and audio output transformer; primary: 500 ohms, center tapped. Secondaries: 8 ohms and 3,000 ohms. Lafayette 99 R 6132
T2—Oscillator coil wound on a J. W. Miller No. 42A999CB1 coil form (Lafayette 34 R 8948). See text.
XTAL—Third overtone CB transmit crystal
Misc.—4 x 5 x 6-in. and 2¼ x 2¼ x 5-in. Miniboxes, perforated phenolic board, flea clips, battery holder, terminal strip, shielded cable

CB SPECIAL

What's really new in CB EQUIPMENT?

By DAVID WALKER

THIS IS the year of the triple-S CB rig—small, silicon and Samaritan. *Small* because the change-over from comparatively big tubes to tiny solid-state devices is in full swing. *Silicon* because this is the transistor that's unseating the older, weaker germanium type. *Samaritan* because much CB equipment now is designed with an eye on the H.E.L.P. program which, if hopes get over the hurdles, may manage to put CB in a large percentage of the nation's 70 million cars.

As for front panels, you can forget about that old Oh Boy, a Remco Toy! jazz. Now you'll declare: The Truth to Tell, It Apes Bell Tel. Reason is that a new seriousness pervades CB gear as manufacturers size up markets that well may set today's near-million CBers to playing second fiddle. Makers, in fact, envision CB spilling into the business world with all the din of a Niagara while capturing the general public's fancy in a manner few foresaw. And therein lies the explanation of why an increasing number of rigs sport such banners as: Fits anywhere! Under $100! More reliable! Simpler controls!

Gone is the glitter many one-time special features once held. PA function, combination S- and output meter and speech compressor now are old hat simply because they've become standard equipment on so many sets. Even the 23-channel rig, which some said would fall before the new FCC rulings, now is available in a surprising number of new models. But not all CB features thrust forward with equal alacrity. Single sideband and selective call currently generate about as much excitement as a waltz in a discotheque.

What's happening behind the self-assured, low-profile 1966 models? For one, solid-state puts backbone in the claim that new sets are more reliable. At least one manufacturer, Kaar, recently extended its guarantee to two years on some models. And unless you pull some devil-may-care stunt in the manner of one CBer we know, much of the maintenance headache *does* disappear. (That CBer hit his mike button with no antenna connected and popped the final RF transistor.)

Though transistors star in the new sets, they by no means are

What's really new in CB EQUIPMENT?

ubiquitous. Some manufacturers elect to go the route of the hybrid—semiconductors in some circuits, tubes in others. The Browning Raven, for example, relies on a two-Nuvistor front-end to receive the weak signals. Nuvistor developer RCA, on the other hand, proclaims all-silicon transistors in its new Mark 10.

Another CB maker applauds solid-state but says it is no easy feat to handle the heat-dissipation problem. Fact is, CBers will have to keep this firm's rigs out of the hot-air blast from a car's heater in winter, just as they will have to let things cool a bit before firing up if the car has been standing in summer sun. But these precautions seem a pittance to pay for units that draw about the power of a pilot lamp while receiving, not much more when transmitting.

Some trends in new CB gear indicate greater operating conveniences, others reflect new attempts at improving circuits. More manufacturers (USL, Sonar) now provide front-panel sockets for quick change of receive crystals. Several producers (International Crystal, Tram and Demco) offer control heads—small separate units which mount under the dash while the main circuits hide in the trunk. Significantly, the Tram XL-100 rig includes two novel features to keep it tamper- and theft-proof. There's a key-operated switch (like a car ignition) for turning on the power and a special mounting bracket to padlock the whole thing to the dash.

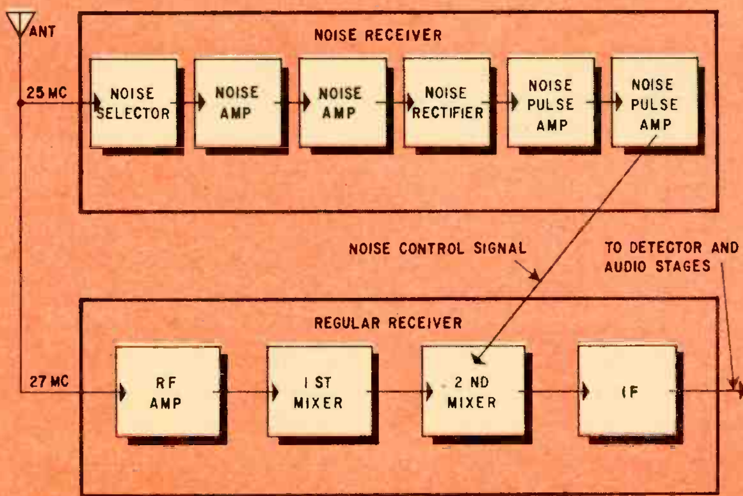
In an otherwise business-like lineup of new CB equipment, two transceivers can be called unusual: the Lafayette HB-600 and the Squires-Sanders Thor Eleven. Either or both could be the bridge between CB, the related business band and H.E.L.P.

The Lafayette unit takes a bold step in the direction of a dual-purpose rig that includes virtually all CB features and provision for operation on the adjacent business band. Full 23-channel CB coverage is built in, with extra crystal positions for two business-band frequencies.

Known as the CB Commander, the Lafayette set also has attracted considerable attention for its technical sophistication. It incorporates one of the most elaborate noise-silencer circuits found in any CB transceiver today. Rave notices captured by this circuit can be explained on the grounds that it utilizes a receiver-within-a-receiver rather than the conventional one- or two-stage limiter. As detailed in Fig. 1, that second receiver is devoted solely to processing and squelching noise.

The Squires-Sanders Thor Eleven is a *30*

Fig. 1—Lafayette HB-600 tosses out conventional one- or two-stage limiter in favor of noise silencer that is a receiver-within-a-receiver. When noisy CB signal enters regular receiver, noise receiver picks up identical noise (but less CB signal) on nearby frequency. Noise is amplified separately, then converted to DC pulses which, fed into regular receiver, tend to cancel out any similar noise on signal frequency.



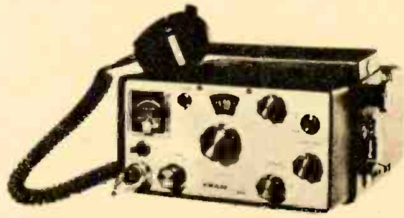
watt transceiver now in a hang-fire state. Awaiting the outcome of a H.E.L.P. proposal to increase power on two 27-mc frequencies. the rig will be pegged in the under-$500 class. It's intended for those services that best would aid the CB-equipped motorist, be they emergency vehicles, ambulances or what have you.

In another Squires-Sanders rig there's evidence of what's happening to conventional CB transceivers that anticipate the H.E.L.P. program. The SS 23'er has a color-coded dial marked for quick identification of channel 9 (the present, unofficial H.E.L.P. channel). And Raytheon, one of the earliest outfits to hop on the H.E.L.P. bandwagon, now markets the TWR-7. This tiny all-transistor set, according to the maker, is as easy to use as a telephone and can operate on a nearly-dead car battery. Raytheon is counting on distribution through Ford dealers to reach the motoring public. Price of the TWR-7 is $129.95.

Other manufacturers also are scaling down prices and simplifying equipment to gain access to wider markets. Pearce-Simpson has announced its six-channel, all-transistor Sentry for $99.90. Multi-Elmac's Citi-Fone, an eight-channel unit, goes for $99.95. And Hallmark Instruments takes a new and different swipe at H.E.L.P. by offering the Banner 85, an eight-channel job that also contains an AM broadcast-band receiver, for $99.50.

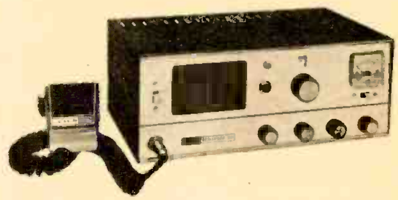
One technical tidbit which just may catch

Kaar Skyhawk, compact solid-state set, comes with usual guarantee but for unusual 2-year period.

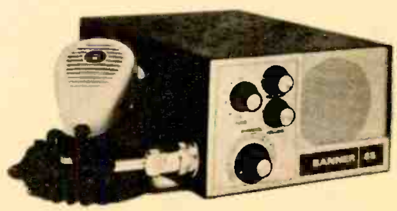


Tram XL-100 has key-controlled on/off switch (top right of panel), lockable mounting bracket.

Lafayette HB-600 incorporates unique RF noise silencer, operates on 23 CB or 2 business channels.



EICO Sentinel 12 goes for just a smidgeon under $100, features a 23-channel tunable receiver.



Hallmark Banner 85, a transceiver with a difference, also tunes the standard AM broadcast band.

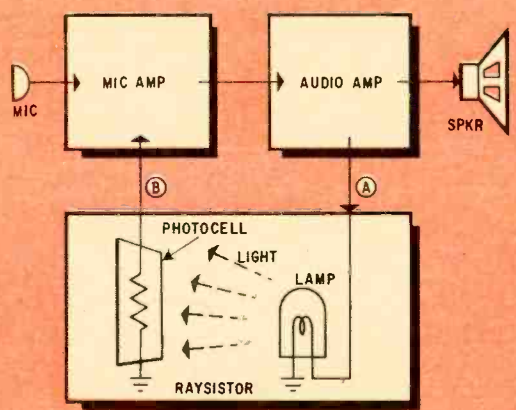


Fig. 2—USL Contact employs a novel speech compressor. Audio, tapped at point A, lights lamp, thus enabling photocell to vary gain at point B.

What's really new in CB EQUIPMENT?

on is a simple speech-compressor circuit in USL equipment. It relies on a photocell and lamp in a feedback system that automatically keeps audio modulation high (see Fig. 2). Still more important is the advent of low-price mechanical filters, which promise to set the pace in receiver selectivity.

If kit-building is your dish, there's good news. Prices have been reduced on simple, stripped-down models by Heath and Allied Radio. The Heath GW-12A, a one-channel job with superhet receiver and push-to-talk mike, now is a low $34.95. (Heath also gives a 5 per cent discount if you order two or more 5-watt transceivers.) Allied's low-cost Knight-Kit is the C-540, which contains AC power supply and superhet receiver. Price is $44.95; $5 more brings you a mobile power supply.

At the higher end of these lines are new sets by both kit makers. Important news from Heath is the GW-14, which meshes with the trend toward extremely compact, solid-state, all-channel operation. Construction centers on a single circuit board to reduce chances of error. Crystals for one specified channel are included in the kit price of $89.95; a crystal package for 23-channel coverage (46 crystals) is an additional $79.95.

The new big rig from Allied is the Safari I, a mostly-tube set that includes all channels at $129.95. Construction of the complex frequency-synthesizer section, which makes possible all-channel operation, is simplified by a preassembled and factory-aligned module.

EICO, long a leading kit producer, currently is readying two new transceivers which mark that company's transition into the field of solid-state CB. Though final specs are not available at this writing, one is an all-transistor 23-channel set that features frequency synthesis and a crystal filter. Price reportedly will be under $200. A companion model, less expensive, will have 12-channel capability with plug-in crystals. Tentative tab is on the shy side of $150.

Unlike other recent models in the EICO CB line (Sentinels 23 and 12), these new units will be offered in both kit and wired form. Preassembled and factory-tuned sections, especially in the critical frequency-synthesis section, lead EICO to feel it has licked one of the big problems in any kit-built model.

While manufacturers slick up their wares with semiconductors, the antenna people are having a ticklish time advancing the state of *their* art. Progress comes with grudging slowness in an area boxed in by height restrictions and limits imposed by textbook theory. Yet these boys won't be caught napping in an effort to feed CB's appetite for more power.

One entry by Antenna Specialists is the Scanner, an electronically rotated beam. Three fixed vertical elements are combined in various ways by remote relays to shift the pattern to the desired direction. A somewhat different non-rotating affair is the Hy-Gain Co-Phaser, which electrically combines two identical base-station antennas for added gain in several switch-selected directions.

[*Continued on page* 113]

Heathkit GW-14, though small and complex, is easy to construct due to single printed-circuit board.

Knight-Kit Safari I boasts factory-wired synthesizer circuit which builder places on main chassis.

CB CORNER

BY LEN BUCKWALTER KBA4480

CB SPECIAL

WANDERING WATTS

BUY a transistor portable and it likely is Japanese. Put up a TV antenna and it well may be a Yagi. Fool with tunnel diodes and you can thank Esaki. And even CB antennas now sport an oriental touch. Produced by Hy-Gain, the so-called Duo-Beams were developed by Charles Liu who heads the company's 35-man staff of engineers. Liu was born in China, lived in Formosa and now contrives new antennas in Nebraska.

Duo-Beams are the high-and-mighty antennas of the CB field. Twin beams, stacked side by side, supply the most signal gain you now can get and still crawl under the legal height restriction. But a talk with Liu reveals that Duo-Beams really sprang from a long-time problem that's been a bogle to many a beam designer. Though it is called mast lighting, it has nothing to do with light. It is caused by part of the beam's signal hitting the supporting mast in light-like fashion.

The evil of mast lighting is shown in our sketch. In a traditional beam radio energy spills off the elements and hits the mast below. Now the mast becomes an element—it has been illuminated—so it fires back a signal. Gone is the sophisticated symmetry that engineers slide-ruled into the design. Instead of firing a lobe of signal straightaway, the beam flicks out the signal in less than optimum fashion. Trouble stems from wandering watts.

But look at the two-beam arrangement. Sure, soup from two separate antennas strikes the mast. But since the effect is equal on both beams, you can forget about it.

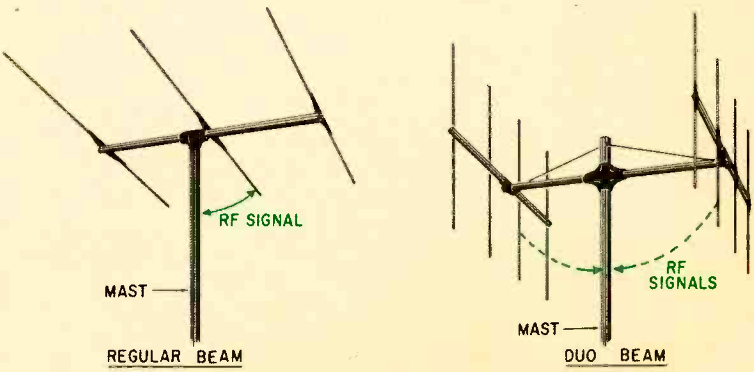
Hy-Gain president Andy Andros proudly says: "We've achieved phase zero. The beams don't 'see' the mast anymore." Still another bonus is the fact that this balancing act makes the intruding coax line disappear . . . electrically, that is.

Six-Buck Blooper . . . Tacked on the back of every solid-state rig should be this bit of doggerel:

If in caution you desist, Sir,
You'll pop your last transis-tor.

For though the semiconductor continues to come on with much hoopla, not nearly enough has been said about some important precautions. Transistors simply can't take the kind of abuse you can heap on tubes. Fact is, you must follow the book to grab the benefits of solid state. Take the matter of output load.

CB sets—tube or transistor—are designed to work into a 50-ohm load, presented by line and antenna. But let's say no antenna is connected. Hit the mike button and you sock the final RF transistor with a whopping voltage that like as not will cause breakdown of the semiconductor material. Big, wide-spaced elements in a tube try to laugh off such shocks but delicate semiconductor junctions wither [*Continued on page* 114]



Symmetry of dual-beam antenna accounts for removal of mast as radiating element. Traditional beam (at left) radiates from elements and mast, but pairing of elements in dual-beam is said electrically to prevent watts from wandering onto mast.

KIT EI REPORT

EI Reports on THREE FIVES UNDER SIXTY

You don't need a pile of hard cash to throw a 5-watt CB rig on the air. EI surveyed the market and found three under-$60 transceivers in kit form that provide reliable communications. We assembled and tested the Heathkit GW-12A and the Knight-Kit C-540 and checked a prototype of Lafayette's Comstat 9.

Heathkit GW-12A

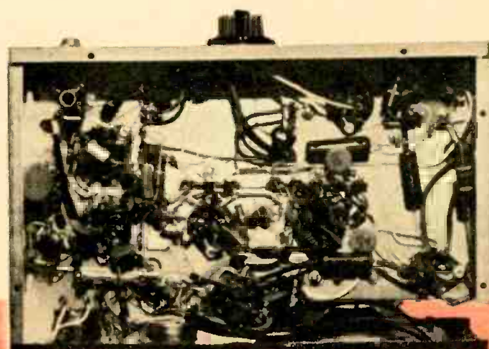
BEARING a price of only $34.50, the Heathkit GW-12A presently is the lowest-cost 5-watt CB transceiver on the market. Its lack of frills and one-channel design make it the ideal H.E.L.P. (Highway Emergency Locating Plan) transceiver. Both transmitter and receiver are crystal-controlled (the receiver is not tunable) and the two crystals (supplied) are inside the cabinet. Only a volume and squelch control are on the front panel.

The GW-12A is designed for 117-VAC operation only. The $39.95 Model GW-12D operates on 6 or 12 VDC *and* 117 VAC. Its DC power supply rides piggy-back on the rear chassis apron as shown in our photo on the next page.

The Circuit

The GW-12A's seven-tube circuit is stripped to the bone. The superhet receiver has one 455-kc IF amplifier and no RF amp. The signal from the antenna is coupled directly to the mixer. The receiver includes an always-on noise limiter and an adjustable squelch. Transmit/receive switching is done electronically; that is, there is no relay.

The RF output is link, rather than pi-net, coupled to the antenna and is designed to work into a 50- to 70-ohm antenna system.



Although the underside of the GW-12A has a lot of hardware, we did not find it so tightly packed as to cause any major construction difficulties.

The design of the kit is in keeping with the GW-12A's basic approach to CB—simple and straightforward. Though the rig's overall size is small by contemporary equipment standards—5⅜ x 8⅝ x 6½ in.—the components are well spaced. A beginner will not have difficulty assembling the kit.

Construction & Alignment

Similarly, the construction manual has been prepared for the beginner. There were more and simpler pictorials than are usually found in a Heath manual for a kit this size. We assembled the kit in about 6 hours.

The IF and RF transformers and coils are not supplied pre-aligned. However, we found alignment presented no problems and could be done without instruments. The coils were close enough to correct settings to enable us to receive a signal from a nearby transceiver. Using the signal from another rig, we aligned the receiver for maximum AVC voltage. If you don't have or can't get a VTVM, you can tune in a weak station and simply align for maximum volume. Since the receiver is crystal-controlled you just peak the front-end for maximum volume.

To align the transmitter you tune up the oscillator and final RF amplifier for maximum brilliance of a supplied dummy-load lamp.

How It Worked

In spite of the stripped circuit and low price, we considered the GW-12A's performance quite good. Measured sensitivity was a shade less than 1 microvolt for a 10db signal-plus-noise to noise ratio (1 μv for 10db S+N to N, wherein the sensitivity rating of 1 μv indicates the amount of signal required at the antenna terminals to produce an output 10db above the internal noise when added to the internal noise level itself). Adjacent-channel rejection was 20db—just about adequate to prevent interference from a moderate-strength signal on an adjacent channel.

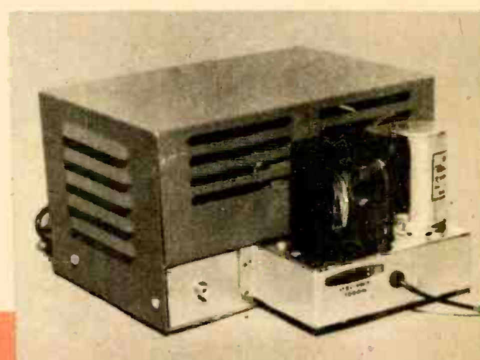
The transmitter final's 3.94-watt input power produced a 1.4-watt output into a 50-ohm dummy load. Modulation was capable of reaching 100 per cent at an average voice level and was clean but hollow.

The GW-12A is rugged and will stand up well in mobile service. Both the chassis and the cabinet are made of extra-heavy steel. A mobile bracket is not available since the cabinet is meant to be attached permanently to an auto's underdash. Because of this method of mounting, the GW-12A naturally cannot be moved easily from car to base station.

To sum it up, the GW-12A delivers quite good performance for the price. If you're looking for a rock-bottom-price transceiver capable of just getting the message through under modest- or no-QRM conditions, the GW-12A will fill the bill perfectly.

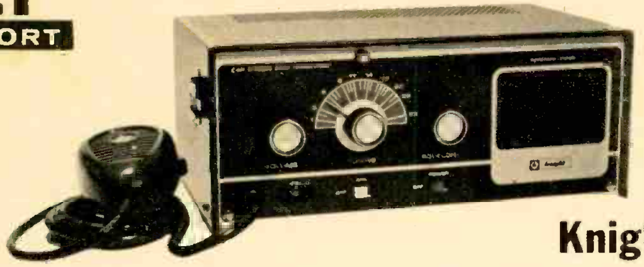
Similarly, if you like easy-to-operate equipment you'd want the GW-12A. What could be easier to operate than just a volume control, a squelch control and a push-to-talk switch?

Rear view of GW-12A. Single-channel operation means no tuning capacitor. Octal plug is for AC line cord or for 6/12-VDC vibrator power supply.



Model GW-12D transceiver includes vibrator power supply for 6 or 12 VDC operation. Supply is bolted to rear of chassis but can be removed.

KIT
EI
REPORT



Knight-Kit C-540

THE Knight-Kit C-540 transceiver is a compromise design. That is, it combines the ease-of-operation and price advantages of a single-channel transceiver with the multi-channel flexibility of more expensive rigs. Although it has a single-channel transmitter, the crystal socket is mounted on the front panel. This permits you to change the transmitting frequency conveniently by plugging in another crystal.

The receiver is tunable over all 23 channels. There is no provision for crystal-controlled receive. Two useful features on the C-540 are a noise-limiter on-off switch and a tuning-dial pilot lamp.

The $44.95 Standard model is for base use (that is, it is equipped with a 117-VAC power supply only). The Universal model, available for $49.95, has all the operating flexibility of more de luxe transceivers. The Universal model power supply works on 117 VAC *and* 12 VDC.

Power-supply switching is taken care of by the input-power cable. Connect the AC cable and the power supply connections are set up for 117 VAC. When the DC cable is used, the internal vibrator is connected.

Like most other basic transceivers the C-540's circuit has no frills. The receiver section has one stage of 455-kc IF amplification. The antenna is coupled directly to the mixer since there is no RF amplifier. The squelch is adjustable and as we said, the noise limiter has an on-off switch. Transmit/receive switching is electronic (no relays).

The transmitter output is link (rather than pi-net) coupled to the antenna and is designed to feed into a 50-ohm impedance.

Putting It Together

Typical of Knight-Kits intended for the beginner, there are loads of pictorials so that each one covers just a few construction steps. All resistors are supplied on a marked card and color-coded lengths of hookup wire are precut to size.

While the assembly, even for someone who has not built a kit before, should present no problems, there is one thing to watch out for. The chassis we received had edges like a razor blade. Therefore, *before* you start assembly smooth all chassis edges carefully with a file.

Another problem involved the panel-support brackets, which are welded to the cover. One of our brackets was broken off and was packed with the power transformer. Also, one shield-base tube socket was missing.

Though the IF transformers are supplied prealigned, the RF and oscillator coils must be aligned. Generally speaking, the front-end could be aligned by tuning in a CB station or by using a 5-watt transceiver or walkie-talkie to provide the test signal.

Naturally, if the test signal is a received station alignment can be quite a problem since the stations go on and off the air. The preferred procedure is to provide your own test signals with another transceiver, or better yet, a *pair* of walkie-talkies—one operating on channel 1 and another on 23.

The procedure without instruments is to tune in a station on channel 1, with the dial set to channel 1, and adjust the oscillator coil slug for maximum signal strength. Then the dial is moved to channel 23 and a trimmer on the main tuning capacitor is adjusted until the high-end signal is received at the correct dial marking. Since the coil slug and capacitor interact to a considerable degree, it takes many tries before the dial finally is calibrated.

Unlike crystal-controlled transceiver kits, which do not require critical receiver oscillator alignment, the C-540's receiver oscillator must be precision aligned. We found the receiver oscillator adjustment to be critical. So much so, in fact, that even when we used a stable signal generator for dial calibration it was difficult to maintain calibration. The slightest vibration and the dial calibration is off. Just lifting the transceiver slightly and dropping it on a table is enough to detune the receive oscillator.

We would assume, due to the detuning caused by mild shock and vibration, that a few bounces in mobile service could shift the tuning out of the band. We would suggest that after you have completed the receiver oscillator alignment you seal the slug with a drop of wax—such as is done in transistor radios.

The IF prealignment was almost perfect and an instrument alignment made no significant improvement in the receiver's performance.

The transmitter alignment required adjusting only the RF power amplifier final's tank coil. The transmitter oscillator coil is prealigned at the factory and is wax-sealed. You must not touch it. The RF output coil is peaked by tuning for maximum brilliance of a supplied dummy load lamp. Construction and alignment took us about 12 hours.

How It Worked

Considering its low price, the C-540's performance is quite good. The mid-band sensitivity is under 2 microvolts for a 10db signal-plus-noise to noise ratio. Adjacent channel rejection was 20db—just about adequate to avoid interference from all but strong signals on adjacent channels.

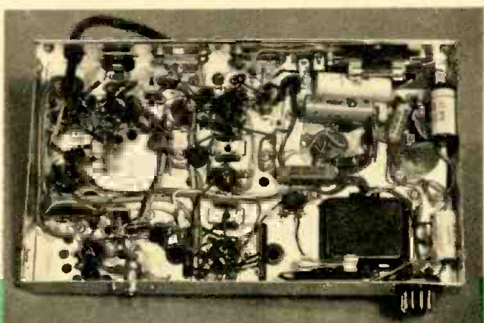
The transmitter delivers 2.3 watts into a 50-ohm load. But this is with an input power of 6.2 watts. Needless to say, this exceeds the legal input limit of 5 watts. To stay within the rules you should reduce the input power to 5 watts. Since the transmitter's RF final is link, rather than pi-net, coupled to the antenna, the input power cannot be reduced by adjusting the loading. You either will have to increase the value of the final's screen-dropping resistor to lower the screen voltage or reduce the B+ voltage to the final RF amplifier.

The modulation, which reached 100 per cent at average voice levels, was notably clean and crisp—as good as that found in the most expensive transceiver.

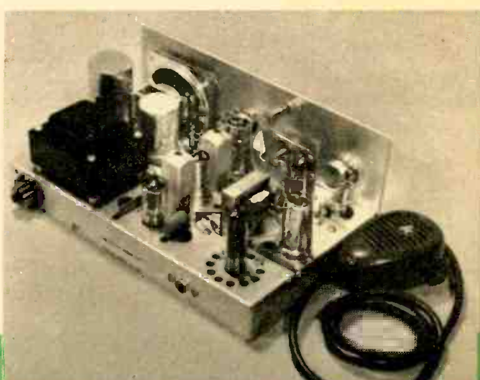
While the cabinet can be screwed to an auto's underdash for mobile mounting, a separate quick-release mobile bracket is available for $4.95. The bracket screws to the dash and the transceiver is slipped in and out of it. Notwithstanding the receiver oscillator coil adjustment, which may prove too critical for mobile service unless the slug is sealed with wax, the C-540 has the most convenient mobile mounting of the budget-price transceivers.

