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**February-March, 1966**
Zip through Scott's new solid state FM stereo tuner kit in one afternoon

Four to six hours! That's all you need to zip through Scott's new LT-112 FM stereo tuner kit. Start after lunch... enjoy superb stereo at dinner. Scott solid state circuitry is the key to the LT-112's superior performance. Costly silicon transistors give performance unapproached by any other kit on the market. The LT-112 is kit-brother to Scott's bestselling 312 solid state stereo tuner, of which Audio said, "... one of the finest tuners anywhere." Your LT-112 arrives with all critical circuitry pre-wired, pre-tested, pre-aligned, and mounted on heavy-duty printed circuit boards. Scott's exclusive life-size, full-color construction book details every step... makes perfect wiring almost automatic. You'd never believe a kit so easy to build could be so packed with features. Built into the LT-112 is a new Scott invention... the Tri-modulation meter, used for a Signal Strength Indicator, Zero Center Indicator, and Alignment Meter. See your Scott dealer today, and pick up an LT-112 tuner kit... $179.95 plus one enjoyable afternoon will net you a lifetime of listening pleasure.

For complete information on Scott's kits & components write:

H. H. Scott, Inc., 111 Powdermill Road, Maynard, Mass. Dept. 565-12

Export: Scott International, Maynard, Mass. Cable HIFI. Prices slightly higher west of Rockies. Prices and specifications subject to change without notice.
A computer recited part of Hamlet’s soliloquy before an august gathering of scientists, and earned their applause by singing in tune, if with a somewhat mechanical voice, a chorus of “Daisy.” The significance of this performance by a computer was that it synthesized speech. It actually spoke and sang. It did not merely repeat or play back as the tape recorders do.

Dr. Peter B. Denes of the Bell Telephone Laboratories used a tape recording of his computer’s voice to dramatize to an International Business Machines Corporation scientific symposium here how computers have become one of the most important tools in speech research.

With computers, Dr. Denes said, “we have been able to generate artificial speech from its basic building blocks, called phonemes, which are somewhat like letters are to written language. What makes speech infinitely more difficult to analyze, however, is that the phonemes change when put in different contexts.”

Dr. Denes told the 150 scientists attending the computer seminar at the Thomas J. Watson Laboratories that because “we all produce and perceive speech with so little effort, we instinctively feel that it must be an unusually simple process. On close examination it defies explanation and seems almost miraculous.”

I hate to quibble with the good doctor, but I am sure that the readers of Radio-TV Experimenter will agree with their Editor that synthesized speech is only the beginning. We now have computers that can “think,” and if man can continue to improve computers, the machines will be able to think well enough to learn how to talk. It may be difficult to imagine a machine issuing forth baby talk and then maturing to an eloquent Winston Churchill or humorous Jacky Gleason, but it is in the cards. It may take a score of years, but don’t be surprised if man compresses the clock into a decade.

Happy Birthday. It isn’t very often the Editor takes time out to congratulate a business on its twentieth birthday, but he would like to make an exception for EICO Electronic Instrument Company. Most of us look at companies as

(Continued on page 12)
Something new!
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impersonal organizations that somehow produce the products we want and cash the checks we send them. This EICO does, but they go beyond the scope of ordinary business. Many years ago before I entered the editorial field I was like many of my readers today—a kit builder. I had the first high-fidelity set in the neighborhood made from EICO kits long before my next door neighbor knew what hi-fi was. And like some kit builders, I goofed in the construction. What to do? I sat down and wrote a letter to EICO telling them of my troubles. Back came a letter listing all the faults that could cause the trouble symptoms my setup had. Sure enough, a cold solder joint in the feedback circuit was the villain. This one letter typed by a technician (not a form letter) made me realize that there were humans behind those letterheads. And with this kind of company attitude toward its customers, no wonder EICO is enjoying its twentieth birthday.

So, happy birthday, EICO, and let me add my special good wishes to Harry R. Ashley, EICO’s president, and Philip A. Portnoy, Executive Vice President—the pair that sired countless kits.