We also should point out that the C-540 is available in package deals in which a saving can be realized if two transceivers are purchased with antennas. One package, which costs $123.95, includes a base transceiver with a ground-plane base antenna, a mobile/base transceiver, a mobile whip antenna, a mobile mounting bracket, coax cable, a book on CB and two transmit crystals.

Taking price into account, the C-540 delivers better than average preformance. The transmitter portion of the circuit is comparable to that found in transceivers priced much higher. And while its overall performance really is in the basic or single-channel class, channel hoppers will find the variable tuning and quick transmit-crystal changing a decided asset.



Though it looks crowded, there's room to spare in the underside of the C-540. 117-VAC or 12-VDC power cord fits on connector at lower right.



Vibrator on Universal model C-540 is between transformer and speaker. Circuit includes six tubes and has solid-state doubler power supply.

KIT

EI

PREVIEW

Lafayette Comstat 9

THE Lafayette Comstat 9 transceiver kit was not in production at press time; therefore, our tests were made on a pre-production wired model that will be essentially the same as production models.

The Comstat 9 is a low-cost kit which compares favorably, in terms of performance and convenience, with transceivers in the $100 to $150 class. Though the $59.95 price may appear low, you should realize that the crystals, vibrator, DC power cable and the mobile mounting bracket are extra.

The receiver section is very much like that of the so-called quality transceivers of a few years back. It includes an RF amplifier, mixer, tunable oscillator, single stage of IF, noise limiter and adjustable squelch. Tunable coverage is of all 23 channels. Nine channels are crystal-controlled. Eight receive crystal sockets are inside the cabinet and the ninth is on the front panel.

We found the receiver sensitivity for a 10db signal-plus-noise to noise ratio to be 1 μv. Adjacent-channel rejection, which we found to be nearly 30db, is obtained by making the IF stage slightly regenerative.

The transmitter has a switch which allows you a choice of either 5-watt or 100-milliwatt input power.

The transmitter, which utilizes a single-tube combined oscillator-doubler and final, uses half-frequency crystals (13.5 mc). The final output circuit is a pi-net with a broad range of adjustment.

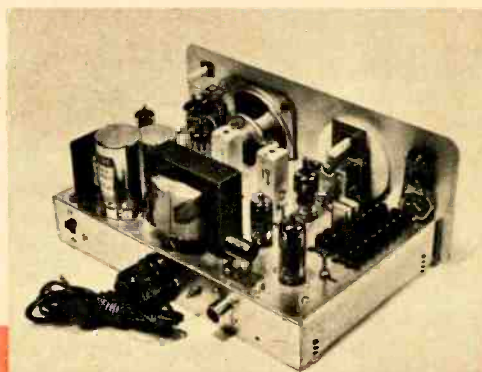
When tuned for maximum output into a 50-ohm load, the transmitter delivered 2.4 watts—but the input power was 6.0 watts. Since 6.0 watts is more than the 5-watt legal limit, you must reduce the input power. The pi-net enables you to lower it easily. When we reduced the input power to 5 watts, the output power was 2 watts. Push-to-talk switching is electronic.

There are sockets for 9 transmit crystals. Eight are inside the cabinet and one is on the front panel. The received audio was clean, and modulation easily reached 100 per cent and had good quality.

Attractively styled, the Comstat 9 has a coil-cord ceramic mike and a heavy-steel cabinet. It looks like top-of-the-line equipment. Additional features include a panel-mounted neon modulation indicator and a headphone jack.

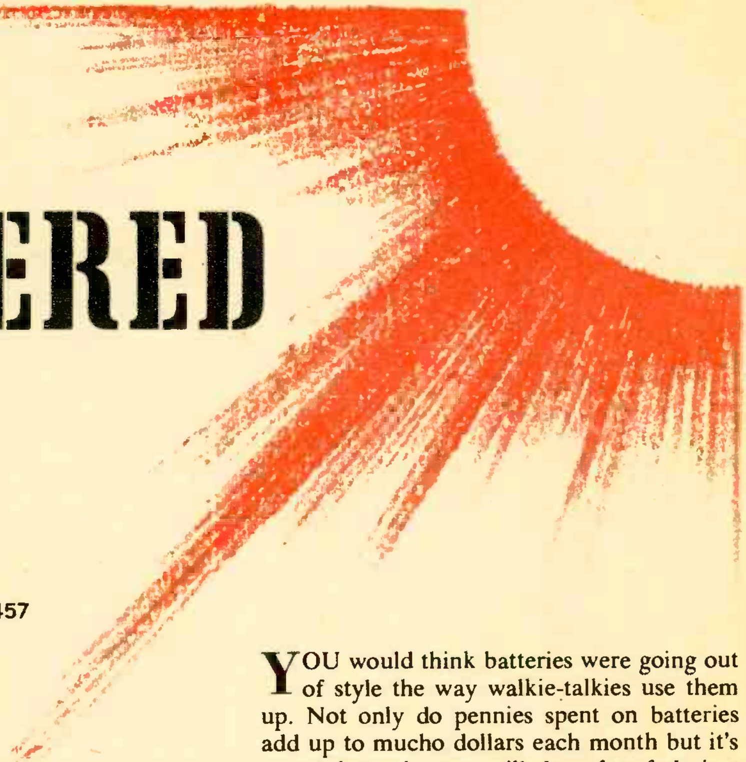
The required extras must be taken into account when you consider the Comstat 9's price. For example, to the basic price of $59.95 you must add $2.25 for each crystal. Therefore, the rig plus one set of receive and transmit crystals would cost $64.45. Add a conventional vibrator ($1.89) and a DC power cable ($1.50) and the total cost goes up to $67.84. A solid-state vibrator is available at $5.95. If you want a mobile bracket, tack on another $1.50.

As far as assembling the kit is concerned, we'll have to hazard a guess as we didn't build this one. There are only seven tubes, the chassis is large and the wiring on our model wasn't packed in layers. Therefore, the kit would probably go together as easily as any other comparable kit.

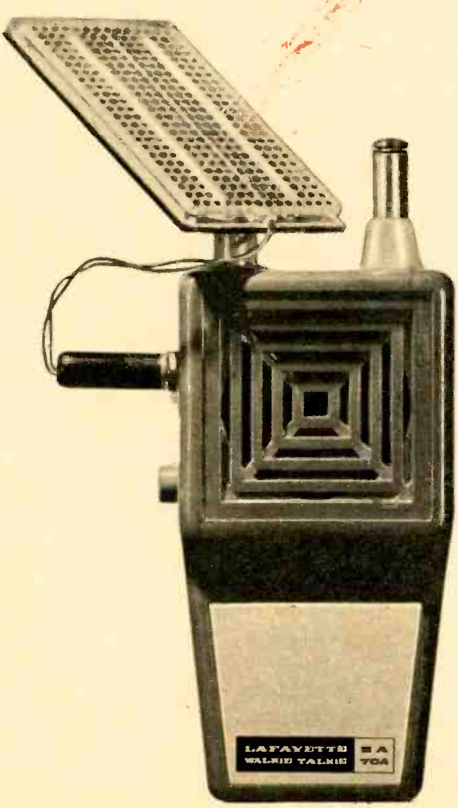


Rear of Comstat 9. Switch at left of rear chassis apron is used to select 5-watt or 100-mw input power. Crystal sockets are at right of chassis.

SUN POWERED CB



By
HERB FRIEDMAN, KBI9457



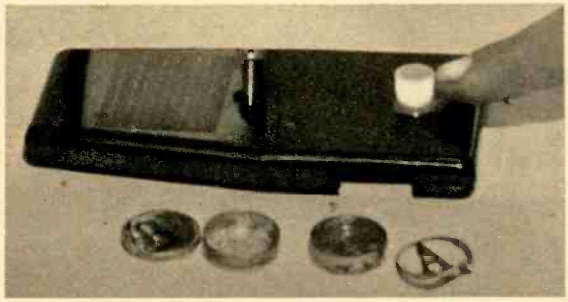
YOU would think batteries were going out of style the way walkie-talkies use them up. Not only do pennies spent on batteries add up to mucho dollars each month but it's a sure bet a battery will do a fast fade just when you need it most.

You know the scene. You're on a picnic or camping or hunting or perched on the roof trying to orient a TV antenna while your wife watches the screen and you're listening either for others in your party or for your wife. Then just as you hear something other than static from the speaker and press the button to answer, the extra current drain is too much for the battery and away it goes to join the big rig in the sky.

But power is available for free—enough to keep the receiver running all day without removing a bit of energy from the battery. This means that when a call is received the battery is ready to put out a strong signal. The free power comes from Old Sol himself—the sun. Just make a minor change in the transceiver's wiring and plug in a solar cell. As long as the sun shines you've got free power to run a walkie-talkie's receiver, or in an emergency, even its transmitter. The only restriction is that the walkie-talkie must be powered by a 9-V battery, such as a Burgess 2U6 or equivalent.

The Hoffman model HSB-9 solar cell we use delivers 9 to 10 volts with sufficient cur-

The photo at the left shows where we placed the jack and one solar-cell mounting cup on our walkie-talkie. The photo below shows where we mounted another cup for the cell. This extra cup is used to store the cell when it is not in use. The two containers hold the epoxy cement and, like the two plastic cups, they are supplied with the cell.



SUN POWERED CB

rent for small walkie-talkies—about 15 ma. At higher current drains the voltage falls. However, the cell can deliver about 8.5 V with a 20- to 25-ma current drain. This amount of current often is enough to drive a three- or four-transistor walkie-talkie when transmitting.

Installation. All that's required is a slight modification of the receiver's power supply connections, as shown at the bottom of this page. The schematic diagram at the left shows the normal battery connection. The modification is shown at the right. A miniature jack (J1) is connected in series with the battery's positive lead. When the cell is not plugged in battery current flows through the normally closed contacts to the circuit. When the cell is plugged in, the plug opens the connection and the cell's output goes to the transceiver.

Select a part of the transceiver's case which is not jammed with components and mount J1. But remove all the guts, including the speaker, before you do any drilling. To avoid melting the plastic case with the soldering iron, solder the leads to J1 before it's installed. Put the guts back in and solder the battery leads to J1.

The cell has a ball-joint mount. Two mounting cups and epoxy cement needed to glue the cups to the transceiver's case are supplied with the cell. Cement one cup on the back of the case near the top. Cement the other cup on the top of the case. Make certain it is mounted away from the antenna to allow the cell to be turned.

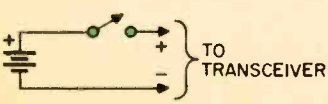
Operation. Snap the cell into the top or rear cup and orient it so it faces the sun. Then plug PL1 into J1. When the power switch is turned on the transceiver will operate as if the battery was being used. To transmit, pull the plug out and press the push-to-talk button.

PARTS LIST

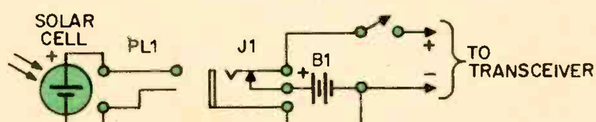
J1—Subminiature phone jack. Switchcraft Tini-Jax No. 42A. Allied 44 U 985 or equiv.

PL1—Subminiature phone plug. Switchcraft Tini-Jax No. 750. Allied 41 U 520 or equiv.

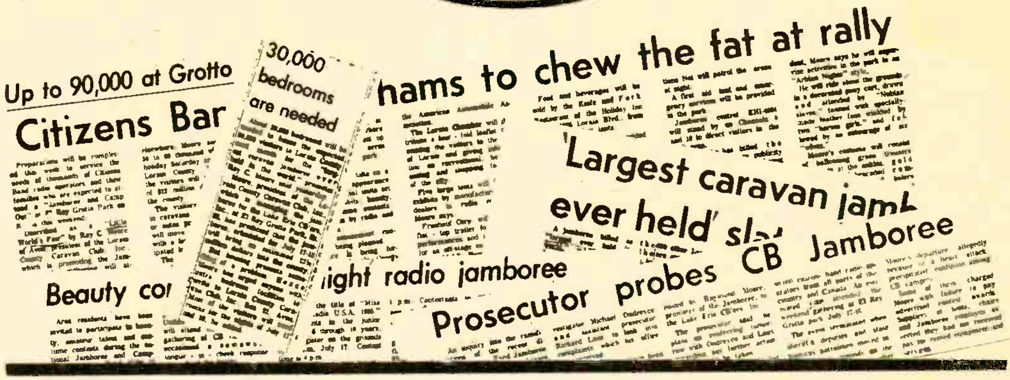
Solar Cell—Hoffman HSB-9. Olson Electronics BA-114. $7.98 plus postage.



The schematic above shows the normal connection of the walkie-talkie's battery. The switch usually is on the back of the volume control but it could be elsewhere.



Modification of rig for solar cell operation. Connect cell's positive lead to plug's tip. Be sure to keep polarities straight when connecting battery and lead from switch to the jack.



CB's Biggest BOONDOGGLE

By ALEX KARLIN

THE NATION'S CBers, like most every other variety of electronic hobbyists, have had their share of odd goings-on. But those invisible national clubs, even the operators without bona-fide handles hold less than a birthday-cake candle to certain events of last summertime. Fact is, CB's Biggest Boondoggle makes others of CB's weirdos seem tame as Sunday dinner at grandma's.

It actually is difficult to say exactly where the crazy quilt picked up its first stitches. But a little back-tracking may enable us to unravel the threads individually and thus better comprehend the manner in which the boondoggle grew.

First, we have CBers themselves—a group of sometimes ordinary, sometimes unusual people who have found a rather unique way of turning something little more complex than a telephone into a gigantic hobby. Next, we have the fact that these same CBers (and there are hundreds of thousands of them) are wont to frequent all sorts of gatherings of the clan. And whether called Coffee Breaks, Jamborees, Eye-Ball QSOs or Hootenannies, all seem attractive to CBers as mud-holes to water buffaloes. Travel to these conventions frequently is over great distances and by almost unbelievable modes of CB-equipped vehicles — bicycles, motorcycles, roadsters and aircraft of all vintages. (An ad we noted recently for one of these affairs was promoting The 90th Meridian Citizens Band Radio Club Rally/Fly-in Drive-in Breakfast.)

Also figuring in our boondoggle was a man the Elyria (Ohio) Chronicle-Telegram has described as all of the following: millionaire, engineer, inventor, ordained minister, professional writer, lecturer and psychologist. Sixty years of age, Ray C. Moore of Avon, Ohio, was yet another of the nation's near-million CBers (call-sign, KHI4084). And his was the job of riding herd over a CB jamboree that long will live in the minds of many.

Recipe: into one 200-acre park, place a large helping of plain promotion; then add odd and sundry CBers, slightly agitated. Call it: The Lorain County (Ohio) CB Jamboree And Campout.

Mr. Moore had the will to create a CB jamboree to end them all. (Advance publicity described the get-together as the Little World's Fair, The Biggest Show On Earth.) It was to be held July 17 and 18, 1965, a time, according to Moore, "when no other club or organization in the world will hold a jamboree." (Records indicate that at least seven other CB jamborees were scheduled for that very weekend, some in neighboring West Virginia and Indiana.)

And it would be something big, with no less than $5,000 in prizes of one sort or another. Moore was to ride round the grounds, dressed in a lavish oriental potentate's costume, in a pony cart pulled by Nubian slaves, who, in turn, were to be attended by yet more slaves.

Arrangements with numerous local tradesmen anticipated the throng. Moore predicted about 90,000 CBers would show, arriving in some 30,000 vehicles. A food market promised to have a large tent filled with a refrigerated van for milk and other perishables. Over two dozen ice-cream trucks were brought in from the Goodie Ice Cream Co. of Pittsburgh. Chairs and tables were rented to the tune of $700; $2,000 worth of tents were leased; with high confidence 123,000 tickets were printed. And though total investment in the Jamboree was an estimated $40,000, Moore himself was confident that CBers would pour some $12.5 million into the area during their two-day excursion into his land of the Arabian Nights.

As for advance publicity, thousands upon thousands of fliers were sent out, and the local paper provided extensive coverage for several months in advance of the shindig. Moore was quoted as reporting a month before the festivities that advance ticket sales were upwards of 10,000.

Things decidedly were building to a definite crescendo, though some thought they detected distortion in the symphony only a few days before J-Day. Area businessmen started to scoff at some of Moore's predictions for the Jamboree. Moore was unruffled, saying

Elyria Chronicle-Telegram photos

Though Jamboree organizer Ray C. Moore, KHI4084. (above) anticipated an attendance of 90,000 CBers. only some 4,000 appeared. Photo at right shows sheriff Vernon M. Smith (in trailer door) lending an ear to what CBers had to say after show closed.

that his national prestige among CB operators would pull them in from 50 states and two countries. He also was heard to comment that the only thing small about this Jamboree would be the way it compared with the one he was planning for the following year.

Came the big day, and Moore was on hand, decked out in flowing robes (as promised) to greet the multitudes. The entertainers—disc jockeys, folk singers and assorted Nubian slaves—had begun to arrive. Unfortunately, the expected 90,000 CBers were about the only ones who didn't seem particularly interested in the lavish spectacle. About 4,000 showed up.

Saturday, first day of the Jamboree, was to see a talent contest (according to Moore's schedule) with $100, $50 and $25 prizes. It was held, but winners received no cash awards.

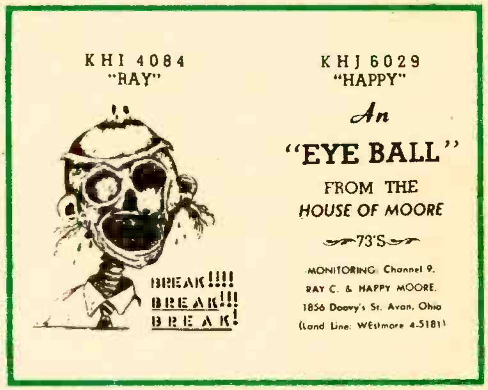
Saturday also was supposed to have offered a beauty contest for girls 6 - 10, but lighting problems allegedly prevented it. Re-scheduled for Saturday night, it finally was held on Sunday. The $200, $100 and $50 prizes were not awarded, but contest winners received notices explaining that they would be contacted by mail regarding the prizes.

Another beauty contest, for girls over 16, was re-scheduled for Saturday night, eventually canceled altogether.

Other promised prizes (for such things as most unusual costume, most distant car caravan, etc.) were not awarded. One man, who had brought a $300 CB rig to be sold to the Jamboree people as a registration prize, was grumbling he hadn't been paid.

When the father of one small girl became irate and demanded the $250 prize money she had won in a contest, it reportedly was awarded. Thing is, disappointed winners claimed this was the only cash prize actually given out.

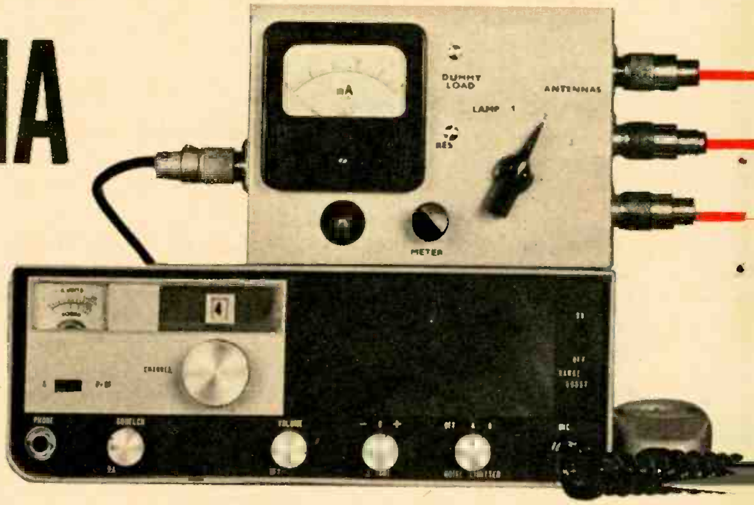
About 3 o'clock Sunday afternoon a report went around the Jamboree grounds that [*Continued on page* 120]



Unusual QSL card issued by KHI4084 was special souvenir promised to every CBer in attendance.

CB SPECIAL

ANTENNA CONTROL CENTER



Twist a switch for your choice of three skyhooks or two dummy loads.

By VERNON SIMMS

THAT mess of antenna cables, adaptors, coax connectors and dummy loads—toss it all out and install the Antenna Control Center, Connected to your CB transceiver, the Center will permit you to connect conveniently as many as three antennas or two dummy loads to the rig's output. Then, at the twist of a switch—and that's a lot easier than plugging in and removing half a dozen connectors—you have your choice of skyhook or test load.

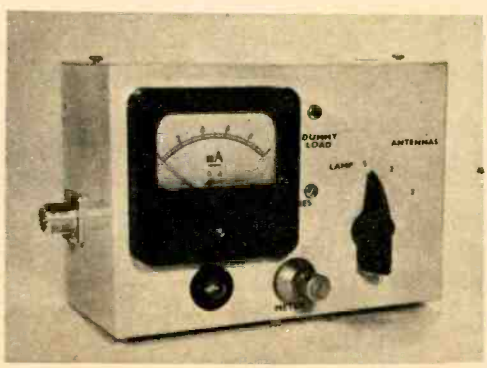
And there's no need to remove the Center from the line. It can remain connected permanently to your receiver. It has no effect on SWR and will not cause significant loss of power to the antenna.

Here's what the Center will do:

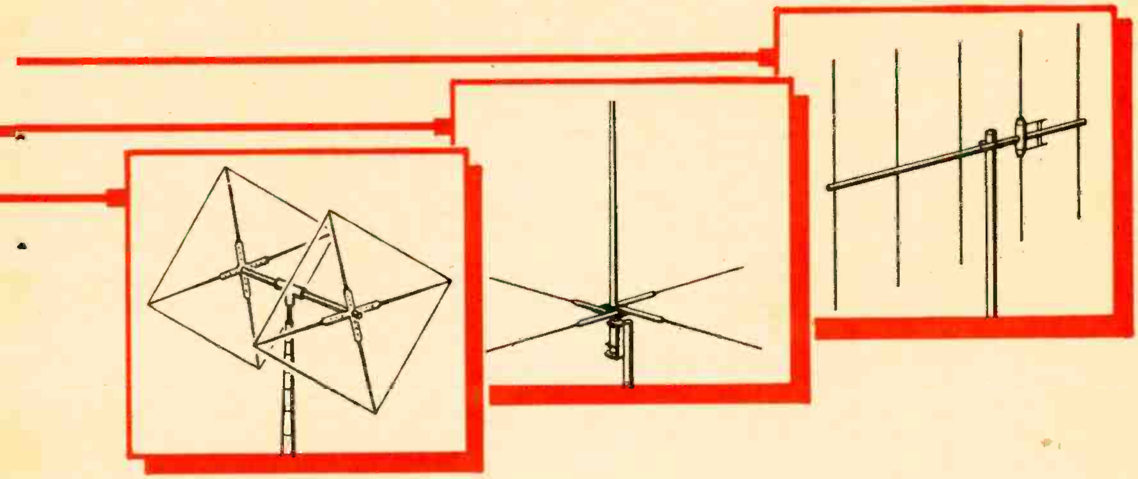
- Antennas. As we said, the Center enables you to hook as many as three different antennas to your rig, Maybe you want to shift from ground-plane to directional beam or collinear to quad. No need to fumble at the back of the rig—you can make a quick changeover with a rotary switch. This function is valuable for making instant comparisons between two or three different antennas.
- On The Air. Ever wonder whether you're really getting out or just heating up the microphone? Glance at the Center's meter and you'll know whether RF is going to the antenna. And no matter what the switch position, the meter samples continuously and indicates whether there's RF in the line.

The meter also gives warning if something's wrong. That is, its indication should be about the same each time you hit the push-to-talk switch. If there's a provision on your transceiver for peaking the final the Center will be an invaluable aid in tuning up.

- Dummy Loads. The Center also can connect either of two dummy loads to your rig's output. One load is the old standby, a No. 47 pilot lamp. Main purpose of this indicator, which will glow brightly when you



Built in a 3 x 5 x 7-in. cabinet, the Antenna Control Center enables you to connect any of three antennas or two dummy loads to your rig.



transmit, is to give a quick check of modulation. As you speak into the mike, varying lamp brightness tells you whether audio is modulating the carrier.

The second dummy load is used when you have to troubleshoot the rig. It's resistive and is a close match to the transmitter's output impedance (unlike the lamp). It lets you run lengthy tests on the transmitter portion of the transceiver without violating the law or interfering with others on the channel.

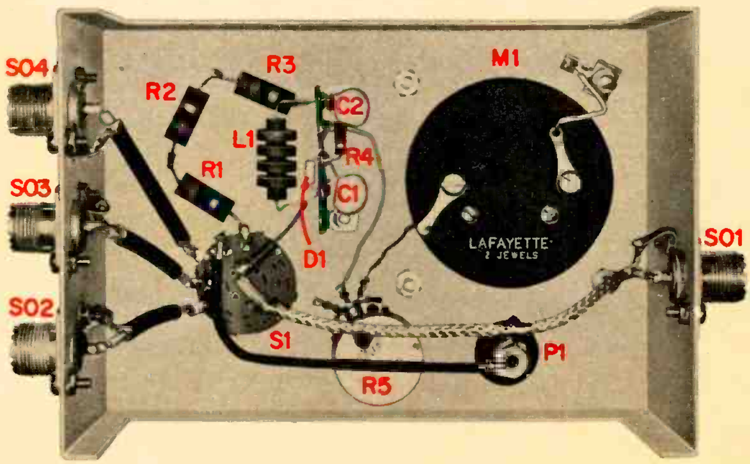
How It Works

Your CB rig's output is fed via socket SO1 (see schematic) to the wiper of selector switch S1. From there, RF can be fed to either of the three output connectors depending on S1's position. A fourth position on S1 sends the signal to the lamp. The fifth position applies the signal to the resistive dummy load. The three load resistors add up to 48 ohms—a close enough match to the 50-ohm transmitter output. Wattage of each resistor is sufficient to provide a safety factor when fed the typical 3-watt output of a transmitter.

The meter circuit takes an insignificantly small amount of signal from the wiper of the selector switch and applies it to a diode detector circuit which converts RF to DC for the meter. A control pot (R5) permits you to adjust the meter's sensitivity.

Construction

Here are some tips you should keep in



Signal from CB rig is fed into Center at connector SO1 at right. Antennas are plugged into three connectors at left. Watch the polarity of D1 when installing it. End with color band gets connected to junction of R4 and C1. Shield on coax from S1 to SO2, SO3 and SO4 is grounded at connector end only and not at S1. Shield on coax from S1 to SO1 is soldered to P1 and to R5's case.

Antenna Control Center

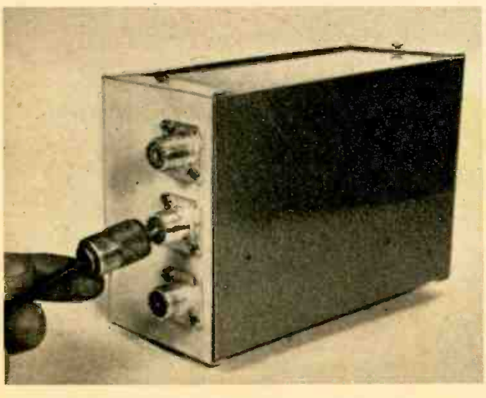
mind when building the Center in a 3 x 5 x 7-in. Minibox. Use short lengths of RG58/U coax to connect the three antenna sockets to the selector switch. The wire shields, however, are soldered only to lugs placed under each socket's mounting nut. Trim off the shields at the other end and do not connect them to the selector switch.

The coax from SO1 to the switch should have its black jacket removed completely. This permits you to solder the shield to both R5's case and to the ground lug on pilot lamp P1's socket. Note that the ground lug is the one closest to the lamp. The other lug is connected to selector switch S1 with a spaghetti-covered piece of No. 16 wire. This arrangement will hold the lamp socket in place. The bulb should protrude through the panel in a ⅞-in. dia. rubber grommet.

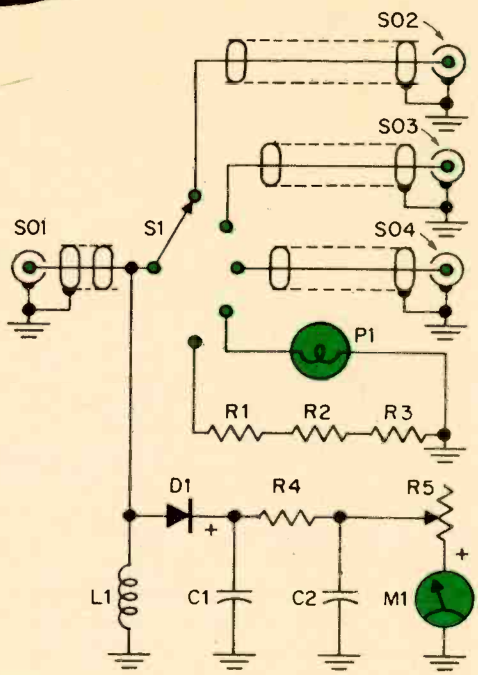
The resistor load, R1, R2, R3, is self-supporting. Be certain that none of the resistor leads shorts to the case. Other components are soldered to a five-lug terminal strip two of whose lugs are grounded. Avoid excessive heat on diode D1's leads while soldering.

Operation

Run any convenient length of RG58/U coax from your transceiver's output to SO1. If you don't wish to place the center on or next to the rig, it can be wall-mounted so it's within easy reach. Connect the cables from your antennas to the output connectors SO2, SO3, and SO4.



Output side of Center. Scrape away the paint on Minibox under connectors to make sure there is good contact between connectors and the cabinet.



Signal from CB rig is fed via S1 to either of three antennas or pilot lamp or resistive dummy loads. Part of signal is detected and fed to M1.

PARTS LIST

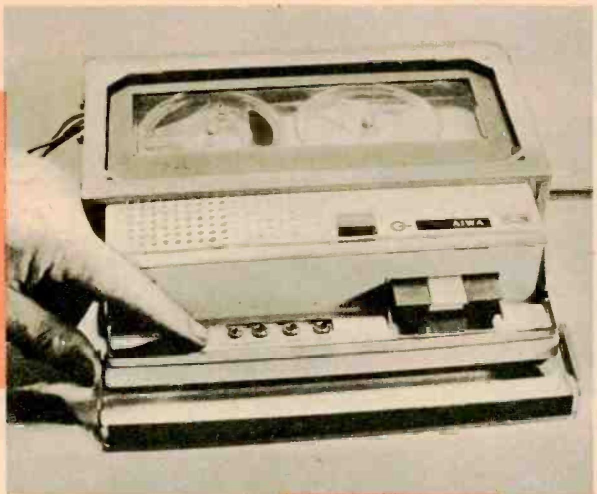
- C1, C2—.001 μf, 500 V ceramic disc capacitor
- D1—1N60 diode
- L1—2.5 mh RF choke
- M1—0-1 ma DC milliammeter (Lafayette 99 R 5040 or equiv.)
- P1—No. 47 pilot lamp and socket
- R1, R2, R3—16 ohm, 2 watt carbon resistor
- R4—10,000 ohm, ½ watt, 10% resistor
- R5—50,000 ohm, linear taper potentiometer
- S1—1 pole, 5 position rotary switch (Mallory 3115J or equiv.)
- SO1-SO4—SO-239 coax connector
- Misc.—3 x 5 x 7-in. Minibox, 5-lug terminal strip, grommet, solder lugs, 2 ft. RG58/U coax.

The meter sensitivity may vary from one switch position to the other because of the different antenna. Therefore use R5 to keep the needle from going off scale. An indication about halfway up the scale is most desirable. Finally, if your rig is a transistor job, don't switch to an antenna position that does not have an antenna connected to it. No harm would be done to tube sets, but a transistor rig might be damaged if operated without a load.

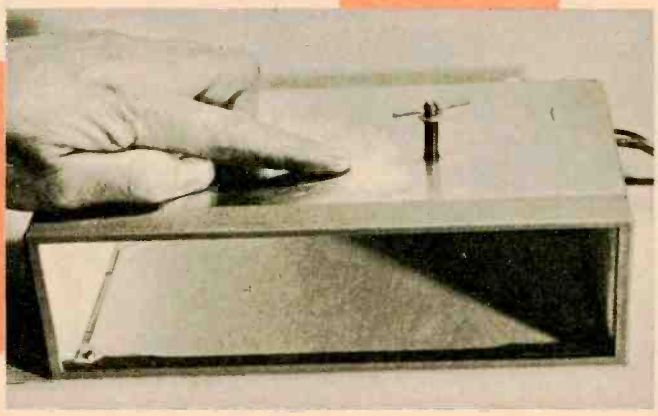
PUT TAPE IN YOUR CAR

THAT latest rage, the auto tape player, is great if you're willing to listen to prerecorded tapes only. But we'll bet there are many times when you'd like to be able to play a tape you made at home or record a tape on the road.

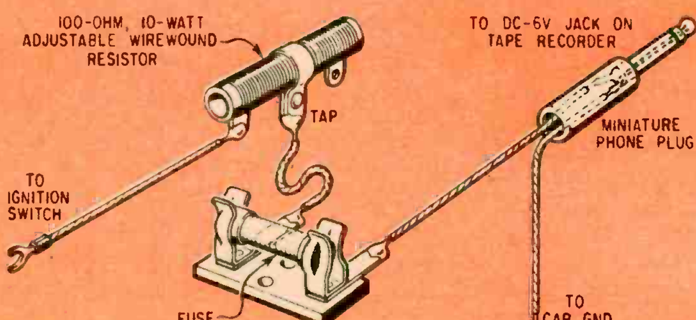
For example, if you're a salesman a recorder in your car will enable you to write orders quickly. Or you could tape reminders to yourself, ball-game scores or important broadcasts. And don't forget the children, who can be entertained by stories taped in advance of a long trip. Here's how we installed a $40 tape recorder in our car.—*Homer L. Davidson*



We installed a Japanese-made Aiwa recorder, which handles 3-in. reels at 1⅞ or 3¾ ips. It operates on 6 V and is push-button controlled. Latest model, TP-706, is available from Allied Radio (stock No. 79 U 970 MX) for $39.95. It has a jack on the front panel into which you feed 6-V power. Push button on mike starts and stops machine. Other jacks are for external speaker and high-level input.



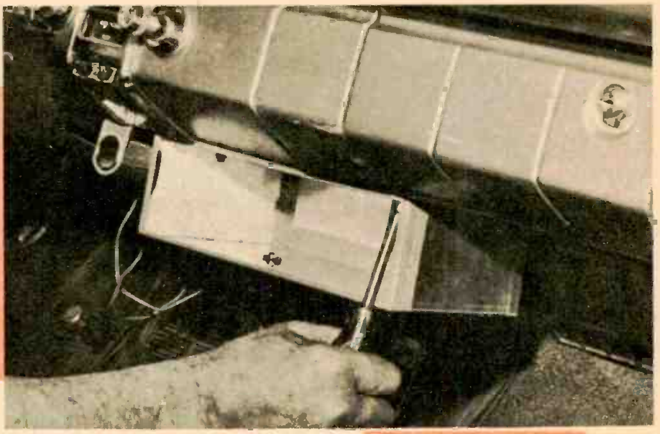
Start by taking a 5 x 10 x 3-in. aluminum chassis (Premier ACH-401 or equiv.) and cut away 10-in. side with nibbling tool. Smooth all edges and cover with tape. Bolt shown is on bottom and is used to hold recorder in place. Drill holes in the top of the chassis to hold it to underside of the dashboard.

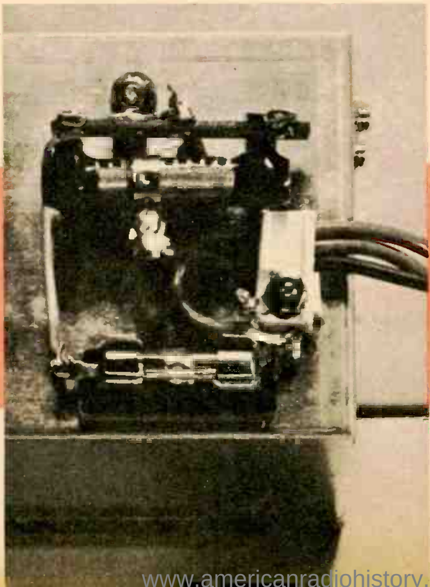


Mount resistor to drop voltage to 6 V on back of chassis. As recorder draws 100 ma, value should be 60 ohms. Use 100-ohm adjustable type and adjust slider with recorder operating to set voltage. Positive lead goes to the sleeve in plug.

The job is done. The recorder is about 3 in. deeper than the chassis; therefore, operating push buttons, level meter, volume control and speaker will protrude just the right distance. Cement a small magnet on back of mike so it can be held to dash when not in use. To remove recorder for use in home, loosen underchassis screw, disconnect power plug and slide unit out.

After resistor has been adjusted, install the chassis under the dash with self-tapping screws. Connect negative power lead to car chassis and positive lead to cold or accessory lug on ignition switch.





Adjustable wirewound resistor and fuse holder should be mounted on back of chassis. Because resistor will be difficult to get to after unit is mounted, measure the dropped voltage with recorder operating before installing chassis under the dash. Fuse should be a .15 A type 3AG.

Notes from EI's DX CLUB

JUDGING from the hundreds of logs that reached EI's DX Club offices shortly after official opening of our Fifth Award Period, many DXers anticipated this Period and were awaiting its arrival. Applications are being processed as speedily as possible, though the heavy volume has slowed operations. The Fifth Award Period will close April 30 and all applications for Awards must be postmarked before midnight of that date (see ALL-CONTINENTS AWARD FOR HAMS & SWLS!, Jan. '66 EI).

In the get-it-while-it's-rare department we now have French Guiana, New Caledonia Is. and French Somaliland. Reason is that France soon will be building powerful SW relay bases in each of these territories. Of the three low-power stations currently in operation, only R. Noumea in New Caledonia recently has been reported in North America. Station transmits on 3355 kc until 0530 EST sign-off.

Hams looking for a way to log the Mediterranean might watch for WA4FTO/MM on 20 meters. As the MM indicates, he's marine mobile and often operates from these waters.

Paul R. Poolman of Oneonta, N.Y., is the first in North America to report hearing R. Ulan Bator's (Outer Mongolia) new 25-meter transmitter on approximately 11850 kc (frequency often runs a little higher). Paul turned the trick at 1725 EST.

Deutsche Welle's African relay at Kigali, Rwanda, now is operating with all of 250 kw. Best time to try for it is at 1245-1330 EST when station has English for West Africa on 17805 kc. Logging should be no great problem. Reports go to DW's headquarters at Cologne, W. Germany. Nor is the DW relay the only potent new station in Rwanda. The Kigali government's own broadcast voice, *Radiodiffusion de la Republique Rwandaise,* also has boosted its power. Don Jensen (Wisconsin) reports reception on 6030 kc. Sign-on is at 2300 EST.

CP75, R. La Cruz del Sur, at La Paz, Bolivia, seems to be heard regularly on the West Coast until 1845 PST sign-off. Frequency is 4985 kc.

R. Athens on 11720 kc proves a hard one to pin, since the B.B.C. also has Greek transmissions on this channel. Thing to do is try for R. Athens after the British sign off at 1430 EST.

Long-wave broadcast station TFU at Reykjavik, Iceland, was heard this winter around the Great Lakes area on 209 kc. Seems to peak shortly after 1830 EST.

Those who have yet to log Kenya—and that means most of us—might try for the East African Telecommunications Co. station (telephone) on 10730 kc. H. L. Chadbourne (California) logged this one at 1515 PST.

Vilnius, Lithuanian S.S.R., now has English for North America Sundays at 1730-1800 EST on 7110 kc. (That frequency should delight hams, hi!) Station is delivering powerful signals to the East Coast.

West Coast BCB fans will be interested in learning that R. Peking frequently makes it through on 1040 kc during early a.m. hours. Who knows? One of these March mornings it even may show up east of the Mississippi!

Anyone having trouble picking up strife-torn Santo Domingo should try for R. Santo Domingo Television on 6090 kc evenings. Station also is heard mornings at 0600 EST.

Propagation: Because days in the northern hemisphere are longer during the summer

[*Continued on page* 113]

The Flexible Flea

Get out of the big-power race with our flea-power transmitter. Its milliwatts can shout or whisper.

By CHARLES GREEN, W3IKH

FOR many amateurs, the goal of ham radio is only a log full of long-distance QSOs. All too often this results in a power race in which operators pile on more and more watts until a full gallon, the legal limit, is reached. Unfortunately this usually ends up being very expensive, may not accomplish much and is a poor way to develop genuine hamming skills.

Why not go the other way? That is see how many QSOs you can make with hardly any power at all. That takes technique! (See THE DAVIDS IN GOLIATH LAND, July, '65 EI) In other words, if you can make a QSO with a half watt when your neighbor uses a half gallon to do the same thing, you're the better operator.

The way to enter the contest of low-power hamming is with the Flexible Flea—a 20, 40 and 80-meter CW transmitter whose input power can be varied continuously from 100 milliwatts to 5 watts. One way to start the game is by establishing a contact with 5 watts. Then you progressively reduce the power to see how little it takes to maintain the contact. Or, you can simply start off at the bottom with say, 200 milliwatts, to see how far you can get with this power. The longer the range you can get with low power, the greater feeling of accomplishment.

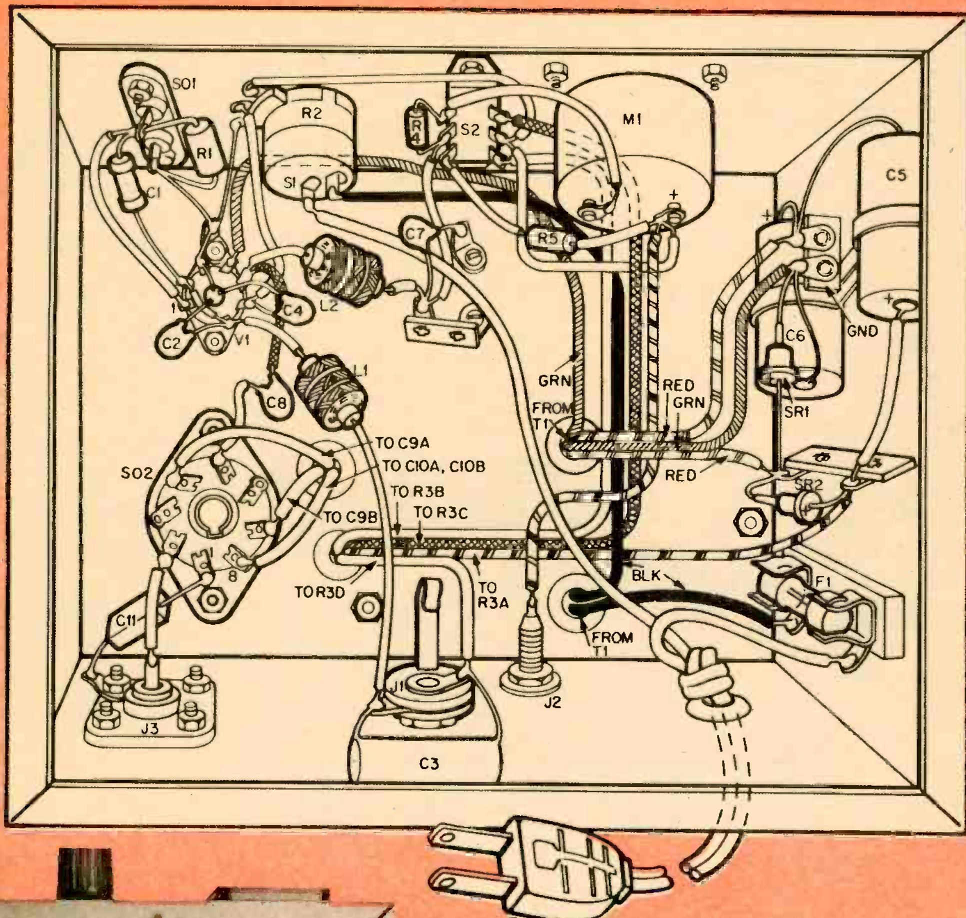
Operation on the three bands is achieved with plug-in coils. The input power of the final (and only stage) is indicated directly on a calibrated panel meter. (On the last page of this article there's a scale which you can cut out and paste on the face of your meter.) A 6AK6 tube is the crystal-controlled oscillator. It is followed by a pi-net output, designed to feed 50 to 72-ohm antennas.

Construction

Mount the components on a 5 x 7 x 3-in. aluminum chassis as shown in our pictorial in Fig. 1. Install variable capacitors C9 and C10 with nuts or washers between their frame and the chassis to keep their fiber side-insulators from touching the chassis.

As in all RF circuits, the wiring to and near V1 is critical. In particular, the grid and plate wiring should be as short and direct as possible.

Install rubber grommets in the top-chassis holes through which wires pass to C9, C10 and R3. Keep the power-supply wiring close



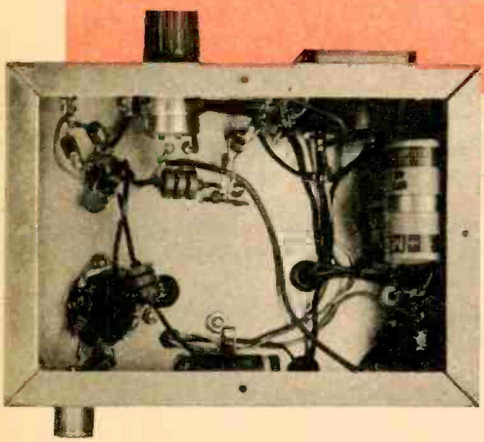


Fig. 1—Underside of transmitter. To layout your chassis, take dimensions from pictorial and multiply by about 2. Arrangement of parts in RF section of transmitter is important; therefore, duplicate our layout as closely as possible. The lugs at the left side of switch S2 are S2A.

The Flexible Flea

to the chassis and away from the RF wiring around V1.

Since R3 is supplied with only one sliding contact, you'll have to make another contact from a piece of soft aluminum. Cut a strip of soft aluminum, approximately 3/8-in. wide x 2¾-in. long, and bend it around R3 so the ends stick out. Remove the strip and put a contact dimple in it with a center punch, using a wood dowel for support. Drill holes in the ends of the strip and install the contact on R3 with a spade lug and a mounting screw. Don't tighten the screw yet.

To prevent ourselves from accidentally touching R3 (which gets quite hot and is also a shock hazard), we made a 1⅛ x 1½ x 2⅜-in. cover for R3 out of a piece of perforated aluminum. We then put flanges at the rear and side of the cover to fasten it to the chassis with self-tapping screws. The cover should be mounted carefully so it doesn't come in contact with R3's lugs.

The three plug-in coils (L3, L4 and L5) are made from a 3-in. length of Barker and Williamson No. 3016 Miniductor coil stock as shown in Fig. 4. The holders for the coils and jumper wires are the bases of discarded

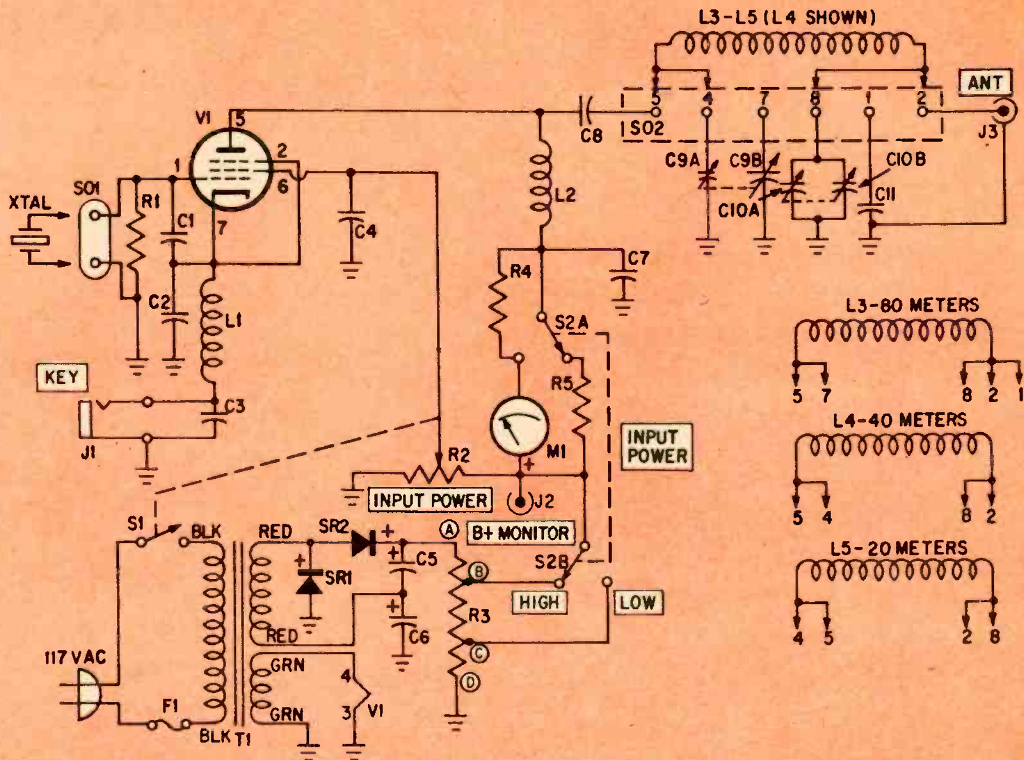


Fig. 2—Transmitter schematic. S2 determines input power. When it's set to "high" (shown), high B+ is supplied to V1 from tap "B" on R3. When S2 is set to "low," lower B+ is supplied to V1 from tap "C." R2, which establishes V1's screen voltage, is used to vary the input power continuously in both ranges. 80-meter coil, L3, is 33 turns. 40-meter coil, L4, is 17½ turns. 20-meter coil, L5, is 8½ turns. (See Fig. 4.)

PARTS LIST

Capacitors:
C1—15 μμf, 500 V silvered mica
C2—100 μμf, 500 V ceramic disc
C3—.1 μf, 600 V tubular
C4, C7, C8—.001 μf, 1,000 V ceramic disc
C5, C6—40 μf, 150 V electrolytic
C9A, C9B—2 gang superhet type variable capacitor; front section (C9B): 10.5-365 μμf; rear section (C9A): 7.6-132 μμf. (Lafayette 32 R 1101 or equiv.)
C10A, C10B—2 gang TRF type variable capacitor: 10.3-365.7 μμf per section (Lafayette 32 G 1102 or equiv.)
C11—470 μμf, 500 V silvered mica
F1—1 A fuse and holder
J1—Open circuit phone jack
J2—Insulated phone tip jack
J3—SO-239 chassis mount coax connector
L1, L2—1 mh RF choke (National R-50 or equiv.)
L3, L4, L5—Coils wound from Barker & Williamson 1-in. dia. 32 turns-per-inch Miniductor No. 3016 (Lafayette 40 R 1625 or equiv.) See Figs. 2 and 4.
M1—0-5 ma DC milliammeter
R1—27,000 ohms, 1 watt 10% resistor
R2—50,000 ohm linear taper potentiometer with SPST switch
R3—6,000 ohm, 25 watt, adjustable wire-wound resistor
R4—300 ohm, ½ watt, 5% resistor (see text)
R5—36 ohm, ½ watt, 5% resistor (see text)
S1—SPST switch on R2
S2A, S2B—DPDT slide switch
SO1—Crystal socket (National CS-6 or equiv.)
SO2—Octal tube socket
SR1, SR2—Silicon rectifier; minimum ratings: 600 ma, 400 PIV
T1—Power transformer; secondary: 125 V @ 50 ma, 6.3 V @ 2 A (Allied 61 U 411 or equiv.)
V1—6AK6 tube
XTAL—20, 40 or 80 meter crystal
Misc.—5 x 7 x 3-in. aluminum chassis; 5 x 7-in. chassis bottom plate; octal tube bases for L3, L4, and L5; 7-pin tube socket (for V1), knobs, perforated aluminum octal tubes.

We determined the value of C11 experimentally to match our rig to our 80-meter antenna. You can try another value for C11 for best match to your antenna.

Adjustment and Operation

Remove V1, L3, L4 or L5 and the protective cover over R3. Connect a voltmeter, set to measure DC voltage, to J2 and turn on AC power. Set S1 to *high* and adjust sliding

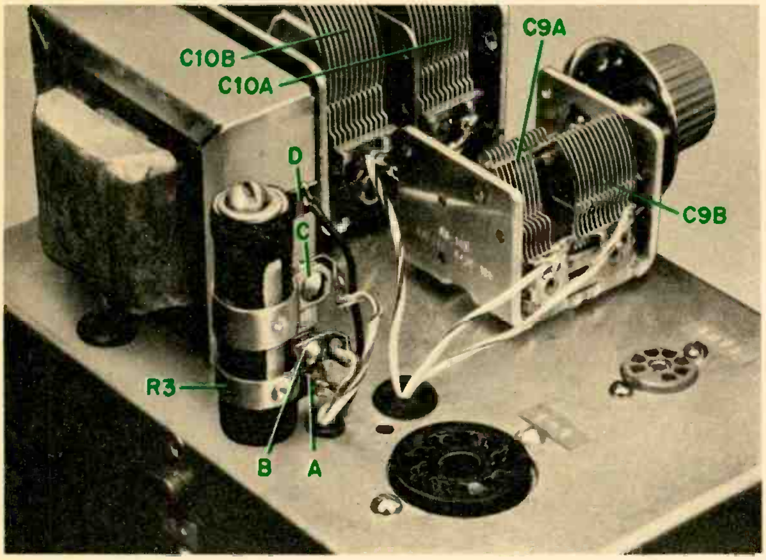


Fig. 3—Closeup of top of chassis shows mounting of B+ voltage-divider power resistor R3. Mount R3 with a ¼-20 x 2½-in. screw. Slider contact "C" is home brew since only one slider is supplied. Make a cover of perforated aluminum to fit over R3 so you don't touch it. If you did you'd get a nasty shock and burn. Both sections of C10 (top) are connected in parallel. C9A is the smaller section of C9.