Wet-Cell Mouth. Our overseas cousins reported in the British Medical Journal that weak electrical currents in the mouth play an important part in corroding metallic fillings. When dissimilar metals, such as gold or amalgam, come into contact within the mouth, electrical currents are developed. If these fillings are in opposing teeth, a short-circuit that may cause a sharp pain develops when the mouth is closed. (That makes the jaw an s.p.s.t. switch.) When the tongue touches fillings made of dissimilar metals, the current passing through may cause a burning sensation. This may be one of the possible causes of leucoplakia, a thickening and overgrowth of mucous membranes that sometimes leads to cancer. If proven true, dentists may switch over to ceramic or plastic filling with gold caps becoming a thing of the dark ages.
The Class D operators have long complained about the "boop boop" radio control signals which were taking up five channels worth of much needed communications space.

Class C operators, on the other hand, said that the talkative Class D operators were generating so much interference in their model ship and aircraft receivers that many were lost as a result.

It now appears that something may be done to alleviate the heated tempers on both sides of the fence. It seems that the Academy of Model Aeronautics has requested that the FCC establish five additional channels for radio control of model aircraft, these channels to be located on 72 mc.

This would mean an extension of the Class C operating privileges, as the FCC has been asked to let the existing 27 mc. R/C channels remain for the model users, should they still find the need for them.

These five new 72 mc. channels would create what amounts to a "private" band for the model aircraft fanciers—far away from the Class D ack-ack guns which (they claimed) were costing them many of their finest flying machines. Indeed, we know of one Class D CB'er who boasts that he "shot down" seven model aircraft during one single skip contact—for this feat he received the coveted Iron Ground Plane medal, Second Class.

Meanwhile, back at the FCC, at least one major manufacturer of commercial two-way radio equipment ran for the aspirin bottle at the prospect of model aircraft being given frequencies in the 72 mc. band. It seems that with a severe shortage of frequencies for commercial VHF communications, the 72 mc. channels are a coveted prize—perhaps too highly desired by industry to be "given away" for model aircraft hobby use.

Yet another cry of woe has come from those hobbyists who sail radio controlled model ships, and the users of 27 mc. automatic garage door opening devices. They are crying "foul" and "sell out" because they don't seem to be part of this master plan to give the aircraft hobbyists their own exclusive channels.

While creation of these five new 72 mc. radio control channels will not remove the R/C from the 27 mc. Class D band, we hope that the new channels will attract so many model aircraft users that the FCC will see its way to shifting all radio control operations to the new band, thereby creating five channels which might then be given over to Class D stations. Perhaps one of these channels could be assigned to low power (Part 15) CB hobby use, which would include the use of CW (code).
How To Have Fun While

New 23-Channel 5-Watt All-Transistor CB Transceiver

Kit GW-14
$89.95
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$124.95

23 crystal-controlled transmit & receive channels for the utmost reliability. Low battery drain... only .75 A transmit, .12 A receive. Only 2½” 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.

New 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 All-Transistor, 10-Band SWL Portable

Kit GR-43
$159.95

10 bands tune longwave, broadcast, FM and 2-22.5 mc shortwave. 16 transistors, 6 diodes, 44 factory-built & aligned tuned circuits. Two separate AM & FM tuners, two built-in antennas, 4” x 6” speaker, battery-saver switch. Operates anywhere on 7 flashlight batteries or on 117 v. AC with optional charger/converter GRA-43-1 @ $6.95. Assembles in 10 hours. 17 lbs.

New Deluxe 5-Band SSB Ham Transceiver

Kit SB-100
$360.00

Full SSB-CW transceive operation on 80-10 meters. 180 watts PEP SSB—170 watts CW. Switch select for USB/LSB/CW operation. Operates PTT and VOX; VOX operated CW with built-in sidetone. Heath SB series Linear Master Oscillator (LMO) for true linear tuning. Mobile or fixed operation with appropriate power supply. 23 lbs... Accessory mobile mount, SBA-100-1... $14.95.

RADIO-TV EXPERIMENTER
New 30-Watt Transistor FM Stereo Receiver

31 transistors, 11 diodes for transparent transistor sound; 20 watts RMS, 30 watts IHF music power @ ±1 db, 15-60,000 cps; wideband FM/FM stereo tuner, two pre-amplifiers, & two power amplifiers; compact 3½” H x 13¼” W x 12” D size. Assemble in around 20 hours. Mounts in a wall, or optional Heath cabinets (walnut $9.95, beige metal $3.95). 16 lbs.