The Flexible Flea

contact *B* (Fig. 3) until the VOM indicates about 245 V. *Caution:* Always turn off AC power before adjusting the contact and do not touch the resistor since it will be hot. Set S2 to *low* and set contact C so the voltage is about 110 V.

Plug in the 80-meter coil, V1 an 80-meter crystal and connect a 50- to 72-ohm dummy load to J3. (You could use two parallel-connected 150-ohm 2-watt *carbon* resistors for the dummy load.) Set S2 to *high*, set R2 full clockwise and set *tuning* capacitor C9 and *loading* capacitor C10 full counterclockwise (plates fully meshed).

Hold the key closed and quickly tune C9 for resonance—indicated on M1 by a dip in power. Slowly open the plates of *loading* capacitor C10 until the power (plate current) rises to about the 1-watt mark on M1. Then retune C9 for a dip and adjust C10 for a 5-watt indication, alternately adjusting C9 and C10 until a dip produced by C9 brings the meter indication to 5 watts. Finally, readjust R2 for 5-watt input power. (See *The Radio Amateur's Handbook* for explanations on how pi-network operate and are tuned.)

Do not change the setting of C9 and C10. Now, with the key closed and M1 indicating 5 watts, check the B+ voltage at J2 and adjust sliding-contact B until the voltage is 200 V with the key closed.

Do not change the setting of C9 and C10 in the next step: Turn R2 fully counterclockwise, switch S2 to *low* and close the key. Turn R2 clockwise until M1 indicates 500 milliwatts (full scale). The VOM connected to J2 should indicate 100 V. If it does not, adjust contact C on R3 until the VOM indicates 100 V with the key down. Turn off AC power and install the protective cover over R3.

Connect a 50 to 72 ohm antenna to J3 and try the rig on the air. Always tune the transmitter (as you did with a dummy load) first with 5-watt input power. Then reduce the power as desired (without retuning C9 and C10). Operation below 300 milliwatts input power on 20 meters is not recommended because the transmitter will double and the output power will be much lower.

How it Works

The crystal is the frequency-determining component in a Colpitts oscillator circuit consisting of V1, C1, C2, R1 and L1. V1 functions as a straight-through oscillator amplifier on 80 and 40 meters. In 20-meter operation, V1 doubles in the plate circuit. A key in V1's cathode circuit starts the oscillator and C3 minimizes key clicks.

Potentiometer R4 controls the input power by varying V1's screen voltage over either of the B+ voltages selected by S2B. M1 indicates V1's input power and is switched by

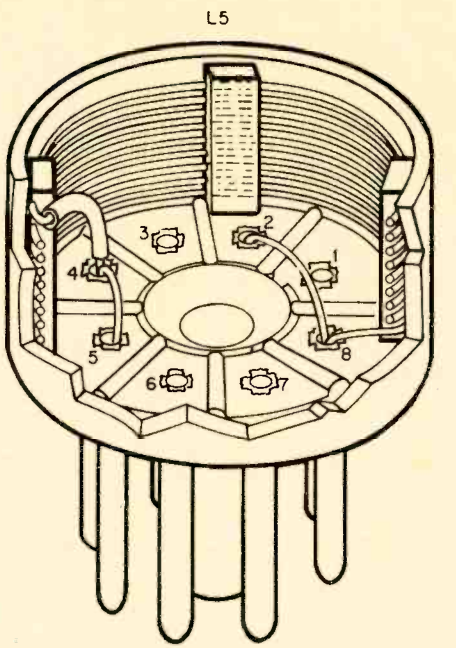


Fig. 4—Pictorial of 20-meter coil. The three diagrams at the right of the schematic in Fig. 2 show pin connections of coils and the jumpers.

S2A to the *low* (500 milliwatt) or *high* (5 watt) ranges.

Plug-in coils L3, L4 and L5 (in conjunction with C9A/B, C10A/B and C11) have jumper connections in their bases to establish the proper L/C ratio in the pi-net output circuit. The RF output is fed to J3, to which can be connected a 52- to 72-ohm antenna.

The two B+ voltages (for high and low ranges) are supplied by voltage divider R3 and the voltage-doubler power supply, which consists of T1, SR1, SR2, C5 and C6.

The resistance values of R4 and R5 were determined by the author to cause M1 to indicate full scale, or 5 watts, when the *measured* input power was 5 watts.

The resistance values we specify for R4 and R5 should be satisfactory. However, if you want your meter to be calibrated with greater accuracy, here's the way to do it: Input power is a product of V1's plate voltage and its plate current.

To determine the power, first connect a dummy load to J3. With the transmitter tuned and loaded (as explained earlier), set *input-power* switch S2 set to *high* and measure the voltage on V1's plate with respect to ground. Then, disconnect the lead going from the center lug on S2A (see pictorial in Fig. 1) to the terminal strip to which are connected L2 and C7. Set up a VOM to measure current and connect its positive lead to the center lug on S2A and the negative lead to the junction of L2 and C7.

Turn on the power and read the current on the VOM. Multiply the current you read by the plate voltage and multiply them. Compare your answer with the power indicated on M1. If the indication in M1 is low, decrease the value of R4 experimentally. On the other hand, if the indication is high, increase the value of R4.

VOLTAGE CHART

V1 (pins)	S1 set to HIGH		S1 set to LOW	
	key up	key down	key up	key down
1	0	—38	0	—6
2	35	0	11	0
3	0	0	0	0
4	6.3(AC)	6.3(AC)	6.3(AC)	6.3(AC)
5	245	200	110	100
6	245	200	68	56
7	35	0	11	0
J3	245	200	110	100

Notes:
1) 72-ohm dummy load connected to J3. S2 set to *high*. Transmitter tuned for 5-watt input power. Or, S1 set to *low* and R2 adjusted for 500 milliwatt input power.
2) 80-meter coil and 80-meter crystal used for test voltages.
3) Voltages measured with a VTVM.

Fig. 5—If the transmitter does not operate properly, measure all voltages at V1's pins. If they differ from ours above, start troubleshooting.

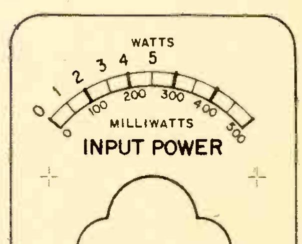


Fig. 6—Meter is calibrated in milliamperes, but if you paste this scale over its scale, you'll be able to read the rig's input power directly.

KIT EI REPORT

Scott's Semi-Kit

The 80-Watt LK-60 Transistor Amplifier

ANYONE who still feels transistors are an unproven sales gimmick needs only glance at an up-to-date hi-fi equipment catalog. He then quickly realizes that solid-state equipment has been accepted and that tube equipment is becoming history. And why not, since solid-state circuitry can give equal or better performance, occupies less space and has greater reliability than tube equipment?

One of the finest examples of solid-state integrated-amplifier kit design, packaging and performance we have seen is the $189.95 Scott LK-60. (It's available assembled as the Model 260 with a price tag of $279.95.)

The LK-60 has practically every operating feature you'd want. There are inputs for tape heads, FM tuner, tape recorder playback preamps, AM tuner or TV sound and magnetic-cartridge record player. Adaptors are available to permit you to connect ceramic cartridges to the amplifier via the magnetic-cartridge input. And there are switched and unswitched AC outlets that can handle 250 watts.

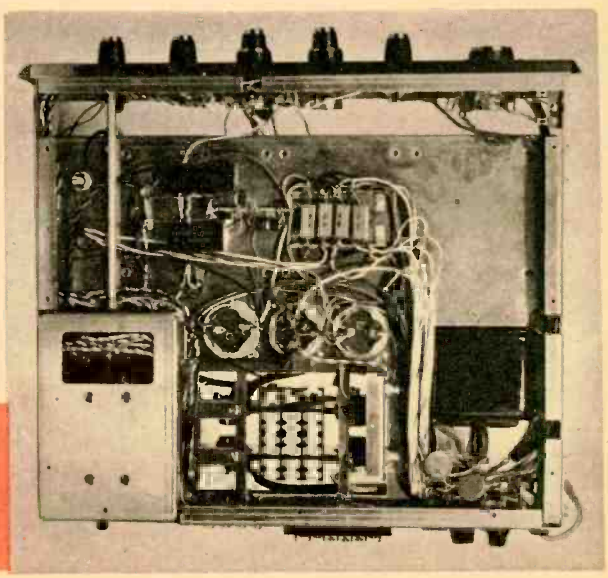
Front-panel controls include an input selector switch, a mode selector switch, concentric bass and treble controls, balance and loudness controls.

The front-panel switches include one marked *tape* that permits you to monitor a tape recording via the playback head on three-head recorders, a rumble and a scratch filter. There's a switch marked *compensator* which converts the control marked *loudness* to a conventional volume control.

And there's a front-panel monitor meter that is used to indicate the relative output power of both channels into 8-ohm speakers.

Putting It Together

The LK-60's flat-lying, spiral-bound construction manual includes many extras, among them a dictionary of hi-fi terms. The book is laid out so instructions and related pictorials are opposite each other. And the pictorials are almost good enough to compete in a pop-art contest. All parts and wires



Underside of LK-60 is exceptionally clean. Preamps are enclosed in shielded compartment in lower left corner. Input selector switch also is located in compartment and is coupled to the unit's front-panel knob with the extra-long shaft.

are shown in their colors. Parts are packaged according to the section in which they're used.

In a nutshell, the manual is the most complete, foolproof one we've seen in a long time. The only thing Scott didn't do is include a technician to build the kit.

Construction should go smoothly since many parts come mounted on the chassis. Such things as the preamps, driver stages and output stages are factory-wired on printed-circuit boards and have been tested. The builder has only to mount the boards and connect precut interconnecting wires. For this reason we consider it a semi-kit. But a lot of wires must be connected. Our builder's construction time was about 25 hours.

A light bulb is included with the kit for test purposes. A built-in circuit connects the bulb in series with the AC line. If the kit is wired properly the bulb glows dimly. If something is wrong and too much current is drawn the bulb lights brightly. You then can look for the error without fear of damaging parts. The built-in monitor meter is used to set the bias current and to make balance adjustments.

And if there is trouble, the manual has a detailed section on troubleshooting without instruments. There is technical information for more advanced builders, a section on amplifier theory and a schematic listing each stage's gain.

How It Checked Out

The LK-60's performance left little to be desired. Maximum sine-wave output power of each channel at 1 kc (both channels driven) was 39, 35.3 and 23 watts at 4, 8 and 16 ohms, respectively.

Frequency response at 1 watt was flat from 5 cps to 26 kc and down 3db at 36 kc. Intermodulation (IM) distortion (60 cps and 7 kc, 4:1) was 0.25, 0.7, 0.58 and 0.83 per cent at 1, 5, 10 and 30 watts, respectively.

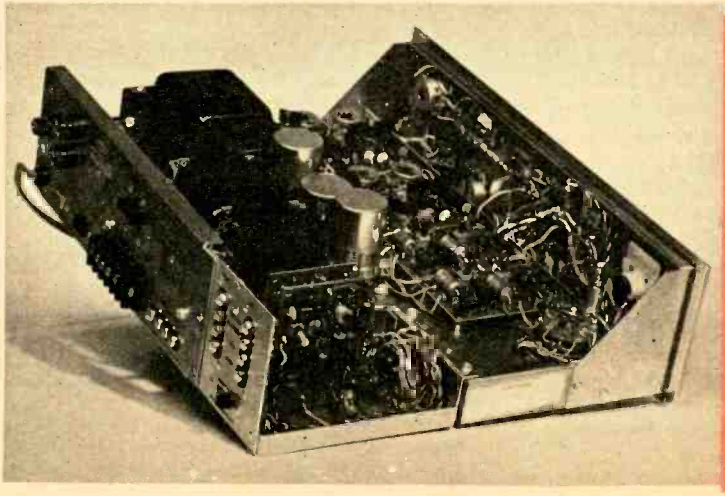
Total harmonic distortion (THD) at 1 kc was 0.15, 0.18, 0.15 and 0.29 per cent at ½, 1, 2 and 30 watts, respectively. THD at 30 watts was 1.2 per cent at 20 cps and 0.95 per cent at 20 kc.

The RIAA phono equalization was flat within 0.5db from 20 cps to 20 kc. The tone controls, rumble and scratch filters, loudness compensation, phono and high-level sensitivities all met Scott's claimed specs.

Our measured 57db signal-to-noise (S/N) ratio may appear high compared to a tube amplifier's but in listening tests the LK-60 sounds as though the S/N ratio is at least 65db or better. The reason for this is that the noise is generated below the limit of audibility.

Other amplifier features are a switch to select output impedance, provision for remote speakers (front-panel switch-selected) and a three-position rear-panel switch that is used to establish the magnetic-phono input sensitivity at 3, 5 or 9 millivolts, for full-rated output. The LK-60's output transistors are silicon.

In every respect the LK-60 proves that transistors are here to stay and can perform every bit as well as those old tube amplifiers —and then some.



Reason the LK-60 looked so clean under the chassis is because of high parts density on top. However, all circuit boards are supplied prewired and tested. Bulk of the work is the interconnecting wiring between boards and switches. Low-level preamp boards are mounted vertically in lower-left corner and are enclosed by a shield cover. Black objects between power transformer and preamps are heat sinks for the output transistors.

The LISTENER

C. M. STANBURY II

THE 212 MYSTERY . . . Probably the hottest controversy in DX these days can be summed up in one sentence—where is Radio Americas? As most EI readers know, there are those who are willing to stick their necks way, way out and state flatly that this station is *not* where most people believe it is, namely, on Swan Island. But if not Swan, where?

One answer stems from a series of interesting discoveries. First is that, at 2100 EST, station WRUL (Radio New York Worldwide with transmitters at Scituate, Mass.) airs a half-hour commentary in Spanish by the biggest name in anti-Castro broadcasting, Dr. Luis Conte Aguero. Said commentary from WRUL is picked up and rebroadcast simultaneously by R. Americas.

Next discovery is that R. Americas must rely on WRUL's transmitter No. 4, the only one beamed to SWBC Zone 11, for this rebroadcast. (This Zone includes Cuba, Central America and, of course R. Americas.) Thing is, a check of FCC records reveals that WRUL No. 4 is beamed at exactly 212 degrees. If the location of R. Americas is not a factor this direction indeed would be a weird choice. It misses Cuba except for the extreme westernmost tip and catches only the western end of Central America (Guatemala and tiny El Salvador). Putting it another way, the whole western half of WRUL's signal is wasted on open water and sparsely populated lower Mexico. Without R. Americas, 212 or any bearing west of 210 (Havana) is just too far west to make sense.

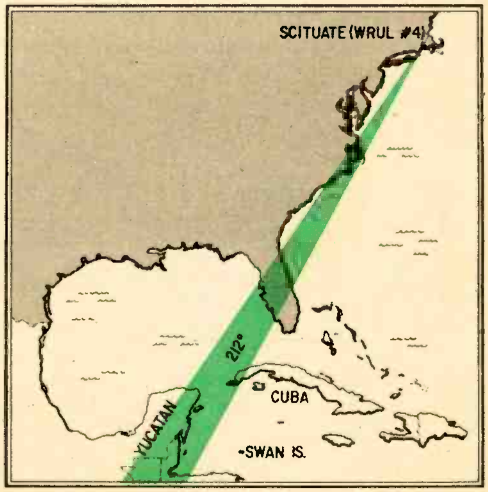
While WRUL would not have to beam on R. Americas absolutely, such a procedure certainly is reasonable. A direct-pickup relay station requires maximum signal from the originating station because the relay's listeners must contend with double QRM, double QSB distortion and double static. The problem becomes even more acute when the originating station is not a regular point-to-point facility but, as in the case of WRUL, one operating on crowded SWBC bands.

Therefore, if R. Americas were located on the northeast corner of Mexico's Yucatan peninsula (that would be the Cozumel/Puerto Juarez area) or aboard a ship in the Yucatan Channel, 212 degrees becomes a perfectly logical selection. Actually, 212 hits the lower Yucatan Channel but the beam could have been pulled slightly east of the exact location in order to provide at least reasonable reception in the rest of Zone 11.

But let's carry the argument a little further. If for some reason WRUL chose not to beam on R. Americas, Cuba would be the next most likely choice. Further, a beam to central Cuba (202 degrees) or Havana itself would improve Central American reception. True, Guatemala has been the scene of Communist agitation but so has Panama (195 also hits Cameguey) and Costa Rica (202 again). So the possibility that Guatemala would be selected over Cuba and the rest of Central America is remote.

Assuming R. Americas *were* on Swan, 212 becomes positively absurd. For by beaming at 208.5 degrees, WRUL could hit exactly halfway between Havana and Swan while simultaneously realizing maximum coverage of the entire Central American population. Such a technical coup certainly would outweigh all other choices, including Guatemala.

Added to the 212 mystery are two more pieces of evidence. Northeast Yucatan is geographically excellent for R. America's purposes. Further, it has been known for some time that the R. Americas supply plane stops at Cozumel! Everything considered, the conclusion seems inescapable.



Real location of R. Americas, long thought to be Swan Is., is suggested by 212-degree beam which WRUL aims at the Caribbean mystery station.

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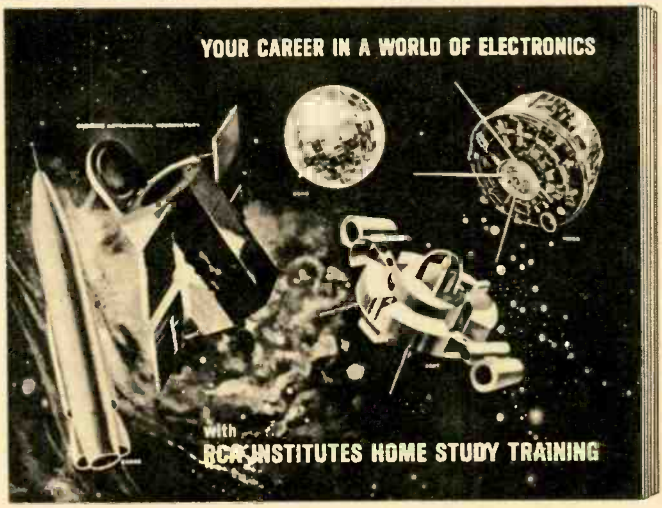

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how to eavesdrop on

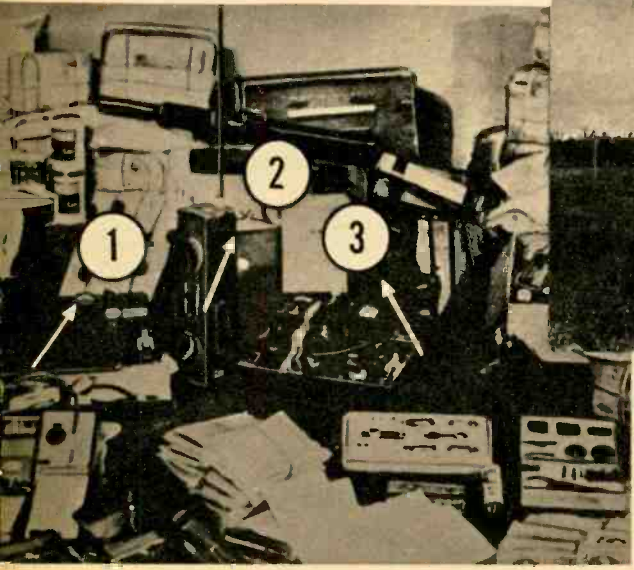
Who would have thunk that distinguished gentleman from U.N.C.L.E. outfoxes

TIME was when spies and spying somehow were unsuitable for mention in polite company. Nations seemed content to agree that such things did not exist. And they more or less didn't, for espionage agents of that era operated suitcase-size transmitters from closets or attics, using multiple coat-hanger (or perhaps bedspring) antennas. Nice civilized countries reacted with shock when some poor agent got caught. And if, by some horrible twist of fate, the nice civilized country was alleged responsible for said agent, there were loud denials and outraged cries of trumped-up charges.

But things are different now, due in part to James Bond, Napoleon Solo and other masters of the story-book spy. For 007 and his boys have so unveiled and de-Paled the ancient profession that nice civilized nations actually swap captured spies. (Remember the exchange of master Russian spy Colonel Rudolph I. Abel for U.S. U-2 pilot Francis Gary Powers?) Fact is, espionage operations now are conducted in a most blasé fashion. The nations of the world almost would seem to have an unwritten pact saying, OK, so we are all spying on each other. This being the case, let's at least make our agents a little more comfortable in the process.

When Russian spy Abel was arrested, he had a bulky, sensitive, American-made shortwave communications receiver decorating the den of his pleasant apartment overlooking New York's picturesque East River. No suitcase equipment for him—and no bedspring antennas either, for his roof sported an extremely practical antenna beamed straight towards Europe.

Radio Swan, yesteryear's No. 1 mystery station, spoke to spies in 1961 Bay of Pigs fiasco. These are station's two antennas.



U.S. spies, if we are to believe Russian sources, come equipped with everything from grab bags to game hens. Originally published in a Soviet newspaper, photo shows alleged U.S. spy equipment that includes what appears to be 1) a scrambling device, 2) a transceiver, 3) a battery-operated SW receiver.

real spies

By TOM KNEITEL, K2AES

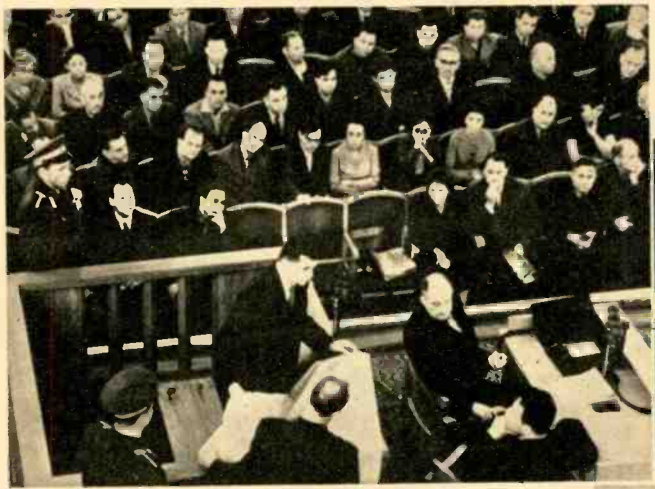
007 a mere bandswitch's throw from 49 meters?

It probably is safe to assume that he was not using this equipment to listen to The Happy Station program over Radio Nederland, nor was he following a yodeling contest from Switzerland. He simply was relying on his radio to bring him espionage instructions direct from the Kremlin. And unlike spies of yore, Abel had no need to transmit. Coded messages *to* him sufficed most adequately.

For our own part, Gary Powers wasn't made to peer at the Russian landscape from the vantage point of an abandoned windmill or a hollowed-out haystack. We sent him in style—in a very powerful, very expensive, very ultra-everything jet aircraft (which for all these superlatives proved incapable of making a hasty enough exit upon its detection).

And as for our own electronics, the Central Intelligence Agency (that's the real-life U.N.C.L.E.) established a powerful broadcasting station right in Fidel's back yard. This was famed Radio Swan, now known as Radio Americas. Of course, the CIA never has admitted any affiliation with R. Swan/Americas, but the station always has operated under only the very sheerest of espionage covers. And it from time to time has treated listeners throughout the world to such cryptic messages as, Attention Stanislaus, the moon is red 19 April. (This, by the way, was an actual message transmitted a few days before the 1961 Bay of Pigs invasion.)

During that invasion, R. Swan directed the entire troop operations in the manner of a command post. Mixed into troop instructions were remarks like, Alert! Alert! Look well at the rainbow. The fish will rise very



Francis Gary Powers, the U.S. U-2 pilot who lost his plane but saved his person over Soviet soil, was tried in Moscow on espionage charges, later exchanged for Col. Rudolph I. Abel, a Soviet spy arrested in the U.S.

Robert Glenn Thompson, an American convicted of spying for the U.S.S.R., was first to reveal shortwave's real role in espionage.

how to eavesdrop on real spies

soon . . . the sky is blue . . . the fish is red. Look well at the rainbow. Though proof is lacking, such seeming gobbledy-gooks most probably were coded instructions for undercover agents within Cuba.

Almost immediately after the collapse of the Bay of Pigs invasion (which turned out to be a well-intentioned but ill-timed venture of the CIA), the use of short-wave radio by espionage agents *really* came out into the open. Listeners around the world suddenly began reporting reception of mysterious phantom stations without call-signs. Gone were the Hollywood-like theatrical instructions with references to red fish and blue skies. In their place were coded messages, offered as 4-, 5- or 6-figure groups of numbers by both male and female announcers and in a variety of languages (English, Spanish, German and Czech among them). Thing is, these are not suitcase stations, but high-powered, sophisticated endeavors using directional antenna arrays. Many frequencies are in use, and in some areas of the U.S. such stations actually roll in like locals. Occasionally, music even is played between messages, possibly as a relaxant for agents engaged in some hasty decoding.

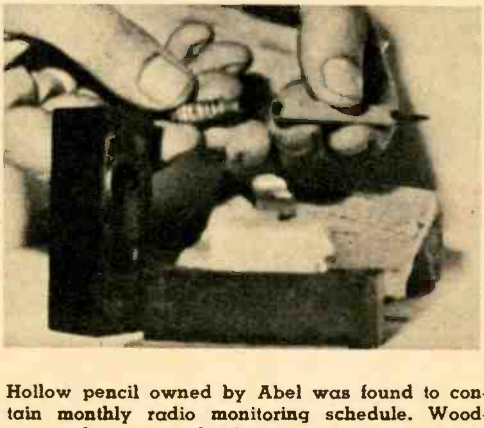
These stations dot the short-wave dial, sending their tidbits for agents who are referred to over the air by names like Amedio 32 and Gruppen 133. Instead of call-signs, the stations either do not identify at all, or they use buzzers or musical numbers. (One has been heard on approximately 4050 kc at 1500 EST, broadcasting in German and playing the March From The River Kwai as an ID; another, also in German, has been picked up on 4665 kc groaning out a schmaltzy Strauss waltz called Wienerblut as an ID; still another station—this one in Czech—uses the code name *Konets* as an ID and is heard around 2130 EST on 9845 kc.)

Most such stations change frequencies and schedules often, but generally a particular station will make use of the same group of frequencies over a given period. (Identical transmissions in Spanish have been heard on 3450 and 4680 kc—the former around 0700 EST, the latter around 1705 EST. Similarly, the 4050-kc transmission in German mentioned earlier simultaneously has been heard on 6400 kc.)

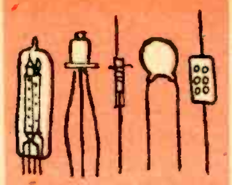
How do agents turn the mysterious numbers into meaningful messages? Such information was not too easy to come by—at least until recently when an American named Robert Glenn Thompson was charged with espionage for the U.S.S.R. He promptly poured out his soul to an Austrian magazine called *Kleines Blatt*, in the process of which he detailed procedures relating to his own spy station.

[*Continued on page* 115]

Col. Rudolph Ivanovich Abel spent years in U.S. prison following his conviction as a Red agent, later was traded for U.S. spy Soviets had caught.



Hollow pencil owned by Abel was found to contain monthly radio monitoring schedule. Wooden sanding block held a microfilm code book.



BEGINNER'S CORNER

Those Multiplying Cells

AIM a camera, push the shutter release and the exposure is perfect every time. Send a space vehicle into orbit and forget about the batteries dying since operating power will come from the sun. The magic component that makes all this possible? The semiconductor photocell.

The examples we've used rely on two basic types. The first is a *photoconductive* photocell. Since it works just like a variable resistor, it also is called a photoresistive cell. The cell's resistance changes in inverse proportion to the intensity of the light striking it. The greater the light, the lower the resistance and vice versa. Thus, the cell is used to *control* current flow in a circuit.

The other type is the *photovoltaic* photocell. Also called a solar cell, sun battery or simply a self-generating cell, it *generates* current when exposed to natural or artificial light.

The operation of both photocells is based on semiconductor action. The material used in the photoconductive cell is cadmium sulphide (CdS). The cell's construction and operation are shown in Fig 1.

The cell is made by depositing a thin layer of cadmium sulphide, to which electrodes are attached, on a ceramic base as shown in A. During the manufacture of the cadmium sulphide, an impurity is added to convert it to a N-type semiconductor—a material rich in free electrons.

If there's no light on the cell electron activity is low and the resistance of the cadmium sulphide, and consequently between the terminals, is high.

When light energy in the form of photons strike the cell, the cell absorbs energy and electron activity increases. Assume that the cell shown in Fig. 1-B is connected to a battery. Free electrons now will be attracted to the positive side.

As the electrons move to the positive terminal they leave behind what are called holes. The holes, which have a positive charge, are attracted by the negative terminal.

In other words, light energy stimulates current carriers within the cell. The more light, the greater the number of carriers and the greater the current flow. The effect of this, the increase in current, is the same as would be produced by a variable resistor connected to the battery. Lower the resistance and current will increase. The cell, load and battery can be connected without regard to polarity since the action will take place in either direction.

The operation of the photovoltaic or solar cell is more complex. It's made of P-type and N-type semiconductor materials (either selenium or silicon) as shown at the left in Fig. 3. This is the way this cell works:

When the P and N semiconductor materials are joined, a potential barrier region is built up. When the cell is in darkness, holes

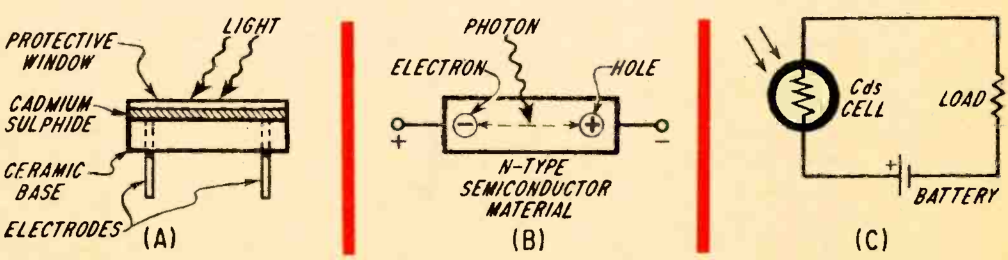


Fig. 1—Diagram A shows photoconductive cell construction. In B, activity of free electrons is increased by light which causes them to be attracted by positive external voltage. Holes left behind are attracted by negative side. This results in a current flow whose magnitude is determined by light intensity.

Those Multiplying Cells

and electrons (circled plus and minus signs, respectively) move toward the junction because of their mutual attraction. This movement eventually stops.

When light strikes the junction, photons force the electrons and holes across the junction, causing electron-hole pairs to be formed. The activity caused by the combining of the electrons and holes produces a difference in potential between the electrodes, which is indicated by the meter as a current flow.

To witness the operation of a photovoltaic cell, connect one to a meter as shown in Figs. 2 and 3. You now have a simple meter that measures light intensity. The cell to use is an International Rectifier type B2M (Allied 7 U 876). Connect the cell's red lead to the positive meter terminal and the black lead to negative terminal. If the meter is a 0-100 μa DC microammeter, it will indicate approximately the intensity of light falling on the cell in foot-candles per square foot. The table below converts current to light level.

Meter indication (microamperes)	Foot-candles / square foot
0	0
20	6.4
40	12.8
60	26.0
80	52.0
100	104.0

The B2M cell can also be used to power a small transistor radio. The cell's output in

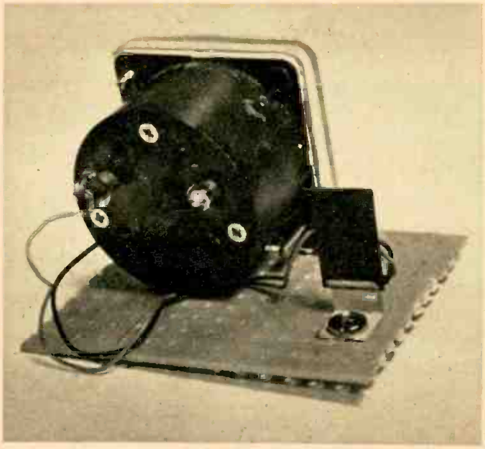
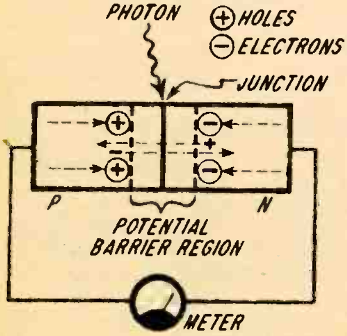


Fig. 2—Experimental setup to demonstrate photovoltaic-cell light meter. You could mount the meter and cell in cabinet for portable applications.

sunlight is approximately 0.4 V at 2 ma. If this voltage is too low, connect cells in series to add their voltages. Higher currents can be obtained by connecting several cells in parallel. A series-parallel arrangement boosts both voltage and current.

In electronic parts catalogs you will find other cells (silicon) whose output is greater. Some have nearly a 1-V output at over 20 ma in sunlight. The International Rectifier type S5M, for example, has a 0.6- to 0.85-V output at 18 to 25 ma.

A cadmium-sulphide photoconductive cell can be connected in a circuit in the same way as a variable resistor. But there is one important thing to keep in mind—maximum applied voltage. If you wish to connect the cell in a 117-VAC circuit, choose a cell with a 250- to 300-V rating. Lower-voltage cells



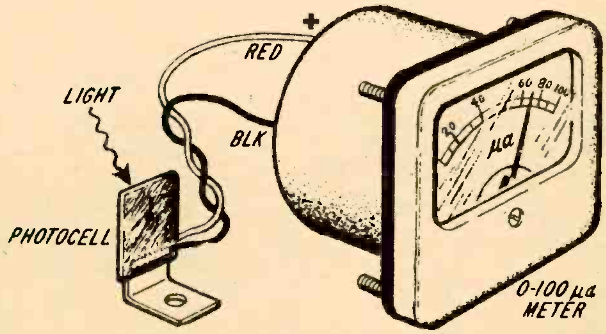


Fig. 3—In diagram of photovoltaic cell at left, holesand electrons are caused by light to cross potential barrier region and combine. Minority carriers which are created pass through the junction and are actually the current developed by the cell. Diagram at the right is of photovoltaic-cell light-level meter.

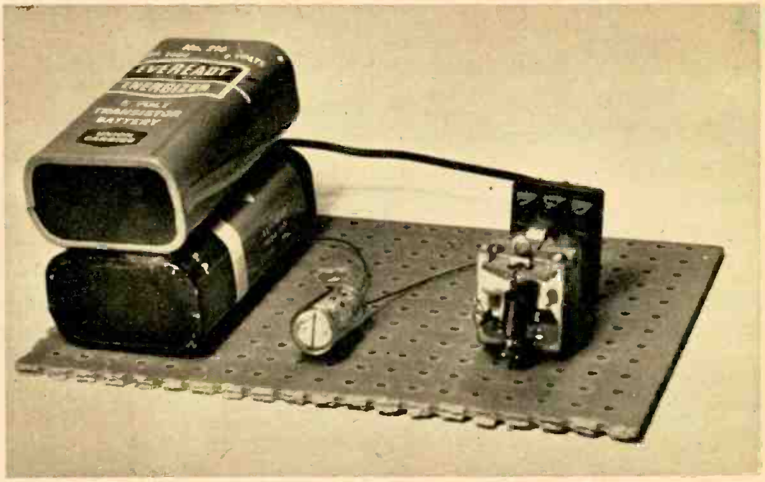


Fig. 4—Photoconductive cell connected in series with two 9-V batteries and a sensitive DC relay can be used to turn on lamp as darkness approaches. Make sure current drawn by external circuit does not exceed rating of the contacts. A 10,000-ohm potentiometer connected in series with the relay can be used to control the sensitivity.

can be used safely with batteries. The cell's ratings and other important details, such as resistance under light conditions, also will be listed in parts catalogs.

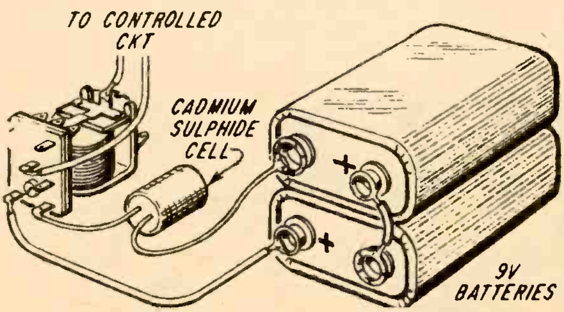
Another value that must not be exceeded is the cell's maximum power dissipation in watts. If it's not stated in the catalog, it can be determined by multiplying maximum voltage and current ratings of the cell.

A simple setup in which a photoconductive cell can be used to control a relay directly is shown in Figs. 4 and 5. This circuit is useful for applications like triggering an alarm or turning on a lamp as when darkness approaches. The cell to use is Clairex type CL-602 (Allied 7 U 460). It's resistance is about 3,000 ohms in bright room light and many times higher in darkness. The relay, (Lafayette Stock No. 99 R 6091) is a sensitive DC type (5,000-ohm coil) that closes when the coil current is about 2 ma.

With these specs you find out that the relay requires 10 volts for its contact to close. Here's how: Using the formula E=IR, we find that .002 × 5,000=10 V. Since the photocell's resistance is 3,000 ohms when illuminated, it will have a voltage drop across it. Thus, if the required current is 2 ma (.002 A) and cell resistance 3,000 ohms, the voltage drop across the cell will be 6 V. Therefore, about 16 V is required to operate the circuit. Two 9-V transistor-radio batteries in series will do the job.

When using this circuit with 117 VAC, you should enclose it in a cabinet so you don't get a shock. Also, an AC relay that will handle higher voltage will have to be substituted. However, a better approach is to use a step-down transformer to reduce line voltage to a safer level. Then long leads may be run to the photocell and other parts with safety.

—*H. B. Morris*



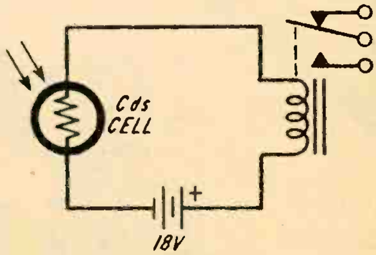


Fig. 5—Schematic of photoconductive-cell control device. Sixteen volts is required to provide current to cause relay contacts to close. Clairex cell we specify (not shown above) can handle up to 300 V and can, therefore, be used with AC relay in line-operated circuits. Cell handles up to 75 milliwatts.

BRIDGE TO NOWHERE

EXPERIMENTING with a new project has a special kind of satisfaction—but it has frustrations, too. Like when you're pawing through the junk box for an inductor. You find one that looks like it might be the right value. When you examine it closely though, you discover to your dismay that the markings have vanished. It's useless.

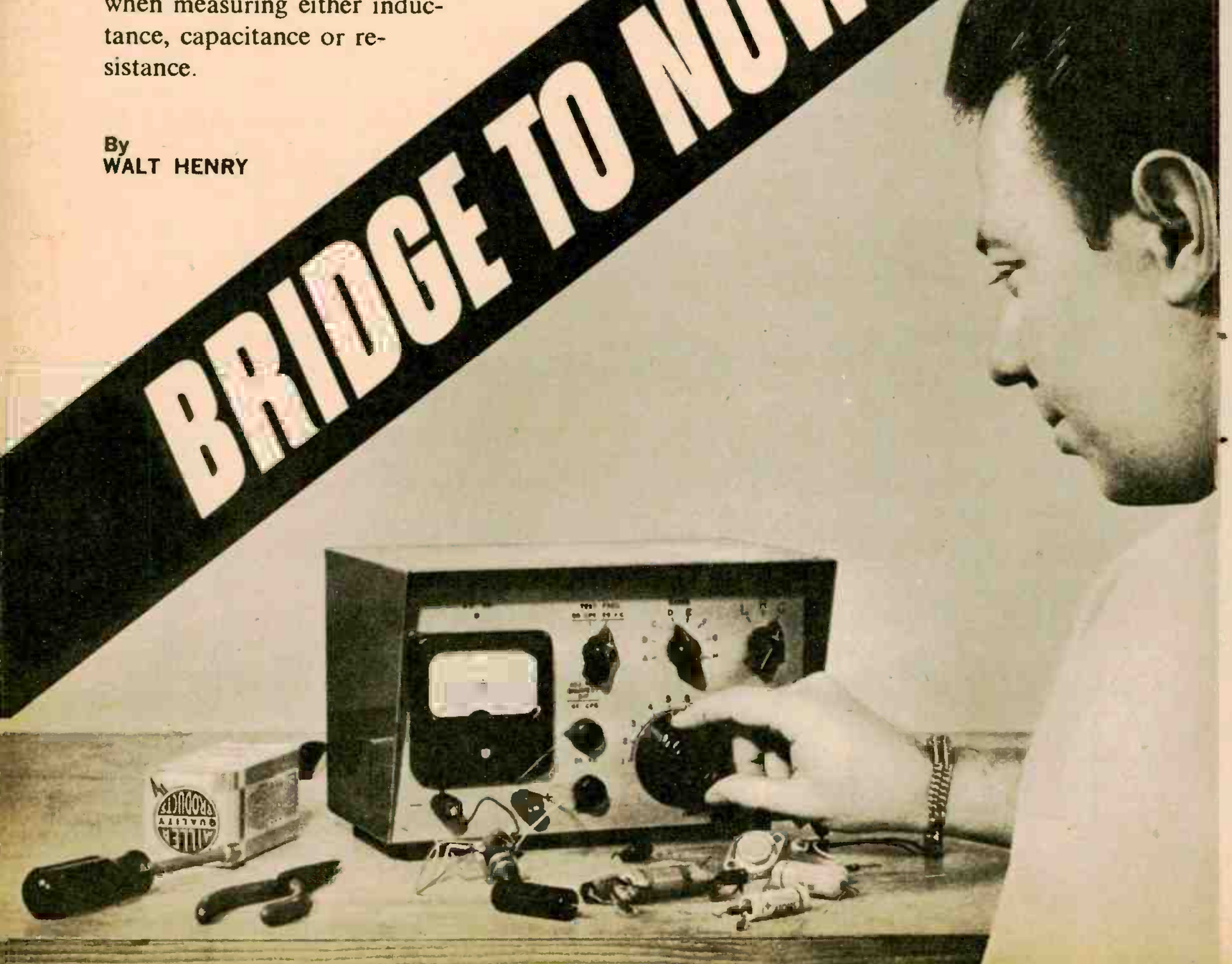
Or you have an odd-looking variable capacitor that was removed from a piece of surplus equipment. How would you determine its capacitance range?

Even though you own a VOM and perhaps even a capacitance meter these two instruments won't always measure a *wide range* of resistance and capacitance accurately. It takes an impedance bridge to do this job.

Our impedance bridge turns those unidentifiable parts into useful components. It measures resistance from 0.1 ohm to 14 megohms, capacitance from 1 μμf to 14 μf and inductance from 10 μh to 10 hy. Carefully calibrated, its accuracy is ± 5 per cent.

For most measurements, the bridge is powered by a battery. A few ranges however, require a 60-cps signal. Since low-frequency transistor oscillators can be complex, a 60-cps signal from a 6.3-V filament transformer (and, consequently, 117 VAC) is used some of the time when measuring either inductance, capacitance or resistance.

By
WALT HENRY



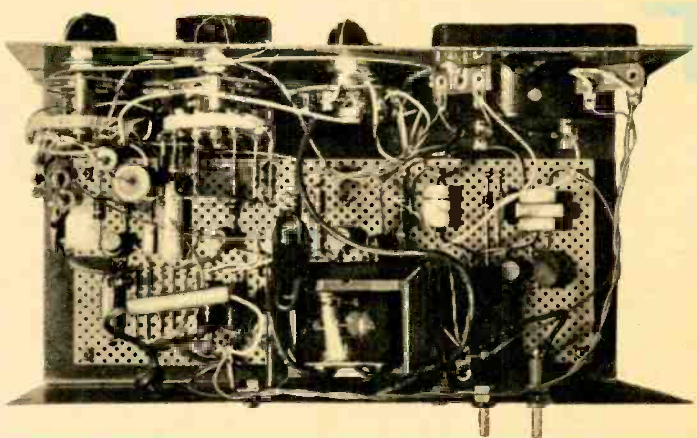


Fig. 1—View down into bridge. Wire selector switches S1, S2 and S3 before mounting them on front panel. Then mount circuit board on bottom of U-section of Minibox with four 1¼-in.-long spacers. Connect front-panel controls to circuit board, then install filament transformer T2 and associated components on rear panel. Pictorial of components on rear panel is shown in Fig. 3.

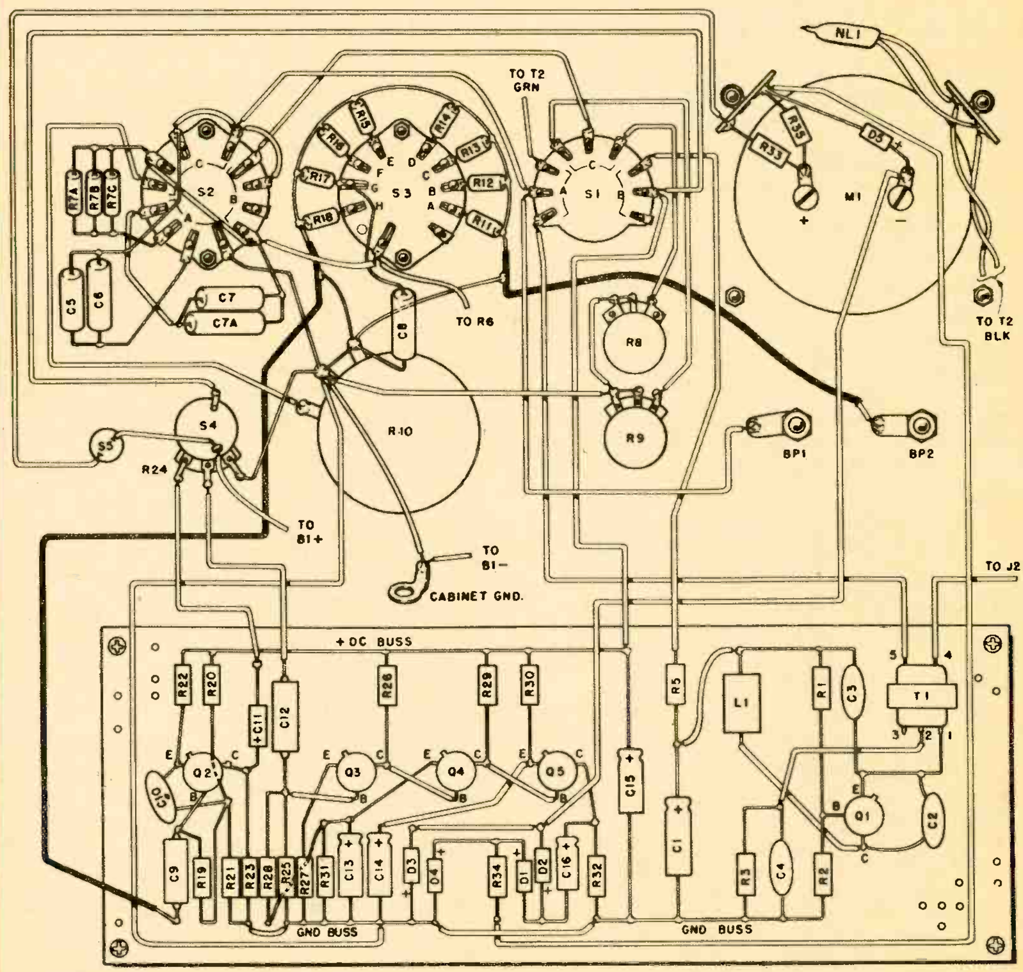
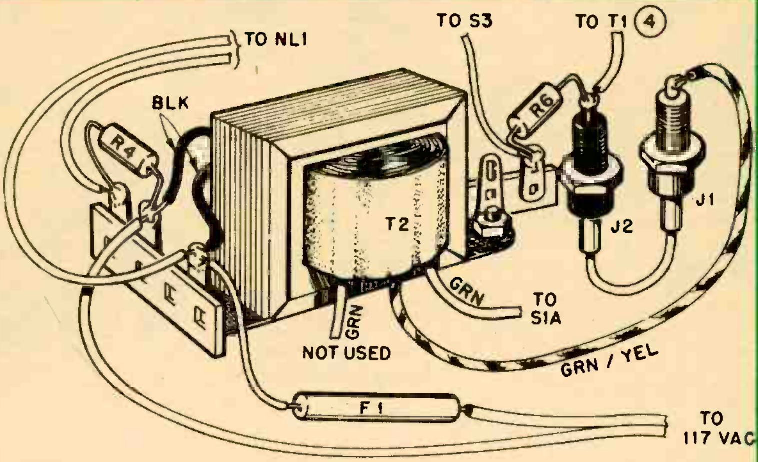


Fig. 2—Circuit board and front-panel wiring. Perforated board is 8½ x 3½ in. To prevent oscillator output from getting to amplifier, put oscillator at right of board and amplifier input at extreme left. Note that shield on wires from BP2 to R11 and from C9 to R18 is grounded at R11 and R18 ends only.

Fig. 3—After circuit board is installed, mount these components on top of rear panel. We soldered F1 in AC line but you could use fuse holder. J1 and J2 normally are connected with jumper. When checking electrolytics, remove jumper and connect + terminal of 9-V battery to J1, negative terminal to J2.



BRIDGE TO NOWHERE

Construction

Circuit layout is not critical but for best performance a few points should be noted. When laying out the circuit board be sure the oscillator (Q1) is located to the right of the output end (Q5) of the amplifier to minimize stray-signal pickup. This keeps the oscillator away from the amplifier input at Q2.

The ground wire from the front-panel components to the circuit board should be connected near the second stage (Q3) as shown in Fig. 2. Note that several ground wires are connected to R10 to stabilize the circuit. Filament transformer T2 should be located away from the input end of the amplifier. In our model it is mounted on the top of the back of the U-section of the Minibox as shown in Fig. 2. One of T2's green secondary leads should be cut short and taped.

So little AC power is consumed that we did not use a switch to turn off power to T2. But since the amplifier is battery powered switch S4 should be turned off when the instrument is not in use. All wiring should be short and direct. Note that shielded wires are used from BP2 to R11 and from R18 to C9. Ground the shield at the R11 and R18 ends only.

To lay out R10's dial as shown on the first page of this article, put 0.1 and 1.0 marks 180° apart on a horizontal line. Then mark off 20° divisions for 0.2 through 0.9. Also mark off 20° divisions for 1.1 through 1.4.

Test and Calibration

Set S2 to *R* and set *test freq.* switch S1 to *60 cps.* Do not plug in the line cord. Turn potentiometers R8, R9 and R10 full counterclockwise. Set S4 to *on* but leave *amp. gain* pot R24 full counterclockwise. Measure the voltage with respect to ground on Q5's emitter (point *A* on the schematic) and on the collector (point *B*). The voltage at *A* should be about twice the voltage at *B*. If it is not, use a different value resistor for R28 to get the proper voltage.

Now measure the voltage on Q2's collector (point *C*). It should be between 2 and 4 V. If it is not in this range a slight change in the value of R20 will do the trick.

Set *range* switch S3 to *E* and slowly turn R24 clockwise. With the gain wide open the meter should indicate below 5 microamps. If it is higher Q2 may be noisy and should be replaced.

Leave S3 at *E*, turn R24 counterclockwise and plug in the line cord. Connect a 10,000-ohm, 1 per cent calibration resistor to BP1 and BP2 and turn R24 clockwise until M1 deflects almost all the way to the right. Now adjust *mult.* pot R10 until the meter nulls. It may be necessary to readjust R24. (If you don't get a null go on to the next paragraph.) Loosen the set screw on R10's knob, set the pointer to 1.0 and tighten the set screw. Now connect a 1,000-ohm, 1 per cent resistor to BP1 and BP2. The null should occur when R10 is set to 0.1.

If you don't get a null it is because components are out of tolerance. It probably will

Range Switch Position	Multiply R10 by		
	C	R(ohms)*	L
A	10 μf*	1	—
B	1 μf	10	100 uh
C	.1 μf	100	1 mh
D	.01 μf	1,000	10 mh
E	.001 uf	10,000	100 mh
F	100 μμf	100,000	1 hy
G	10 μμf	1 meg	10 hy*
H	—	10 meg	—
* Use 60 cps			

Fig. 4—Cut out this chart and paste on top of cabinet for reference. Set S3 for approximate value of component to be checked. For exact value of part, multiply reading on R10's dial when meter nulls by figure in the appropriate column.

be necessary to change the value of R7A, B, C slightly to get nulls at exactly 1.0 and 0.1. We had to parallel R7 with a 1,500-ohm resistor. An easy way to determine the value of the resistor is to parallel R7 with a 5,000-ohm pot and repeat the above procedure with different potentiometer settings until nulls occur at exactly 1.0 and 0.1. Measure the pot's resistance and solder a resistor of the same value in parallel with R7. If R7 should happen to be too low in value, replace one of the 68-ohm resistors with an 82-ohm resistor and repeat the procedure.