Kit AR-14
$99.95
(less cabinet)

66-Watt Transistor AM/FM Stereo Receiver

Just add 2 speakers for a complete stereo system. Boasts AM/FM/FM stereo tuning; 46-transistor, 17-diode circuit for natural transistor sound; 66 watts IHF music power (40 watts RMS) at ±1 db from 15-30,000 cps; automatic switching to stereo; preassembled & aligned “front-end” & AM-FM IF strip; walnut cab. 35 lbs.

Kit AR-13A
Now Only $184.00

New 30-Watt Transistor Stereo Amplifier

17 transistors, 6 diodes; 20 watts RMS, 30 watts IHF music power @ ±1 db 15-60,000 cps. Accommodates phono, tuner, auxiliary...4, 8, 16 ohm speakers. Bookshelf size: 10¼” D x 3” H x 12” W. Install in a wall, or Heath cabinet (walnut $7.95, beige metal $3.50). 10 lbs...Matching FM/FM stereo tuner available @ $49.95.

Kit AA-14
$59.95
(less cabinet)
New mechanical practice putting green, called Roputt, can be adjusted to an infinite number of tilt and slope angles. The grass-like top of the 9 by 4-foot green, endorsed by Arnold Palmer, simulates the feel and speed of creeping bent.

For more information on Roputt, which operates on 115 volts, lists under $350, and weighs about 175 lbs, write Wichman Industries, 7110 South France Ave., Minneapolis, Minn., 55410.

Microswitch pushbuttons control motor-driven jacks to adjust tilt and slope of green.
This go-round we have a new solid-state transceiver, the most gung-ho antenna ever to be seen zipping down the highway, and a little gadget that promises to make your mobile unit sound like a base station. Interested? Well, let's go!

**Full 23.** Our transceiver is from an outfit with the handle of Squires-Sanders, this is the company which manufactures Clegg equipment for the Ham bands—and any VHF Ham operator can attest to the superior quality of every piece of gear which emerges from Clegg's production line. Anyway, as their world premier in the CB field, Squires-Sanders offers a rig called the "23'er," which has (you guessed it), 23 channels and is designed for mobile and base station CB'ing.

Pumping out a full five watts, the 23'er comes factory equipped with crystals for all channels (what, no crystal synthesizer?) plus the following other features: 23 silicon transistors, 6 diodes, 1 Zener diode, supersensitive receiver, 4 watts of receiver audio, Squires-Sanders special speech booster in the modulator, transmit light, and a provision for instant conversion to PA service—but there's more!

This rig has one of those "noise silencer circuits" which everybody is talking about these days. The circuit really goes to town...
CB Rigs and Rigmarole

on ignition noise and completely eliminates it—not just gives it a once over lightly with a slight clip as in many of the standard noise limiters. The manufacturer says that in spots where a weak CB signal cannot be read, the 23'er can still hear 'em—and well too!

Besides the fact that this circuit gives you a sharper CB' rig than normal, it probably saves you a good $30 for having your car's ignition system de-noised, which won't be necessary with the 23'er.

The rig operates from any vehicle with a 12 volt negative ground electrical system (that's just about every American car today) or from 115 volts AC when used in conjunction with an optional AC power supply.

Weight is a scant 4 pounds, and the compact unit measures 8" by 3½" by 7".

In the price department, the 22'er goes for $235, including ceramic mike, mobile mounting bracket, and all crystals. The AC power supply is $24.50.

For further details, drop a line to Squires-Sanders, Inc., Martinsville Rd., Millington, N. J. 07946.

Adds Color to CB. Our wild, wild, antenna comes from The Antenna Specialists Company, 12435 Euclid Avenue, Cleveland, Ohio 44106.

This antenna is the Colorguard, and is actually a whole series of antennas, rather than just one single sky hook. These antennas are produced in a brilliant fluorescent "International Emergency Orange" material—some in fiberglass, others in steel which is encased in plastic orange jackets.

Originally conceived for police work on radio equipped motorcycles, the idea met with such outstanding official reception in the experimental stages that it was quickly worked up for other frequencies. The CB versions have already created quite a bit of happy talk among CB clubs and REACT teams.

At a recent "sneak preview" of the CB version in Fairfax, Va., six mobile units were equipped with Colorguard antennas and tested under a variety of traffic conditions. Public safety officials expressed considerable interest in the antennas.

Your editor has seen these antennas and must admit that he hasn't ever seen anything quite like them before. The color is a dazzling orange which can be seen at great distances. It immediately identifies any mobile unit as being one equipped for emergency radio communications. Although Antenna Specialists make no claims for the other benefits of their Colorguard antennas, your editor found that they make an eyecatching addition to your car when trying to seek it out in a crowded parking lot.