When you are through tighten the knob set screw securely. It is a good idea to check the other ranges, using several resistors of known value. The bridge's accuracy can be increased if R11 through R18 are 1 per cent resistors instead of the 5 per centers specified in the Parts List.

For accurate capacitance measurements, the values of C5 and C6 must be selected; their combined value will be close to 0.3 μf. We obtained the proper value by paralleling 0.1 μf and 0.18 μf capacitors. Connect a 0.001 μf 5 per cent calibration capacitor to BP1 and BP2. Set S3 to *E*, S2 to *C* and S1 to 20 kc. Increase the gain (R24) for a full-scale deflection and adjust R10 for null. Try various parallel combinations for C5 and C6 until the null occurs with R10 set at 1.0. Then use a 100 μμf capacitor to make sure the null occurs when R10 is set at 0.1. Always adjust R9 or R8 first for sharpest dip. Check other ranges with different capacitor values. For values greater than 1 μf, S1 should be set to 60 cps instead of to 20 kc.

If the capacitor under test is an electrolytic, connect a 6- to 9-V battery to *ext. bias* jacks J1 and J2. Be sure to observe polarity marks when connecting the capacitor to BP1 and BP2.

Calibration for inductance is accomplished by selection of C7 and C7A. Their combined value normally is about 0.25 μf. We obtained the proper value by paralleling a 0.22 μf and a 0.047 μf capacitor. Connect a 1-mh choke to BP1 and BP2, set S3 to *C*, S2 to *L* and S1 to 20 kc. Adjust R8 and R10 for sharpest null and try parallel combinations for C7 and C7A until the null occurs when R10 is set at 1.0. Check out the other ranges with other chokes. For values above 1 hy, 60 cps should be used.

The bridge can be simplified if you're willing to sacrifice some features. For example, if you do not have to measure capacitance above 1 μf, inductance above 1 hy, and resistance above 1 meg, T2, S1, R8, R4, R9, F1, J1, J2 and NL1 can be eliminated. S5 and R33 can be left out if you don't need the battery-test feature.

A less sensitive meter can be used with some loss in measurement sensitivity. For example you can use a 1-ma meter and eliminate R35 and D5. But change R34 to 2,200 ohms.

Operation

First, check the battery. With S4 off, press *batt. test* push button S5. If the meter indicates between 30 and 40 microamps, the battery is good.

For all resistance measurements, set S1 to 60 cps. For capacitance measurements up to 1 μf, set S1 to 20 kc. Above 1 μf, set S1 to 60 cps. Do likewise for inductance up to 1 hy. Set switch S2 to either *C*, *L* or *R*, depending on the component you are checking.

Set S3 to the appropriate position determined from the chart in Fig. 4. Adjust either R9 or R8 (depending on the test frequency) for the sharpest null, keeping R24 turned down to prevent M1 from going off scale.

Then adjust R10 for a sharper dip, turn R24 clockwise and adjust R10 for another null. Now multiply the value on R10's scale by the number in Fig. 4 to get the value of the part.

How it Works

The bridge contains three major circuits: the signal source (20 kc from the built-in os-

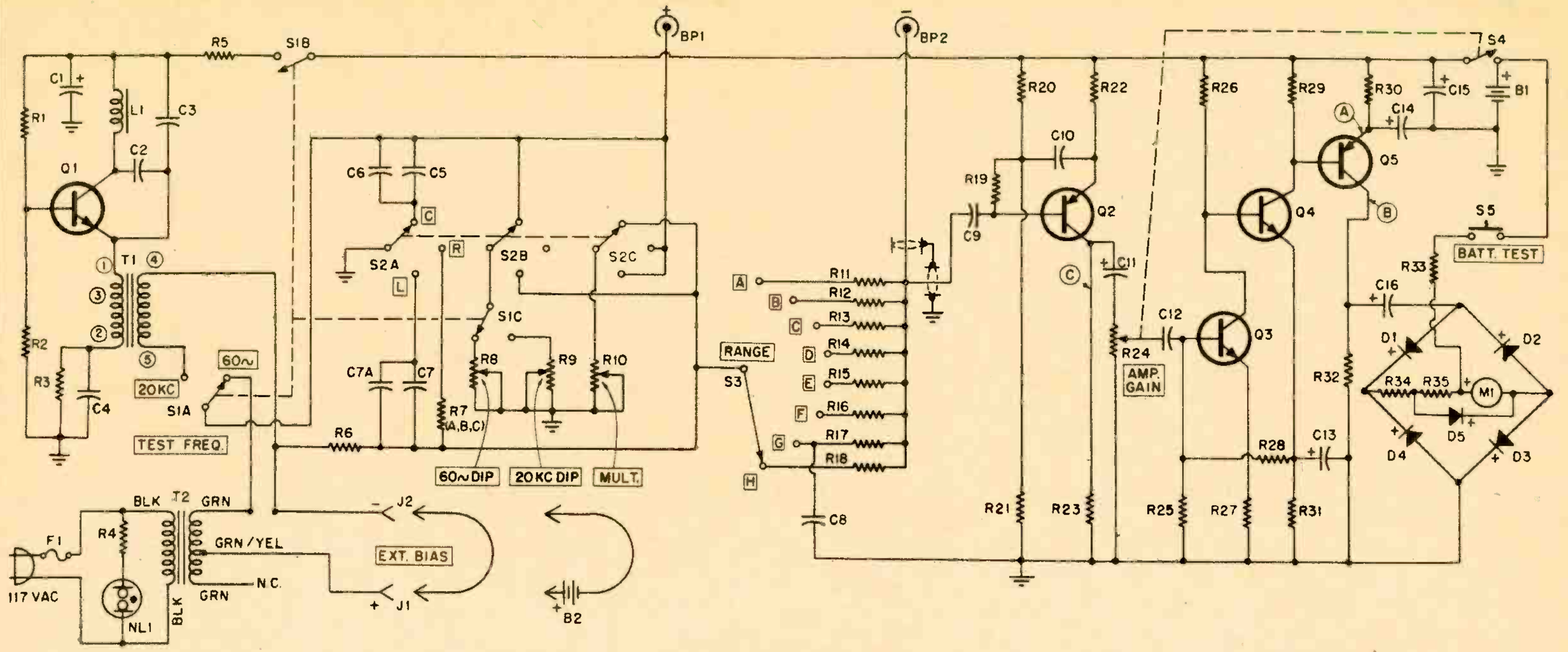
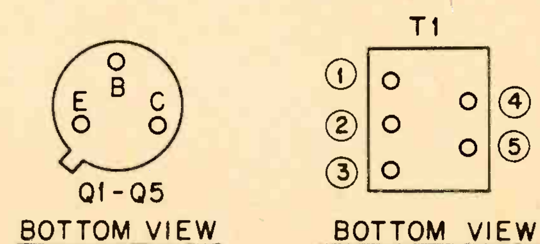


Fig. 5—Schematic of impedance bridge. Two different test signals are used. The 20-kc signal is generated by Q1 and associated components. The 60-cps signal is provided by T2. Switch S1 selects the test signal and feeds it to bridge. Depending on whether part to be checked is capacitor, resistor or inductor, S2 is used to set up either a Wheatstone or a modified Maxwell bridge configuration. Output of bridge then is fed via range switch S3 to the high-gain amplifier, which consists of Q2 through Q5. Bridge is first coarse-nulled by either R8 or R10, depending on test frequency. Amplifier gain is increased by R24 and bridge finally is fine-nulled by R10. In our model, T1 was an Olson Electronics transformer with lugs. The Lafayette transformer has color-coded leads. Its green and black secondary leads correspond to lugs 5 and 4, respectively. And on the primary side, the brown, red and green leads correspond to lugs 1, 3 and 2, respectively.



PARTS LIST

B1—9 V battery (Burgess 2MN6 or equiv.)
B2—6 to 9 V battery (see text)
BP1, BP2—Five-way binding post
C1—100 μf, 10 V electrolytic capacitor
C2, C3, C4—.01 μf, 100 V (or higher) ceramic disc capacitor
C5—.1 μf, 200 V tubular capacitor (see text)
C6—.2 μf, 200 V tubular capacitor (see text)
C7—.22 μf, 200 V tubular capacitor (see text)
C7A—.022 μf, 200 V tubular capacitor (see text)
C8, C9—.1 μf, 200 V tubular capacitor
C10—.1 μf, 100 V (or higher) ceramic disc capacitor
C11, C16—5 μf, 10 V electrolytic capacitor
C12—.47 μf, 200 V tubular capacitor
C13, C14, C15—50 μf, 10 V electrolytic capacitor
D1-D4—1N60 diode
D5—IN270 diode
F1—3/8 A fuse
J1, J2—Phone tip jack
L1—10 mh RF choke (J. W. Miller 70F102A1, Newark Electronics 59F250; 99¢ plus postage. Minimum order $2.50)
M1—0-50 microampere panel meter (Lafayette 99 R 5042 or equiv.)
NL1—NE2 neon lamp
Q1, Q3, Q4—2N388 transistor
Q2, Q5—2N414 transistor
Resistors: 1/2 watt, 10% unless otherwise indicated
R1—100,000 ohms
R2, R23, R34—10,000 ohms
R3—4,700 ohms
R4—150,000 ohms
R5—390 ohms
R6—10 ohms, 1 watt
R7A, R7B—68 ohms (see text)
R7C—1,500 ohms (see text)
R8—250,000 ohm, linear taper potentiometer
R9—10,000 ohm, linear taper potentiometer
R10—50 ohm, wirewound potentiometer (Clarostat 58C1-50, Newark 8F439. $1.35 plus postage)
R11—1 ohm, 1%
R12—10 ohms, 5%
R13—100 ohms, 5%
R14—1,000 ohms, 5%
R15—10,000 ohms, 5%
R16—100,000 ohms, 5%
R17—1 megohm, 5%
R18—10 megohms, 5%
R19—68,000 ohms
R20—270,000 ohms
R21—220,000 ohms
R22—5,600 ohms
R24—10,000 ohms, log taper potentiometer with SPST switch
R25—22,000 ohms
R26—6,800 ohms
R27—220 ohms
R28—43,000 ohms, 5%
R29—3,900 ohms
R30, R35—1,000 ohms
R31—3,300 ohms
R32—2,200 ohms
R33—200,000 ohms, 5%
S1—3-pole, 2-position non-shorting rotary switch (Centralab PA-1007. Allied 35 U 068)
S2—3-pole, 3-position non-shorting rotary switch (Centralab PA-1013. Allied 35 U 071)
S3—1-pole, 8-position non-shorting rotary switch (Centralab PA-1001. Allied 35 U 065)
S4—SPST switch on R24
S5—Normally-open push-button switch
T1—Transistor audio transformer; primary impedance: 500 ohms, center tapped. Secondary impedance: 3.2 ohms (Lafayette 99 R 6127 or Olson T-231)
T2—Filament transformer; secondary: 6.3 V center tapped @ 1.2 A (Allied 61 U 419 or equiv.)
Misc.—6 x 10 x 7-in. cowl-type Minibox (Bud SC-2130), RG174/U coax, terminal strips, line cord, perforated board, flea clips, knobs.
Note—One of each of the following parts should be borrowed or purchased to calibrate the bridge: 10,000-ohm, 1% resistor; 1,000-ohm, 1% resistor; 1-mh RF choke (J. W. Miller 70F103A1, Newark 59F243. 75¢ plus postage); .001 μf, 5% capacitor (Centralab CPR-1000J, Newark 19F2377. 15¢ plus postage); 100 μμf. 5% capacitor (Centralab CPR-100J, Newark 19F2353. 15¢ plus postage).

cillator or 60 cps from a filament transformer), the bridge circuit and the amplifier-meter circuit. An AC signal is applied to the bridge circuit and the bridge is balanced by turning R8, R9 and R10. The output from the bridge then is applied to the high-gain amplifier.

The amplified signal is rectified by a diode bridge whose DC output goes to M1. The meter current depends directly on the amplitude of the signal from the bridge. Thus, when the bridge is balanced, the meter indicates a low value, or nulls.

Switch S3 permits you to check component values over a wide range. Switch S2 sets up the bridge for measurement of resistance, inductance or capacitance. The test frequency is selected by S1 and the instrument's sensitivity is adjusted by R24.

The 20-kc oscillator (Q1 and associated components) is a modified Colpitts whose output is coupled through a transistor audio-output transformer (T1) to the bridge. The oscillator's frequency is determined by L1, C2 and C3. The output is a clean sine wave.

The bridge has to have different circuit configurations for measuring R, L or C. Switch S2 makes the necessary changes. For inductance and capacitance measurements, two potentiometers (R8 for 60 cps, R9 for 20 kc) cancel variations in component values.

The four-stage amplifier (Q2 through Q5) has a high input impedance and a high voltage gain. Stability or motorboating problems are eliminated by the upside-down output stage, Q5. The use of this configuration made stage-by-stage decoupling unnecessary. The oscillator is decoupled from the amplifier by R5 and C1. R34, R35 and D5 prevent the meter from being overloaded.

THE HAM SHACK

BY ROBERT HERTZBERG W2DJJ

CHANGE OF MIND . . . Transceivers never have appealed to us much because of what we thought was their lack of flexibility. But they do have important advantages, as we found out when we had to give up a 12 x 15 ft. shack and take refuge in a small room just about filled by a desk and some book shelves. We cleared two spaces, a mere 14 and 8 in. wide, and in them placed an EICO 753 transceiver and its matching 751 power supply (see our photo).

Fortunately, we were able to retain our Mosley TA-33 Jr. beam. Hitching the components together in a few minutes, we fired up the rig and in rapid order worked stations in England, Germany, Italy, Sweden, Florida and California. The one-knob tuning is great, the receiver can be offset from the transmitter by as much as 10 kc and there's a choice of AM as well as SSB and CW. We're having a real ball with this compact, handsome setup.

Fooled Again . . . We've remarked before in these columns that it's easy to be confused and confounded by the speech patterns of many hams, both domestic and foreign. Just the same, we recently did a double take when we heard a chap with an unmistakable German call and an even less mistakable pecan-pie accent repeating "CQ Atlanta Georgia, CQ Atlanta Georgia."

Catch was that we'd forgotten the DL4 and DL5 combinations are assigned to the U.S. forces in Germany and that the boys there always are anxious to get fone patches into the States. Georgia is a particular target for CQs because it is the home of the huge infantry center and many military dependents live nearby. What say we give these calls clear frequencies?

Universal Tongue? . . . Listen to DX on 20 meters in the early morning and you get the impression that English is a required subject in overseas schools. Reason is that practically all foreign hams speak it or at least the American version of it. However, a surprisingly large number of them learn the language the way they learn circuitry . . . by working at it.

This was brought home to us during a long QSO with SM6UG of Sweden. We complimented him on his precisely correct speech and asked him where in the U.S. he had studied. He laughed and said that he never had been outside the Scandinavian countries but had learned to read, write and speak English by reading ham magazines and working American hams daily for several years between 1200 and 1300 GMT (his lunch hour). Wish we could do half as well in Swedish!

Look Ma, No Hands . . . It would seem VOX should be ideal for mobile operation because it enables the driver-ham to keep his hands on the steering wheel. However, traffic noises—horn blasts, especially—too often kick a transceiver from receive to transmit just when the other guy is giving his call. Push-to-talk isn't the answer, either, since it's dangerous if you like to QSO while on the road.

A much better arrangement in the ham shack on wheels is a foot-actuated microswitch fastened to the floorboard to the left of the brake pedal (or of the clutch pedal, in

[*Continued on page* 115]

The Ham Shack's original proprietor, W2DJJ, has taken on extensive foreign travel commitments and must move out of the chair he has filled so ably. This is his last column. Watch our next issue for a new proprietor. Good luck, Bob!

Shack-in-a-pigeonhole gave W2DJJ cause for concern until he tried a little something called a transceiver. Unit next to 24-hour clock on top shelf is power supply, which also houses speaker.

the ABCs of RADIO

By JOHN T. FRYE, W9EGV

PART 5: DETECTION

A FEW short steps into a radio receiver bring us to the last tuned-radio-frequency (TRF) amplifier or the last intermediate-frequency (IF) amplifier, depending on the particular type of circuit being used. Out of either of these stages comes an amplitude-modulated carrier as depicted in Fig. 5-1A. A single illustration serves for both instances because the only difference between the two signals lies in the carrier frequency involved. With the TRF amplifier, the carrier frequency is the same as the one being transmitted; with the IF amplifier, the carrier frequency at this point is the IF frequency.

But regardless of where it falls in the spectrum, the carrier frequency now has ceased to be important. Having served as the vehicle for carrying significant information from transmitter to receiver and permitting us to amplify the signal or even translate it from one frequency to another (as in the case of the superheterodyne), the carrier has served its major purpose and we are nearly through with it. What interests us now are those bulges and dents in the amplitude of the carrier. We know both were put there by modulating the carrier with various audio frequencies, which themselves were fathered by sounds. We want to recover first those frequencies and then the sounds. How shall we go about it?

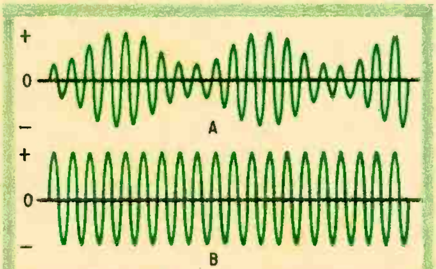


Fig. 5-1

Since amplitude goes up and down with modulation, you might think placing this signal on the grid of an amplifier tube would produce plate-current changes which would correspond precisely to the level of modulation. Not so! While *instantaneous* plate current faithfully would follow the ups and downs of individual cycles of the carrier voltage, *average* plate current would not change with the comparatively slow undulations in overall carrier amplitude that modulation produces. Here's why.

An unmodulated carrier consists of equal, symmetrical, alternate half-cycles of positive and negative voltages as shown in Fig. 5-1B. In a 1000-kc carrier, only 1/2,000,000 of a second separates consecutive positive and negative peaks. This means that for anything other than the most instantaneous period the two peaks necessarily must be viewed as occurring simultaneously. Thing to bear in mind is that an amplifier is a linear device and responds equally to equal changes in input voltage (see Fig. 5-2). Any plate-current increase produced by a positive half-cycle of the carrier will be offset precisely by a plate-current decrease evoked by the immediately following and equally negative half-cycle. Average plate-current change will be nil.

This still holds true when the carrier is modulated because modulation, as seen in Fig. 5-1A, applies a sort of two-way stretch to the carrier cycles. Any increase or decrease in the amplitude of a positive half-cycle caused by modulation is accompanied by an equal change in the negative portion of the same cycle. To state this algebraically, we could call the amplitude at any given instant x, whereupon x when added to $-x$ would be zero for all values of x. Adding equal positive and negative values to a quantity produces no change in the quantity, no matter what opposing values are added. And therein lies the explanation as to why average plate current of an RF or IF amplifier in a receiver remains the same whether no signal, an unmodulated carrier or a modulated signal is applied to its grid.

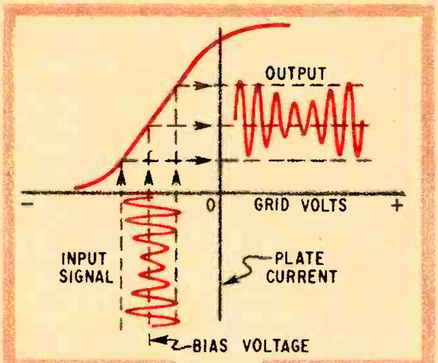


Fig. 5-2

But suppose we increase the fixed negative bias on the grid of our amplifier tube until the plate current is just cut off, as shown in Fig. 5-3. Now any negative-going signal applied to the grid can have no effect, for plate current that already is zero obviously cannot be reduced beyond this point. A positive-going signal, though, will subtract from the negative bias and allow plate current to flow. Further, the greater the amplitude of this positive-going signal, the greater the resulting plate current. Our average plate current now will rise and fall right in step with the average amplitude of the positive half-cycles of the carrier. Far more importantly, this changing average plate current effectively will reproduce the original modulating frequency.

All this should sound familiar. Remember when we combined two frequencies and discovered that the smaller modulated the larger with amplitude variations equal to their difference frequency and then ran the combination through a tube biased to cutoff to obtain this difference frequency in the form of variations in average plate current? We then called the tube a *mixer* or *converter* and we named the process *heterodying*. Now we have a carrier modulated with the varying difference frequencies between that carrier and its twin sidebands. And what we do is pass the signal through a tube biased to cutoff (sounds like a broken record, doesn't it?) to extract the difference, or modulation, frequencies in the form of average plate-current variations. In this case, we call the tube a *detector* and the process *detection*.

Though there are several different types of detectors, the *power* or *plate detector* just described is used infrequently. Instead, the *diode detector* shown in Fig. 5-4 is employed almost universally in modern broadcast receivers. The diode can be either a vacuum-tube or solid-state type, since the important characteristic shared by both is that they are about as non-linear as you can get. In other words, they readily pass current in one direction but not in the other, which is precisely the property we need for detection. We shall discuss the tube.

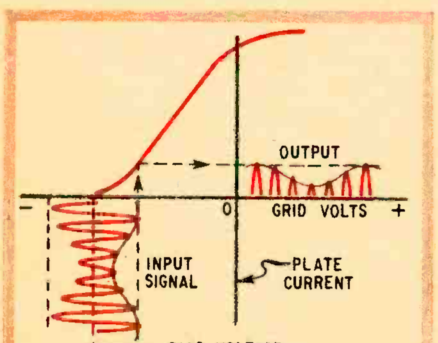


Fig. 5-3

The modulated signal voltage is delivered by the secondary of the

IF transformer to the plate, or anode, and through R1 and R2 to the cathode of the diode. When the plate end of the secondary is made positive with respect to the cathode by the AC carrier, the plate attracts electrons emitted by the cathode in proportion to how positive it is at that particular time. During half-cycles when the plate is made negative, the plate repels electrons. But electrons attracted during positive half-cycles move down through the IF transformer and R1 and R2 to return to the cathode through the common-ground circuit. And in doing so, they create a pulsing, DC *diode current* through the resistors with accompanying voltage drops.

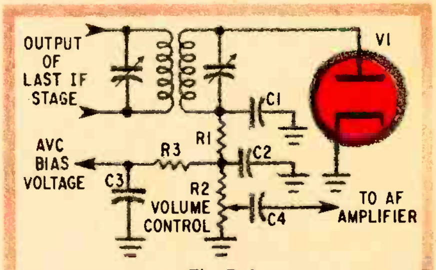


Fig. 5-4

These high-frequency pulses charge C1 and C2. However, the values of the components are such that the capacitors do not have time to charge to the peak of the positive pulses or to discharge fully between pulses. Result of this sawing-off-the-peaks-and-filling-in-the-valleys action is to blend together individual carrier pulses. In the end, we have a smoothly-changing DC voltage across C2 and R2 that varies only with the modulation of the carrier. In actual fact, the voltage across R2 is an AC audio voltage superimposed on a DC voltage. But since C4 will not pass the DC component, only the audio voltage is delivered to the audio amplifier.

We still have one more chore for our tired old carrier before we discard it. Large-value R3 and C3 filter out the audio variations in voltage across R2 so the charge across C3 changes only when there is a sustained increase or decrease in overall carrier amplitude. Such fluctuations normally occur when the carrier is subject to fading or when a station of different signal strength is tuned in.

Automatic-volume-control (AVC) voltage developed across C3 from the rectified carrier is applied as automatically varying negative bias to the grids of the mixer and IF amplifier tubes. Thing is, the amount of amplification provided by these tubes varies inversely with the magnitude of negative bias. Any increase in received signal strength tends to deliver more signal to the detector; but this produces more AVC voltage to reduce the gain and cut down on the signal delivered to the detector. Conversely, a decrease in strength of the received signal produces less AVC voltage, permitting the gain of the controlled stages to increase and beef up the signal delivered to the detector. End result is that audio voltage across R2 is maintained at nearly constant value in spite of wide differences in received signal strength.

But how can we hear dots and dashes produced by keying an unmodulated carrier? (Remember that a dead or unmodulated carrier produces no sound.) The answer is simple: we add modulation to the carrier *in the receiver* before the carrier reaches the detector. To do this we mix the received signal with one generated by a local oscillator called a *beat-frequency oscillator* (BFO). If the BFO is tuned only a few hundred cycles away from the carrier frequency, it modulates the carrier with a difference frequency falling in the audio range.

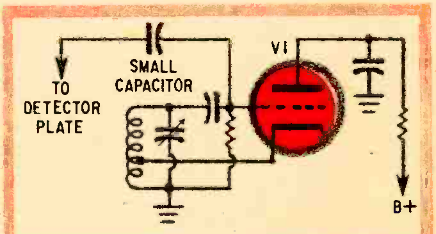


Fig. 5-5

We could retune our BFO to beat with each carrier received and mix the signals at the input of the receiver but a better arrangement is shown in Fig. 5-5. Here the BFO is adjusted to a frequency slightly removed from the IF and is so arranged that its output mixes with the IF signal just before the latter enters the detector. Suppose the BFO is set at 453.5 kc and mixes with a 455-kc IF. Now any signal received will be translated to 455 kc and will be modulated with the 1500-cycle difference frequency between the IF and the BFO frequency. This modulation will be detected in the normal manner and will produce a a 1500-cycle tone in the detector output. If desired, the frequency of the BFO can be altered slightly to adjust the pitch of the dots and dashes to suit individual taste.

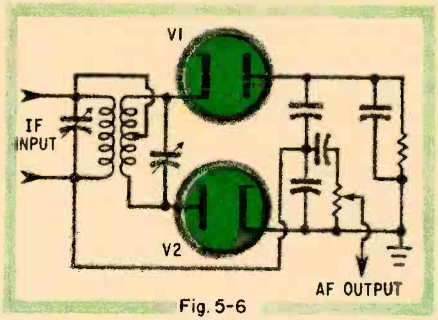


Fig. 5-6

All our problems have not been solved, however, for our diode detector will not detect FM signals properly. For that matter, the IF stages of an FM receiver are somewhat different, too. Because the FM band runs from 88 to 108 mc, FM sets ordinarily employ a much-higher IF frequency—say 10.7 mc—to improve image rejection. But since the modulating signal shifts an FM carrier back and forth up to 75 kc each side of the center frequency our IF amplifier must pass a bandwidth of 150 kc to accommodate a fully modulated FM signal. We can flatten out the response curve of a tuned circuit by loading it with a resistor placed across the circuit and the response can be widened still further by deliberately stagger-tuning the tuned circuits of the amplifier. Resulting loss of gain can be taken care of simply by adding more stages.

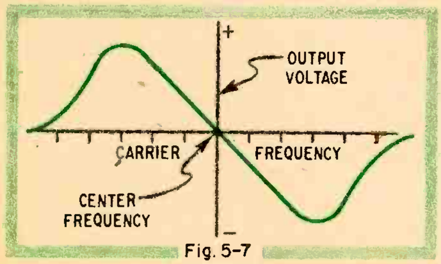


Fig. 5-7

The diagram of a *ratio detector* used in an FM receiver appears in Fig. 5-6. While we don't have room to explain in detail how the circuit operates, we can discuss what it does. Take a look at Fig. 5-7 to see how the voltage output of a ratio detector is affected by a change in the instantaneous frequency of the input signal. Notice that a voltage is developed as the signal departs from the center frequency. Polarity of this voltage depends on which way the signal has moved and the amplitude of the voltage depends on how far it has moved. Since we know our FM signal is swung back and forth across the center frequency by the modulation we can see that the ratio detector will reproduce both the frequency and amplitude of the modulation.

Still another popular type of FM detector is known as the Foster-Seeley *discriminator*. The Foster-Seeley responds to both AM and FM signals and, therefore, must be preceded by a limiter stage or stages to remove any amplitude variations in the signal before it reaches the detector stage. A ratio detector, in contrast, inherently rejects AM signals and doesn't require addition of a limiter stage.

NEXT ISSUE: SIGNAL TO SOUND

The TRUTH About That UL Label

By ROBERT ANGUS The picture is a confusing one. What one sees depends on what one is looking for. For instance:

● In Wallingford, Conn., a careful housewife checks electric toothbrushes in a discount house to see which ones are approved by Underwriters' Laboratories before making her purchase.

● In Richmond, Va., a city inspector makes an appliance dealer take a Japanese-made tape recorder out of his window because it doesn't carry an Underwriters' Laboratories seal.

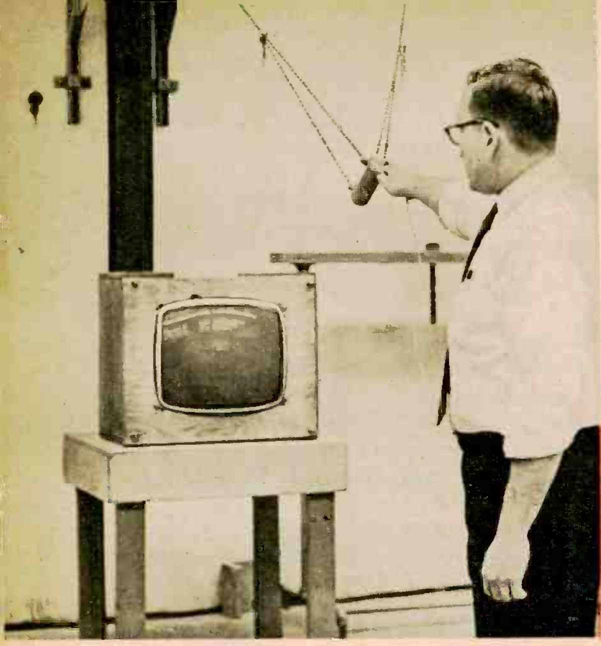
● In Daytona Beach, Fla., a retired executive examines an electronic machine that supposedly cures arthritis and is offered by a door-to-door salesman. Seeing a UL tag on the unit, he buys it—only to find that it offers no relief.

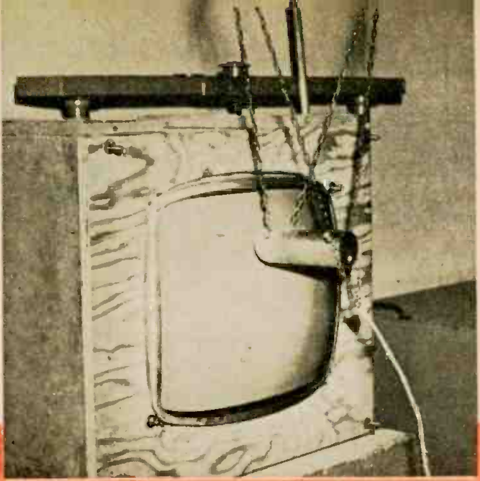
● In Oakland, Calif., a confirmed do-it-yourselfer burns his hand on a soldering gun bearing the Underwriters' Laboratories seal.

● And in New York City, a speaker tells the National Electrical Wholesalers' Association that building codes across the country are making it virtually impossible to use electrical equipment not tested and listed by UL in building construction.

What is UL, anyway? And just what guarantees are embodied in its label? When dealing with questions such as these, it's much easier to deal in negatives than positives. For example, UL is *not* just another consumer testing organization such as Good Housekeeping Laboratories or United States Testing Company. UL tries to make clear that it doesn't *approve* anything; it merely lists items. Its seal or labels are no guarantee of satisfaction; they guarantee only safety in construction. And the label on the line cord of an electric toothbrush or an AC/DC radio even doesn't guarantee that UL has tested the toothbrush, holder *or* radio.

Why, then, do some communities insist on a UL label on all electrical products sold by





Among most dramatic tests conducted at UL's Melville, N.Y., facility is that for implosion of a TV picture tube. Technician (at left) was forced

stores? And why do many otherwise astute consumers look upon the UL label as a stamp of approval or guarantee of customer satisfaction?

Much of the credit for consumer acceptance of the UL label as a sort of papal imprimatur should go to the organization's 50-year public-relations campaign to bring itself to your attention. UL is (and always has been) a nonprofit organization seemingly with no terribly obvious axes of its own to grind, a fact which has helped the public to accept it. There are those, however, who feel that the organization may have oversold itself and its label to John Q.

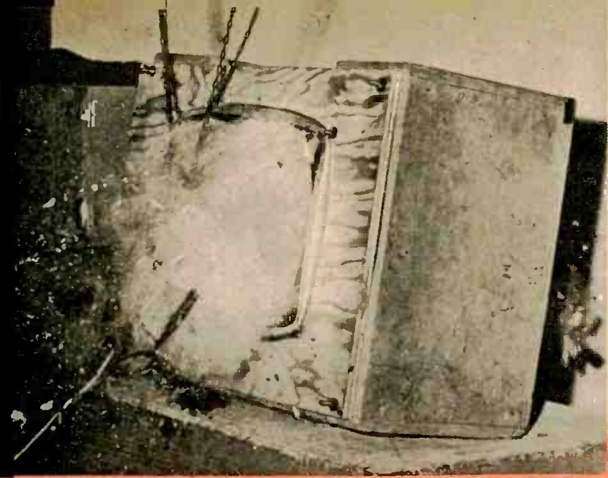
Underwriters' Laboratories, in fact, was created in 1894 by the National Board of Fire Underwriters. At the time, electricity was a relatively new and widely misunderstood source of power. There was a belief that if a light bulb broke (which occasionally happened), it might start a fire in the cloth or celluloid lampshades then coming into use. In other cases, certain electrical gadgets had killed their operators under unusual circumstances.

The underwriters, representing the major fire and life insurance companies, were nervous about the possibility of widespread claims arising from the use of electricity. Accordingly, they bought a building in Chicago, set up an engineering staff and equipped a testing laboratory. The lab's job was to set up standards for construction of electrical (and other types of) equipment, to test models submitted by manufacturers for approval and to encourage the public to buy and use those which passed the test. The UL's job in those days was pretty clear: to save money for the insurance companies by heading off claims.

Since then, UL has grown to an organization employing more than 400 persons in its engineering department alone, with resources in excess of $8.6 million. And it now tests everything from bank safes to line cords; from battery additives and gas-station pumps to soldering irons, tape recorders and hair curlers; from fire escapes to oil furnaces.

UL's only concern in testing merchandise, a spokesman tells you, is safety. Will an electrical product start a fire, create injury, possibly kill someone? Will a fire escape stand up under intense heat? Will a fire extinguisher work when it's supposed to, yet not endanger the health of a child who might decide to play with it?

Fire and shock, then, are the two hazards —at least among products you're likely to have in your home—in which UL is interested. To reduce the possibility of either and to reduce the possibility of insurance claims arising from faulty equipment, the Laboratories conduct tests on a year-round basis in specially-built facilities in Melville, N.Y.; Northbrook and Chicago, Ill.; and Santa Clara, Calif. (In Canada, a governmental group, the Canadian Standards Association, serves somewhat the same function and similar governmental testing laboratories exist throughout Europe.)



to move in toward tube because of camera placement; metal projectile ordinarily is held higher to heighten impact. Photos above show tube approximately ½-millisecond before and after the impact; photo at far right depicts technician removing all that remains of the CRT.

UL, incidentally, no longer has any connection with the National Board of Fire Underwriters, which went out of business in 1964. It now is affiliated with the American Insurance Association, which elects its board of directors but has no control over day-to-day operations of the organization.

And UL is self-supporting, living in the style to which it has become accustomed through not-so-modest fees for testing and the sale of labels. Not surprisingly, this mode of existence has led some critics to charge that the reason many newcomers to UL testing fail to pass the first time around is so the organization can collect a second fee when it retests.

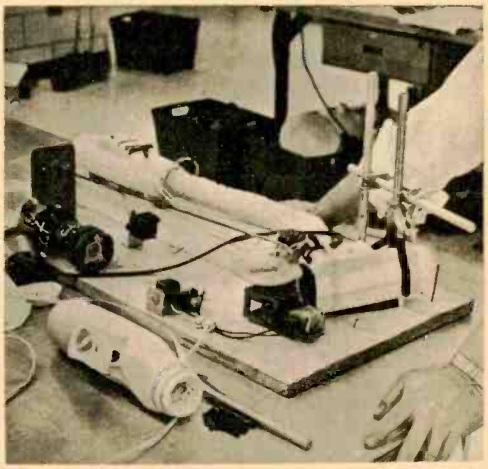
"That's ridiculous," scoffs UL spokesman Howard Kontje. "We have all the business we can handle. We never have to make work or go out looking for new business."

Even so, the UL listing adds to the cost of the electrical and electronic goods you buy. How much is anybody's guess since most manufacturers aren't talking. But here are some facts: one medium-size manufacturer of electrical cable, sockets, plugs and other equipment has a UL inspector on the premises three hours every working day. The inspector has his own office in the plant and receives a salary and expenses from the manufacturer. (And this is in addition to UL's testing fees and the sale of labels to the manufacturer.)

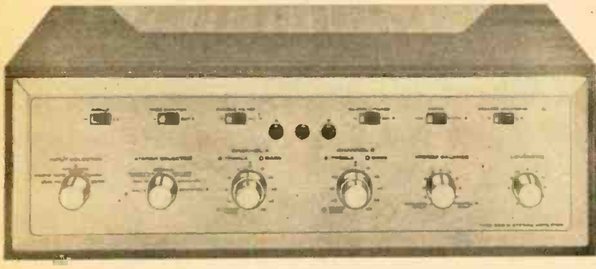
One high-fidelity component manufacturer says it cost him approximately $750 to have an amplifier tested. "We sold 1,200 units of that model—so the testing alone cost us about 60¢ apiece." Some estimates of UL unit cost have been as low as half a cent on 1,000 ft. of zip cord to $5 each on some tape recorders and other hi-fi components.

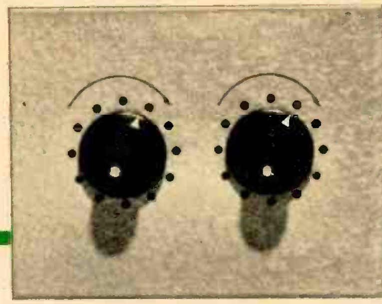
Through the years, UL has made some enemies—though they're not easy to find. Those manufacturers who already have UL approval on a product don't want to rock the boat and those who don't are still hoping for a boat not to rock. Nevertheless, while virtually everybody agrees that UL has done an outstanding job in promoting safety in elec-

[*Continued on page* 106]



Switch on hair dryer is turned on and off continuously to determine duty cycle. Commercial testers often are not available, so UL makes its own.





Big BOOM Box

by AL TOLER

GETTING real solid bass out of your stereo system often is like trying to find the pot of gold at the end of the rainbow. First reason good bass is so hard to come by is that at low volume levels your ear's sensitivity begins to drop off around 300 cycles. Strike No. 2 is small speaker enclosures. In many cases the modern trend to bookshelf speakers has resulted in designs that sometimes produce faked bass. Result is there are a lot of midget speakers that really need a swift and hard kick in the low end.

Of course, bass can be increased by cranking up the amplifier's bass control. But since the control takes effect at about 1 kc, it not only raises the bass but increases the mid-range as well. Therefore, though the bass level is increased, the sound still is unsatisfactory.

For knee-bending bass at low volume levels only frequencies below about 200 cycles should be boosted. The low-cost way to achieve this is with our Big Boom Box bass booster.

The booster is a passive (no tubes or transistors) low-pass filter that you connect between your amplifier and speaker to give added oomph to the frequencies below 200 cycles.

For juke-box boom all that's required is a turn of the booster's controls. By advancing R2 the boost at 30 cycles will be about 9db—a real solid window-rattler.

Construction

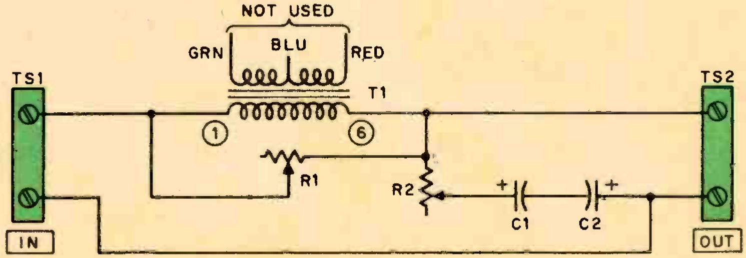
While layout is not critical—build the booster any way you want—component values are. Under no circumstances substitute a different part for L1 or change the values of C1 and C2. In fact, unless you are trying to keep cost at rock-bottom use quality capacitors for C1 and C2.

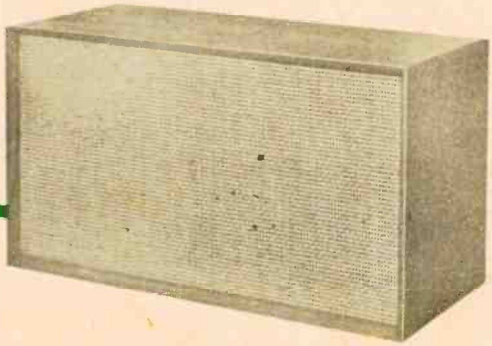
L1 is a universal output transformer used as a choke. Cut off the three primary leads and connect to secondary terminals 1 and 6.

Capacitors C1 and C2 are connected back-to-back; that is, connect the positive terminal of C1 to the positive terminal of C2 (or negative to negative). *Do not* connect the capacitors in series—plus to minus—unless you like distorted sound.

In order to provide an *off* position for the booster, R2 must be modified. Remove the

When R1 is set full clockwise (wiper to the left) all the signal goes through T1. Since the impedance of T1 gets lower at low frequencies, more bass than treble goes from input to output. C1, C2 and R2 provide additional attenuation of the highs.





cover by bending the tabs. You'll see that R2 is a wirewound pot whose resistance wire is wound from one side terminal to the other. The wiper rides on top of the wire. Hold R2 so the exposed rear is facing you and the lugs are pointing up. Using a pair of small diagonal cutters, cut through the wire where it connects to the left lug. To make certain you cut through the wire, cut about 1/16-in. into the form holding the wire. Reach in with a small screwdriver or ice pick and pull the wire away from the terminal, then unwind or pull back a few turns. Check with an ohmmeter to make certain the wiper does not touch the turns when it is fully counterclockwise.

We used phono jacks (see photo), but they cannot be used unless at least one of your amplifier's output terminals is grounded. On some transistor amplifiers one output terminal is *not* always grounded.

Using the booster under such conditions will cause the output transistors to be damaged if the metal cabinets of two boosters should touch. To get around this problem, use a two-lug terminal strip (TS1 and TS2) and run a common wire between the input and output lugs (bottom, in schematic) making certain there's no cabinet connection.

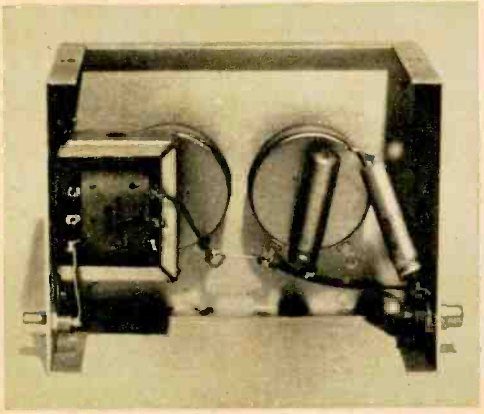
Using the Booster

Connect the amplifier to TS1 and the speaker to TS2. Set R1 and R2 counterclockwise—the *off* position (R1 shorts out T1 and R2 is open). Advance R1 to about 4/5ths of its rotation—a good starting point that will produce a 3db boost at 20 cps. For additional boost just turn R2 slightly clockwise for an additional boost of 3db or so. For more bass continue to advance R2.

The booster is designed for low to moderate listening levels. If you try to produce thundering bass you're likely to burn out R1 and R2. The booster normally produces a moderate loss of gain, making it necessary to advance the amplifier's volume control in order to obtain the same effective volume level as when R1 and R2 are in the *off* position.

PARTS LIST

- C1, C2—100 μf, 15 V electrolytic capacitor
- L1—8 watt universal output transformer (Lafayette 33 R 7504)
- R1—20 ohm, 4 watt wirewound potentiometer (Clarostat Series 58. Lafayette 32 R 7295)
- R2—30 ohm, 4 watt wirewound potentiometer (Clarostat Series 58. Lafayette 32 R 7297)
- TS1, TS2—Terminal strip (see text)
- Misc.—3 x 4 x 5-in. Minibox, knobs



Parts are mounted in main section of 3 x 4 x 5-in. Minibox. R1 is mounted at left, R2 is mounted at right. Output jack is at left, input jack is at right.

To add off position to R2, cut wire where it connects to left lug. Then remove a few turns so wiper doesn't touch wire when turned all way to left.

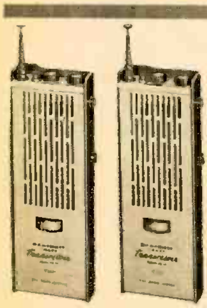
How To Have Fun While You

23-Channel 5-Watt All-Transistor CB Transceiver

Kit GW-14
$89^{95}

Assembled GWW-14
$124^{95}

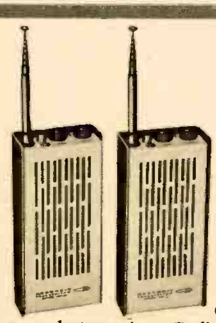
23 crystal-controlled transmit & receive channels for the utmost reliability. Low battery drain . . . only .75 A transmit, .12 A receive. Only 2⅞" H x 7" W x 10½" D . . . ideal for car, boat, any 12 v. neg. gnd. use. "S" meter, adjustable squelch, ANL, built-in speaker, PTT mike, aluminum cabinet. 8 lbs. Optional AC power supply, Kit GWA-14-1, 5 lbs. $14.95. Special 23-Channel Crystal Pack (46 crystals), GWA-14-2 . . . reg. $137.70 . . . only $79.95. CB crystals only $1.99 each with *any* Heathkit CB transceiver order!



Powerful 1-Watt Walkie-Talkie!

Kit GW-52A
$69^{95}
(pair $129.95)

Up to 3 mile inter-unit communications. 10-transistor, 2-diode circuit. Crystal-controlled transmit & receive. Includes $20 rechargeable battery & built-in 117 v. AC battery charger. Adjustable squelch, automatic noise limiter, rustproof metal case, earphone, strap, and crystals (specify channel). 4 lbs.



Deluxe 9-Transistor Walkie-Talkie

Kit GW-21A
$39^{95}
(pair $74.95)

1 mile range between units. 100 milliwatt input power crystal-controlled transmitter, superhet receiver. Built-in squelch & automatic noise limiter. Includes sturdy aluminum case, earphone, strap, crystals (specify channel). Fast, simple circuit board assembly. 3 lbs. GWA-30 Battery Set (2) $2.95

Fully Automatic Electronic CW Keyer

Kit HD-10
$39^{95}

All-transistor circuitry. 15-60 words per minute. Solid-state switching—no relays to stick or clatter. Convertible to semi-automatic operation. Built-in paddle. Self-completing dashes. Variable dot-space ratio. Built-in sidetone. Keys neg. voltages only, such as grid-block keying. Transformer-operated power supply. Fused. 6 lbs.

New Amateur Radio Hybrid Phone Patch!

Kit HD-15
$24^{95}

Features individual gain controls for receiver-to-line & line-to-transmitter audio level; VU meter; 1-switch operation. Minimum of 30 db isolation between transmitter and receiver circuits permit VOX & PTT operation. 4 lbs.

New Reflected Power Meter

Kit HM-15
$14^{95}

Indicates forward or reflected power and SWR. Band coverage 160 through 6 meters. Handles peak power of well over 1 kilowatt. Matches 50 or 75 ohm lines. Essential for tuning and monitoring transmitter/antenna systems. 3 lbs.

The Truth About That UL Label

Continued from page 99

trical construction, some electrical experts point to areas in which UL has done less well.

For example, some products listed by UL or carrying a UL label do not perform as advertised and a few don't do the job they're sold to do. An example is the arthritis cure, which turns out to be a little more than an electrical heating pad, carefully insulated and bearing a UL tag.

Why didn't UL refuse to list an item that (later) was considered a fraud?

"That's not our function," Kontje said recently, "although if we found that a unit submitted to us didn't do anything at all we probably wouldn't list it."

The National Better Business Bureau tells the story of a manufacturer of a battery additive who submitted his product to UL for testing as a fire hazard. Upon receiving a listing the manufacturer advertised his product as approved by Underwriters' Laboratories and the product bore the UL seal. UL did nothing until the NBBB protested that the manufacturer was creating the illusion that UL had recommended his product. UL's response was to require the manufacturer to add the words Tested As Fire Hazard Only. (But in other instances, equipment which has been tested and listed by UL and which has been used in accordance with the manufacturer's instructions has caused injury and started fires.)

As another case in point, the vast majority of AC/DC radios on the market have UL labels on their line cords—despite the fact that some of the sets can be lethal and that the majority of the radios never have been inspected at all by UL.

"There's nothing we can do about that," a UL spokesman says. "The labels are sold to the manufacturer of the line cord, who applies them to his products under the supervision of inspectors. It signifies that the plug, the molding and the cord itself have been tested by us and are being manufactured under our inspection. The manufacturer certainly has a right to display them on his products when he sells them, whether his customer is a consumer, a contractor or another manufacturer." UL's Kontje adds that the tag itself explains (albeit in small print) that it covers the line cord only.

UL also has a tendency to move slowly, an attribute which has acted as a brake on new electrical and electronic industries. High-fidelity components, for example, first began appearing on the market in the late 1940s. Yet it wasn't until 1965 that UL set up standards for testing record changers, amplifiers and tuners as separate items. For this reason, few high-fidelity components have been listed by UL, yet because of local laws only these could be sold legally in such states as Virginia and Oregon as recently as 1964.

The slowness in conducting tests also poses problems, according to Fisher Radio's Fred Mergner. "Whenever we'd come out with a new model," says Mergner, "we'd submit it to UL for testing, putting it on the market at the same time. If the first model didn't pass we'd have to make alterations and submit another. Even if that passed by the time we got the listing it might be a year later and we'd be ready to withdraw it in favor of a new model. But we'd spent all that money with nothing to show for it."

Thing UL has been zealous about is guarding its good name—acting quickly against trade-mark counterfeiters or fly-by-night organizations which have developed similar names.

"Hardly a month goes by that we're not tied up in litigation with somebody about the trade mark," Kontje told EI.

Such fraud usually takes one of two forms: a counterfeit label (sometimes of a regular UL stamp or label by a manufacturer whose product never has been or no longer is listed) or an independent testing laboratory with a sound-alike name.

Although UL in-plant inspectors are in a strong position to cost (or save) a manufacturer hundreds of dollars in the making of a product, there never have been reports of bribes being offered to or accepted by them, so strong is UL's reputation for integrity. It is not unknown, however, for a UL inspector to quit and take a job with a manufacturer whose plant he's been inspecting. In fact, most large electrical and electronic manufacturers have on their top management staffs an executive who once worked with UL. His job consists of liaison with the UL inspector and recommendations to the engineering department regarding product design to meet UL specifications.

To sum up what you should know about that UL label: read the fine print on it.

99-3027WX

99–3046L

LAFAYETTE SOLID-STATE 5-WATT C.B. TRANSCEIVER

Model HB-500 Small, Quiet, Powerful . . . only 3" High

109.50
- Mechanical Filter for Razor Sharp Selectivity
- 12 Crystal Transmit and Receive Positions
- 23 Channel Tunable Receiver with Spotting Switch
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WEBCOR 2611 bi-directional tape recorder, Hallicrafters SX-16 communications receiver, other items. Need mobile ham converter, all-band whip antenna with bumper mount, mobile power supply for Elmac AF-67. Al Lahndt, K2IAG, 48 Bocket Rd., Pearl River, N.Y. 10965.

JOHNSON 1-kw low-pass filter, other items. Want HG-10 VFO. Jim Cannon, WB6NXK, 1106 Mary Ave., Sunnyvale, Calif. 94087.

ADMIRAL TV tuner, Lafayette variable-voltage regulator, other items. Want grid-dip oscillator. David Joblon, 2041 Raritan Rd., Scotch Plains, N.J. 07076.

PURITRON air purifiers. Need VLF receiver. Drew Kalman, 11 Shady Hollow, Dearborn, Mich. 48124.

HEATH AA-21 stereo amplifier. Want CB transceiver. John Dinwiddie 1402 Laird St., Key West, Fla.

STARLITE A-120 receiver, TK-10 multitester, homebrew test equipment. Want communications receiver or ham transceiver. Lewis Brenner, WN3DWB, 1314 Fanshawe St., Philadelphia, Pa. 19111.

KNIGHT PA amplifier and broadcaster. Want Shure 575 or Knight KN-4520 dynamic mike. John Parker, 2008 Colebrooke Dr., Washington, D.C. 20031.

HEATH DX-40 and HD-11 Q-multiplier. Will exchange for tube tester or CB equipment. W. Spitler, Box 248, St. Elmo, Ill. 62458.

TEST EQUIPMENT, antique receivers. Want Hy-Gain tri-band beam. W. L. Kennamer, W4YPC, 1008 Wilbanks Ave., E. Gadsden, Ala. 35903.

RANGER transmitter, ham gear and parts. Need walkie-talkies. Douglas Zagrodnick, 604 Iolite Ave., Johnstown, Pa.