It Makes Your Antenna 10-Feet Tall. The Dyna-Power, a solid state antenna booster, is a multi-purpose device which sounds like the answer to a CB'er's prayer. Tied up in a little package, smaller than a frozen juice can, we have something which offers the following features: increases power by reducing SWR, gives you more range, decreases noise and static, has a built-in RF and modulation indicator, and a lightning arrester.

The unit requires no external power and installs by simply inserting it in your mo-
bile antenna lead. It's water tight and ruggedized.

Price is $9.95 from Dyna-Comm Products, 4860 N.W. 2nd Avenue, Miami, Fla. 33127. If you write to them, they'll send you some data on the Dyna-Power and also data on one of their other products called the Dyna-Filter which eliminates noise from your car's generator brushes or voltage regulator.

Dyna-Comm Products “Dyna-Filter”
Car Generator Noise Suppressor

We'll be back next issue with late news on some of the highlights appearing on the CB scene. Until then, we'll be CB'ing you!

Lighting System For Small Airports

The aviation lighting unit shown above is part of a low-cost electronic flash and approach lighting system for small airports made by Sylvania Electric Products Inc. The system consists of a series of the units, ranging from 10 to 28, spaced 100 feet apart down the centerline approach path to the runway. Each unit is equipped with a five lamp incandescent light bar and a powerful condenser discharge light. By means of a master timer, the condenser discharge lights flash in sequence from the outer light bar towards the runway threshold, providing the pilot with long-range centerline line-up even under low visibility conditions.

FEBRUARY-MARCH, 1966
There was a time when important electronic book titles never reached the book stores because authors did not have the information on hand. More so, the task of writing these titles usually was greater than the efforts one man could muster. So, electronic companies have become book publishers and with their resources they have grouped the efforts of many professions to produce a title that normally would take several years in the making. Three such companies are Motorola, General Electric and Allied Radio. Considering the effort put into the texts reviewed in this issue of RADIO-TV EXPERIMENTER as well as the quality of the end results, the prices asked for these texts are very low. To prove a point here are reviews on three titles everyone should have on their bookshelves. You would have to go far and wide to equal them with a library of several volumes—if they could be had.

**Hobby Manual.** Want a light that dims gradually at a pre-determined time—just right for the bachelor’s den or the children’s bedroom? Or an electronic organ the size of a typewriter that gives off melodious tones when plugged into your hi-fi? Or an airport receiver that lets you eavesdrop on conversations between pilot and control tower? Or a second ignition system to improve gas mileage and assure quick winter starts?

![Hobby Manual](image)

200 pages
Soft cover
167 illus.
$1.50

The General Electric Electronic Components Division’s Hobby Manual, believed

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**PERSONAL TV LISTENER**

Enjoy Television in private without disturbing others. Full rich sound through comfortable individual earphones. Others don’t hear a thing. Ideal for late night viewing or keeping house quiet during children’s programs. With extra ear sets® two can listen.

**TELEX 1200**

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- Extra rugged and tamper proof
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- Available with or without microphone boom
- Dynamic microphone and speakers

**COMMUNICATIONS MICROPHONE**

- Transistorized, noise-canceling, dynamic
- Voice response characteristics proved superior by test
- Standard equipment on most new American aircraft
- Ideal for all communications
- Carbon noise-cancelling type also available. Both types FAA approved (T50 C58)

**TELEX ACOUSTIC PRODUCTS**

More Than 100 Telex Headsets, Microphones, Pillow Speakers and Private Listening Devices are available. Write for descriptive literature today. Dept. 9A 3054 Excelsior Boulevard, Minneapolis, Minn. 55416
to be the most comprehensive hobby manual ever produced by a major electronic components manufacturer, tells you how to make them. Expanded in size and scope from last year’s 50-page G. E. Silicon Controlled Rectifier Hobby Manual which concentrated on simple circuitry using silicon controlled rectifiers, the new manual utilizes a wide range of components: transistors, vacuum tubes, reed switches, thyrectors, thermistors, capacitors and photo-conductors, as well as silicon controlled rectifiers. It also has 45 pages explaining in layman’s language the fundamental operation of these components.

There’s a step-by-step explanation for making the automatic lamp dimmer utilizing a triac, three transistors and several diodes. It will amaze the girl friend when it’s time for romance or help the youngsters fall asleep in a gradually darkening room.