SURPLUS Navy RAK-7/CRV-46155 receiver. Will swap for Hallicrafters SX-28 or SX-73. John Mork, 711 Alabama St., Huntington Beach, Calif. 92646.

RCA portable TV, Atwater-Kent 511 receiver, other items. Want AM transmitter and antenna tower. Steve Bladek, 46 Lawrence Dr., Paramus, N.J. 07652.

TESLA coil power transformer. Will exchange for walkie-talkies. Bob Walsh, 8361 Trinette Dr., Garden Grove, Calif. 92641.

RCA kinescope, other items. Will swap for transmitter or ham gear. Brian Lippey, 169 Polk St., Newark, N.J. 07105.

REFLECTOR telescope, chemistry apparatus. Will swap for tape recorder, VHF converter, crystal calibrator or Q-multiplier. Louis Mlinarski, 1 Sadore Lane, Yonkers, N.Y. 10710.

RCA 5820 image orthicon tube with camera schematic. Will swap for vidicon camera, CB rig or ham gear. Richard E. Beatie, 1904 E. 114 Ave., Tampa, Fla. 33612.

GLOBE CHIEF 90 transmitter. Will exchange for stereo tape recorder, electric guitar or other stereo equipment. Bob Phillips, Rte. 2, Box 280, Jeffersontown, Ky. 40029.

KNIGHT R-55A receiver. Need oscilloscope. Ned Westman, WA9PBU, Rte. 4, Box 78, Wausau, Wis. 54401.

INSTRUMENT DEVELOPMENT 2610 Geiger counter. Want graph recorder, small transmitter or semiautomatic key. Tom Adams, WN9LGD, 6612 Aberdeen, Chicago, Ill. 60621.

HEATH HW-32 transceiver, 150-watt transmitter and Johnson matchbox. Want HT-32, HT-37, HX-50, TX-1 and HX-10. Jim Baughman, WA8RHZ, 4219 Manor, Royal Oak, Mich. 48073.

LAFAYETTE HE-29C walkie-talkie, Brush BK-104 tape recorder and 14RP4A CRT. Will trade for SWL receiver or radio/TV test equipment. Dave MacDougall, 41 Pastoral Lane, Willingboro, N.J. 08046.

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[*Continued on page* 110]

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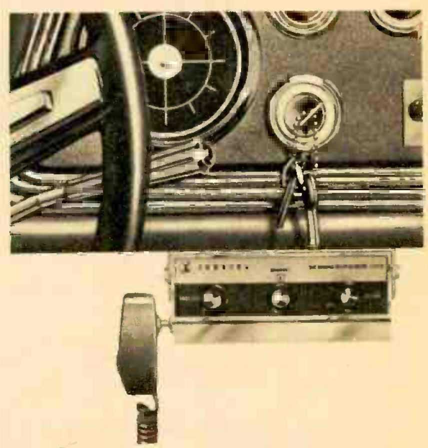

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ELECTRONIC SWAP SHOP

Continued from page 108

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KNIGHT Star Roamer. Will swap for VTVM, signal generator or tape recorder. Seymour Wallach, 70-38 Parsons Blvd., Flushing, N.Y. 11365.

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HEATH HA-10 receiver. Will swap for CB gear, test equipment or tape recorder. Dick Stout, Rte. 1, Chatham, Ill.

HEATH QF-1 Q-multiplier. Will swap for ham or hi-fi gear. Bill Golden, WA9LTP, 8909 S. Dante Ave., Chicago, Ill. 60619.

LAFAYETTE KT-135 receiver. Want crystal calibrator and world clock or walkie-talkies. Steve Bristow, 139 Mt. View Ave., Vallejo, Calif. 94594.

HEATH TS-3 TV and FM sweep generator. Need transistorized TV, tape recorder and walkie-talkie. R.E. Rosebrough, Rte. 3, Box 75A, Marion, Ohio.

HEATH HW30 2-meter transceiver. Want Heath 10-21 oscilloscope. M.H. Zeiders, WB2JVJ, 391 Knickerbocker Ave., Brooklyn, N.Y. 11237.

OLSON S9 walkie-talkies. Want Hallicrafters S-120 SW receiver. Donald B. Crowe, 895 Cove Pl., Apt. 2A, Pittsburgh, Pa. 15207.

ARC-5 Command receiver, Motorola 6-meter transmitter. Want National NC-173 receiver. Robert Berg, 29863 10th S.W., Federal Way, Wash.

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ROBERTS 192 mono tape recorder. Interested in stereo tape player. Jack Wherry, Decker House Inn, Maquoketa, Iowa 52060.

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EMERSON table radio, car radio, transistor IF transformers. Need 800-VCT, 200-ma power transformer, oscilloscope, walkie-talkies. Thomas DiGiacomo, 1897 Calvin Blvd., Tonowanda, N.Y. 14151.

ASSORTED TUBES and Lionel electric train set. Will trade for ham or CB equipment. Paul T. Judkins, 1200 Stuart Rd., Herndon, Va. 22070.

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SIMPSON and Triplet meters, 6-meter transmitter, assorted parts. Will trade for ham equipment. John Maynor, WA4VOP, Box 85, Hillsboro, Ala. 35643.

SYLVANIA 21-in. TV. Will exchange for Lafayette HE-45B or other 6-meter equipment. Scott Stingel, 68 Burning Tree Rd., Greenwich, Conn. 06832.

ROCK AND ROLL 45-rpm records. Want SW receiver or walkie-talkie. Anthony Lombardo, 844 High St., Chestertown, Md.

[Continued on page 112]

ELECTRONIC SWAP SHOP

Continued from page 110

HALLICRAFTERS S-20R receiver. Want portable TV, stereo equipment or oscilloscope. Rickie Prindle, 810 Amherst Dr., Abilene, Tex. 79603.

KNIGHT Star Roamer. Make swap offer. Jay Kunin, WA8PBU, 239 Upland Ave., Youngstown, Ohio 44504.

RUBY LASER CRYSTAL, flash lamp. Will exchange for stereo tape recorder. Louis Serapiglia, Jr., 105 E. Esplanade, Louisville, Ky. 40214.

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HEATH QF-1 Q-multiplier, Knight Span Master receiver, other items. Interested in Heath Twoer, or surplus transmitter. Jan Ojdana, WN8PGY, 4909 15th St., S.W., Canton, Ohio 44710.

ESPEY R-48/TRC-8 receiver, other items. Will swap for ARR-5 or APR-4 receivers. John A. Rokita, 3701 Pleasant Dr., Sharon, Pa. 16148.

ADMIRAL AM/FM portable radio. Will trade for pair of walkie-talkies. James Hick, 710 N. Market St., E. Palestine, Ohio 44413.

LAFAYETTE HE-15B, HE-100 and Lakeshore Dual D walkie-talkies. Will trade for Knight Ten-2 CB checker. Richard Stout, Chatham, Ill. 62629.

GILBERT HO model trains. Want communications receiver. Jeff Meyers, 8502 Temple Rd., Philadelphia, Pa. 19150.

CB and ham equipment, including transceivers, receivers and antennas. Want VHF ham gear. Jim Sheetz, 1701 Greenleaf Ave., Des Plaines, Ill. 60018.

CRT (7JP4). Will exchange for direct-drive vidicon. Bob Longenberger, 681 Strawberry Ave., Bloomsburg, Pa. 17815.

RADIOMARINE T-387/SRT-3A transmitter. Make swap offer. John A. Rokita, 3701 Pleasant Dr., Sharon, Pa. 16148.

KNIGHT oscilloscope, signal generator, sweep generator, tube tester. Will swap for ham gear. W. E. Key, WB4APV, 4442 Bonnie Glen Ct., Conley, Va. 30027.

CHORD ORGAN, VM turntable. CB gear, other items. Make swap offer. Frank H. Kunik, 148 Burlington Rd., Riverside, Ill. 60546.

LAFAYETTE HB-115A CB transceiver, other gear. Will trade for Hallicrafters or National ham receiver. Sandy Napel, 816 Ashford St., Brooklyn, N.Y. 11207.

MEISSNER FM tuner. Interested in SW receiver or tape recorder. F.D. Wally, Box 122, Davidson, N.C.

KNIGHT Star Roamer, Will trade for tape recorder. Stephen C. Keating, 2919 Colorado, Topeka, Kan. 66605.

KELLOGG telephones. Will trade for battery radio, parts or magazines. J.N. Clapp, 1516 Elm St., Davenport, Iowa 52803.

EICO ST70 stereo amplifier. Will exchange for tape deck or other equipment. Manfred Leiser, Apt. 4, Bldg. 2, New Slocum Heights, Syracuse, N.Y. 13210.

TEKTRONIX T55P2 CRT tester. Will swap for EICO 710 grid dip oscillator. K.S. Brown, WN7CPV, Box 6, Prescott, Wash. 99348.

DECCA record player, chemistry equipment, other items. Will swap for SW receiver. P. Hicks, 11565 Richmont, Loma Linda, Calif.

BC-455 Command receiver. Will swap for anything of equal value. Harold L. Cohen, 1480 Eastern Pkwy., Brooklyn, N.Y. 11233.

AMATEUR RADIO COURSE. Want Zenith Trans-oceanic receiver. Steve Tate, 4102 Walker Ave., Greensboro, N.C. 27407.

SONY recorder, Hallicrafters S-120, other items. Want complete ham station. Len Gilbert, 236 E. 16th St., Brooklyn, N.Y. 11226.

GLOBE KING 400B, RME DB23, other gear. Want ham mobile equipment. Gus Bell, 8 Charles St., Slickville, Pa. 15684.

CRAIG 404 tape recorder. Will swap for walkie-talkies or remote-control gear. Bobby Wheeler, Rte. 3, Box 149, Brookville, Ohio 45309.

Notes From El's DX Club

Continued from page 68

months, international broadcasters make much more use of the higher frequencies. As a result, DX in the 19-meter band will be possible from one part of the world or another almost around the clock. The 16- and 13-meter bands also will see increased use and DX in these bands should be fairly good during daylight hours.

Short skip on the higher bands also will be possible from about 0900 to 1500 local time because of increased activity beginning in May. As a result, many stations operating in the U.S. and Canada will be heard with strong signals.

During the night hours DX openings in the 49-, 41-, 31- and 25-meter bands will occur at one time or another. And with sunspots on the upswing transatlantic nighttime DX in the 31-meter band will be possible come summer.

What's New In CB Equipment?

Continued from page 50

Another trend in antennas is the slow migration of the mobile loading coil to the top of the whip for improved efficiency. But the big blast in the antenna field emanates from Hy-Gain. This company has pulled out all stops with a massive antenna whose signal well might ignite a ball of steel wool at twenty paces. And unlike a Volkswagen, the new Duo-Beam 10 will make your house look smaller. For in Hy-Gain's search for more power within that 20-ft. height limitation, they've expanded not vertically but horizontally.

The antenna, which allegedly converts a 5-watt CB signal to 120 watts, consists of two five-element beams stacked side by side and aimed by a heavy-duty rotator. The big Duo-Beam 10 is tagged at $99.95, with lesser models scaled down at $69.95 and $39.95. No one at Hy-Gain will predict the range of a Duo-Beam 10 but it just may give you a mile a dollar under the right conditions.

So the new CB equipment generally promises to be cool, well-behaved and agile at receiving weak, congested stations while shooting signals farther than ever. At some of those prices, who's complaining?

Life With The New Rules

Continued from page 42

involved. Apparently much justification was found for ending the man's activities.

Is anyone cheering the new rules? No one seems to be delirious with joy but there are positive observations. The rules didn't clean up the band overnight. Yet there is plenty of agreement that for valid use, 16 channels now are less laden with QRM. Another bright note is from a CB manufacturer. He breathed a sigh of relief when the rules became effective after years of languishing in the proposal stage. "The other shoe has dropped," he said, "and we now can get on with our business."

One shrewd conclusion by the manager of another company: "Consider the guy just getting into CB—the one who comes in under the new rules. He can't complain. He hasn't lost anything."

Finally, you might subscribe to the most optimistic explanation of all. It's the Rip Van Winkle theory of the new regulations. Let's say Old Rip took out his license in September 1958 when the Class D band began. And he operated within the spirit and letter of the old-old regulations, then took a snooze until 1966. After shaking dust from his old superregen rig, chances are he could communicate his business and personal traffic with barely a change from the good old days.

Does this mean that CB's future is secure? The field has its share of CBologists who predict panic on one hand, boom on the other. Here's how we size up CB and its new rules:

We now have some 1 million CBers who have shelled out maybe $200 million for equipment. And if past FCC performance is any indication, we foresee no disastrous assault on CB-land. In many decisions of the past the Commission has taken careful note of the public's investment in equipment and has protected it. Examples are technical decisions for color TV (whose images you can pick up in black and white) and stereo-FM (which doesn't obsolete old-time tuners). In the marine field, boat owners were given years to change over to new equipment when higher power became law. In short, if the FCC slaughters CB, it will run neither true to form nor be responsive to a sizable segment of the public. And it should be recalled that the Commission is an extension of the public—not vice versa.

You don't have to be a cockeyed optimist to believe that the new rules ultimately may prove to be a good thing. One reason is that the FCC *had* to do something about excesses on the band or that agency would have failed to live up to its function, which is to regulate communications. Now that its action is a reality one might say it could have been far worse.

CB still is a viable medium if you want to use it as prescribed back in 1958—for business or personal messages. And who knows? Through some stretch of logic, maybe those seven channels really were created to give the loose operator someplace to go and leave ample room for the upright, law-abiding CBer.

CB Corner

Continued from page 51

forthwith. This mistake runs about $6 per.

Another little-known cause of transistor breakdown lurks in the ignition system of your car. As the starter kicks over the engine, voltage from the battery (and thus the whole electrical system) slips down to as low as 9 volts in a 12-volt system. Then the engine catches. Starter stops, voltage jumps back up. Thing is, this kind of electrical surge may create a voltage spike across the transistor and sluice up the precious silicon. Result: another six bucks cooked.

Morals of our little story are two. First, *never* operate solid-state with no antenna connected. And be sure the rig's power switch is off *before* you start the car.

Hot-Shot Tubes . . . Some CBers imply that special tubes can work Mars on a clear night. Tube manufacturers do, in fact, offer lines of premium, high-grade tubes that go smack into the sockets of ordinary ones. But is Mars the thing the premiums were made for?

Answer is yes—and no. Point is that these super tubes are largely for industrial and military use. And unless you operate at an altitude of 50,000 feet, accelerate at the G-forces of Gemini or cruise around the Libyan desert, such tubes are a questionable investment.

If you insist on boasting about a jazzy 6201, it'll cost you $2.95 for the privilege. And that works out as roughly twice the price of a homely but fully satisfactory 12AT7.

How To Eavesdrop

Continued from page 82

His particular station was identified only as Amur ja Lena, and he claimed that he would listen to it each day for his instructions. He copied down all of the numbers sent and then subtracted those numbers from other numbers appearing on a printed card in his possession (a different code-card was used each day). The result of this computation produced a series of numbers which then were related to the positions of letters in master sentences such as The quick brown fox jumps over the lazy dog or Now is the time for all good men to come to the aid of the party.

Let's say that he received a message reading: 2-2-4-7 2-6-4-6 6-5-9-4. Looking at his current code card, he then would copy down its first 12 numbers, say: 21-5-7-8 14-12-5-8 36-22-39-20. Subtracting the transmitted numbers from these would provide him with 19-3-3-1 12-6-1-2 30-17-30-16. And checking these figures against a master code sentence for numerical position of the letters would present the actual message: MEET WITH AJAX, for example. Obviously, this isn't a very complicated code, but it also just as obviously is one which no one (no, not even the most adroit computer) ever can break.

And so it goes, with the various espionage headquarters competing for better signal strength and finer audio (just like on the ham bands) and the various agents using quite conventional gear to hear home base. Thousands of DXers in all countries meanwhile stand aghast at the thought of being afforded this most intimate glimpse of actual espionage operations.

Matter of fact, anyone with a short-wave receiver can do some espionage eavesdropping by keeping careful check of frequencies between 3 and 7 mc, where most of these stations congregate. (An actual spy message monitored at 1907 EST on Nov. 17, 1965, was broadcast in Spanish on 4226 kc and read as follows: 30245 52104 54872 10894 96531 23995 39851 22967 90913 27568 48745 20440.) People reading groups of numbers over the air might seem straight from some fantastic TV plot but evidence says they are not. For this is the real thing—even tomorrow's headlines!

The Ham Shack

Continued from page 92

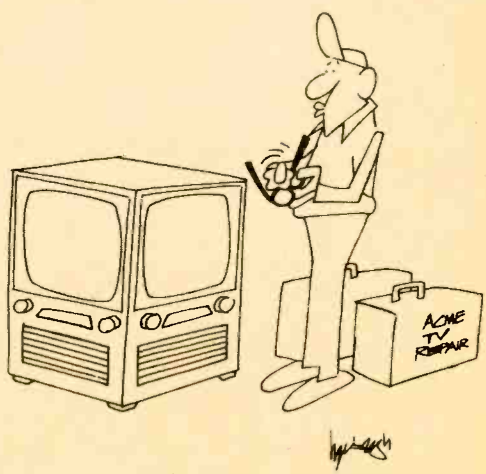
stick-shift cars). Connect this in the relay control circuit, wear one of those lightweight, telephone-operator style headsets and you're in business.

Watch Out . . . Carbon tetrachloride, a common dry-cleaning fluid, usually is suggested for cleaning crystals. Unfortunately, its fumes are highly toxic and several deep whiffs can bring on a liver ailment called hepatitis. So be warned. If you want to give your prize rocks a going over take them out of the shack and into the open air. And always work with the wind blowing away from you.

Stamp Act, 1966 . . . When we casually showed our dentist a couple of foreign QSLs he asked eagerly, "Can I have the stamps? They're new ones to me." He almost wept when we said we had drawers full of similar cards.

Naturally, he visited our shack and became so excited about the philatelic possibilities of ham radio that within two months he had his General ticket and was on the air himself. Now he's practically supporting the post office with his purchases of airmail stamps for his outgoing cards and International Reply Coupons for the requested incoming ones.

He also says that ham radio, being a sitting-down activity, is great for a man who works all day on his feet!



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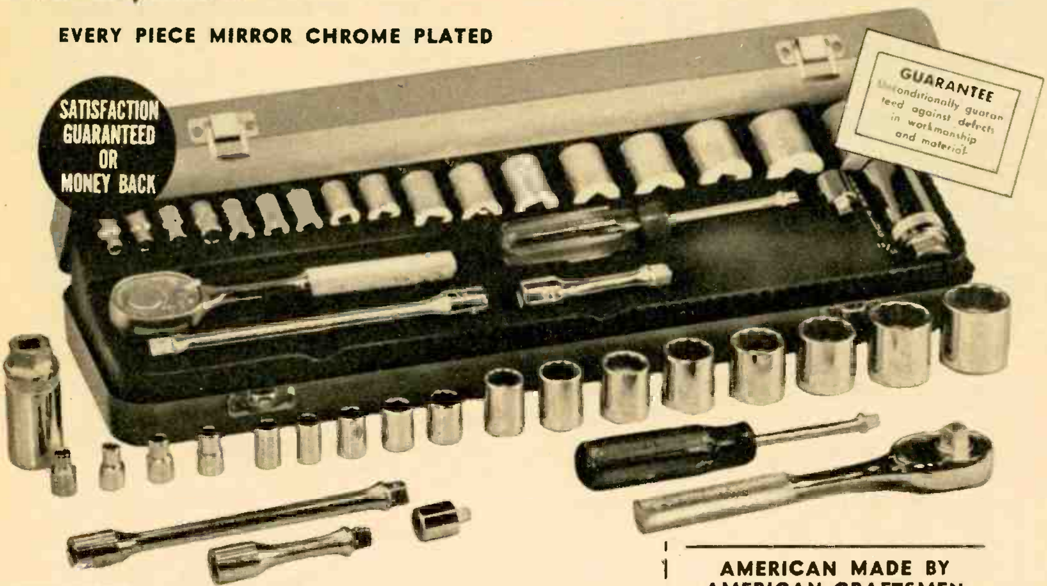

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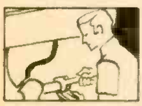

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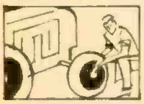

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The Blue Eagle

Continued from page 29

him of the possible results and penalties is known only to the staffer who wrote the letter. It is easy to see, however, why the engineers failed when it came to "observing the station in operation."

As the summer and the tests wore on the Blue Eagle was reported next on 9530 kc and then 13680 kc. Then it disappeared, later to turn up in Santo Domingo during the thwarted revolution there. Communications on the ground were in a sad state at the time and the airborne station could fill many needs. From there the plane presumably headed west for it soon was being picked up by DXers in California and Washington State.

Despite the measured success the Blue Eagle had achieved in Santo Domingo, the project was not wholly accepted. The Connie, it turned out, was badly overloaded. Such a plane normally has a service ceiling of about 24,000 ft. but that's with a normal load. All that radio and television equipment held it to a much lower altitude. With a mighty grunt the Blue Eagle was able to top 10,000 ft. It was not sufficient to gain a really commanding range for the equipment aboard, particularly for the UHF TV transmitter. The bird started turning into a white elephant. According to one report, the Voice of America was asked whether it had a use for the plane. It declined.

The Blue Eagle next turned up on a Pacific island, reported variously as being either Wake or Okinawa. And there it rested. One rumor that seeped back to the States had the Blue Eagle carrying a small band of nurses to Southeast Asia for a week end. What started out as a lark turned to near tragedy when the plane lost an engine on take-off. It did limp home, however, and settled down for another snooze.

At that point many who knew officially or unofficially of the Blue Eagle considered the project permanently asleep. But the big bird seemingly was playing possum.

At the turn of the year came an announcement out of official American circles in Saigon that revealed the presence in Vietnam of a plane outfitted with, amongst other things, *two* UHF television transmitters. The

[*Continued on page* 120]

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The Blue Eagle

Continued from page 117

plane, a Navy Super Constellation, would circle above Saigon, said the announcement, and would transmit programs simultaneously in Vietnamese and in English.

As might be expected, there was one slight hitch. No one amongst the Vietnamese populace owned a TV set, no store in the country could sell one and the Americans had failed to bring sets with them. Naturally, plans were afoot to rectify this situation. A thousand TV sets, it was said, had been ordered by the U.S. aid mission for distribution to groups of Vietnamese, and the American military command planned to bring in 500 receivers. There was one more surprise: the one flying TV station suddenly had turned into two. Now there was a Son of Blue Eagle.

But that would be another story. . .

CB's Biggest Boondoggle

Continued from page 61

Moore had suffered a heart attack and had been taken home. He was seen leaving the grounds.

By this time, tempers had reached their highest point and isolated disorders had started to break out. In the confusion, a number of CB dealers and tradesmen, who had left their booths unattended while finding out the status of the Jamboree, quickly were relieved of most of their wares.

About an hour after Moore left the Jamboree, sheriff's deputies and state police arrived on the scene. While there was no violence to be taken care of, a number of CBers were discussing the problems of the day in a highly agitated tone (the sheriff called them loudmouths).

Larry Hensler, who said that he was an employee of Moore, announced formal cancellation of the Jamboree at 6 p.m., then promptly closed himself in a building when reporters and CBers tried to speak with him. Richard Honoshofsky, who worked Saturday night and Sunday morning parking cars, tried to see Hensler about being paid the $3 per hour he had been promised. Hensler said he would be contacted later.

A mother of one of the beauty-contest entrants complained she was charged $3.50 for a chest ribbon which all contestants were required to have. The mother argued that advance publicity said all contests would be free.

By this time, the chair-and-table rental man was looking for his $700. And the tent man was grumbling that he already had initiated legal action to get *his* $2,000.

Within a week after the Jamboree, the Lorain County Prosecutor's department had started an inquiry into the tangled mess, the result of many complaints which had poured in. Contest winners, employees and others wanted to be paid. Even the members of the Lake Erie CBers, Inc., a local club, were wondering if they ever would be paid the $5,000 they said Moore owed them. It seems the idea for the Jamboree had been theirs and that Moore had bought it from them with a note.

Lake Erie CBers eventually obtained a judgment for the $5,000 against Moore, his wife and the Loraine County Caravan Club, Inc., of which Moore was president. But they had little luck immediately in collecting the money, judgment or not. Representatives of a bank were summoned to court to discuss Moore's assets.

As is readily apparent, The Loraine County CB Jamboree And Campout became quite a boondoggle. The Moores left Elyria. Though both sheriff and prosecutor examined the affair, no charges were filed. The CBers involved would just as soon forget the whole thing. Which none of them is likely to do.

Hi-Fi Today

Continued from page 38

FM stations may not duplicate more than 50% of their sister station's AM programing is going to give stereo-FM a boost. Several stations, including New York's potent WABC, have expanded stereo programing to fill the void left by the departing AM material. And more are promising to follow suit shortly.

An important development on the FM front is the increasing number of CATV (community antenna television) concerns offering stereo-FM as well as TV to their subscribers. Benefit here is precisely what it is in the case of TV—a chance for many people to get more and better stereo than they normally could.

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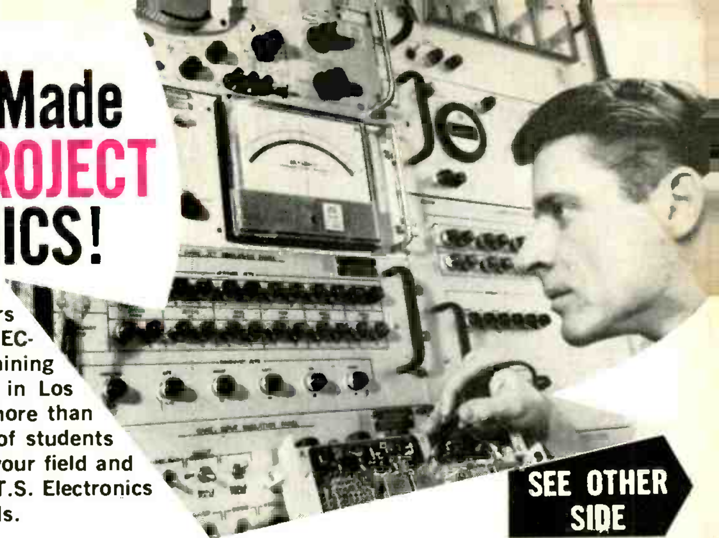

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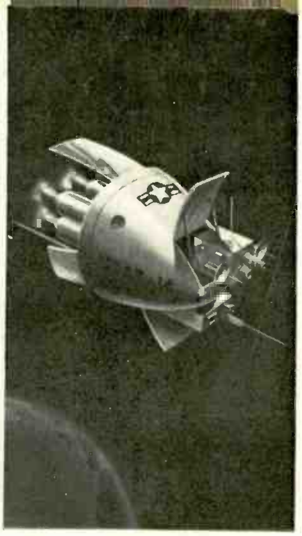

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