The eight-key organ employs a simple circuit with a unijunction transistor which permits manual raising or lowering of the octaves. The airport receiver uses two transistors, two penlight cells, some wires and a plastic box. And the electronic ignition system, as an alternative to the normal system, works off the existing coil and breaker points thanks to a silicon controlled rectifier.

There are 35 projects in all ranging from the gimmickry of a magic lamp that turns on and off with a magnetic wand to such handy items as a one-compactron, all-band short wave receiver; a thermistor thermometer with remote control and alarm, and a battery saver employing one resistor and one silicon controlled rectifier.

The manual may be obtained from authorized distributors for General Electric electronic components or from the G-E Warehouse, Dept. RPG, 3800 North Milwaukee Ave., Chicago.

**Your First Measurements.** The VOM (volt-ohmmeter) and the VTVM (vacuum-tube-voltmeter) are probably the most useful and most commonly used instruments for electronic/electrical measurements. Now Allied Radio has published a compact, clearly written, well-illustrated booklet, “Best Ways to Use Your VOM and VTVM”.

The information supplied will enable anyone, even a beginner, to locate most of the common troubles in electronics and electrical equipment. The text, assuming little knowledge on the part of the reader, tells exactly how to connect VOM’s and VTVM’s for measurement of voltage, resistance, current.

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*February-March, 1966*
With a brief coverage of basic principles, emphasis is on the important features of the instruments, how they work and how they are used. Photos and drawings show connections for various measurements, how to set switches and controls, and what scales to use. Applications discussed cover measurements that can be made around the home on television and radio sets, and hi-fi, Citizens Band and Amateur Radio equipment.

Tests and measurements are explained for resistors, capacitors, coils, diodes, transistors, fuses, motors, lamps, batteries and switches. Miscellaneous applications cover use of a VOM and VTVM as a tachometer, temperature indicator, salinity tester, soil tester, relay tester, and for tape recorder bias measurement. A chapter on care, repair, adjustment and calibration of these two instruments is also included. Available for fifty cents, post-paid in the U.S.A., from Allied Radio Corp., 100 N. Western, Chicago, Ill., 60680.

As an aid to the user, the Semiconductor Data Manual is arranged in device-application sections such as high-frequency transistors, power transistors, silicon controlled rectifiers and gate controlled switches, zener and reference diodes, and integrated circuits. Altogether, there are ten device sections. For those occasions when it is necessary to locate a device by type number alone, there is a comprehensive alpha-numeric index.

As an aid in applying semiconductors, an additional section of the Semiconductor Data Manual is given over to applications data and technical information such as: How to Get More Value Out of a Transistor Data Sheet, Understanding Transistor Response Paraments and High-Power Varactor Diodes — Theory and Application.

The true scope of the Semiconductor Data Manual is partially indicated by considering the coverage of just a few of the device sections. For example, the zener and reference diode section provides complete specifications on some 911 basic zener diode types, 162 temperature compensated reference diodes and 48 reference amplifiers. Among the nearly 650 transistors listed in several sections are 262 high-frequency types, 159 power transistors and 84 low-power, low-frequency (milliwatt) transistors, plus field effect transistors and multiple transistors.

The silicon rectifier section describes some 181 devices with current ratings to 1000 Amperes. The rectifier assembly section includes more than 400 types. The silicon controlled rectifier section covers 192 scr's plus gate controlled switches.

The Semiconductor Data Manual is available at $3.50 per copy from the Technical Information Center, Motorola Semiconductor Products, Inc., Box 955, Phoenix, Arizona 85001.
NEW products

Paperback Bookrack

Here is the handiest, most versatile bookrack ever designed for your desk-top electronic paperback books and magazines. Holds one or as many as thirty paperbacks. This sturdy paperback rack becomes full sized bookrack simply by turning around, can also be used for displaying '45 records or tapes. Has these "more for the money features"; adjustable—self locking book-ends fold flat when not in use—angled to secure and make viewing easy. Ideal place for often read books. Handsome brass plated finish with non-marring legs—compact sturdy construction. Excellent for paperbacks; copies of RADIO-TV EXPERIMENTER, ELEMENTARY ELECTRONICS, RADIO-TV REPAIRS; or electronic reference texts you would like to keep on your desk top. Price: $1.49 postpaid. For more information or to place orders write to CEL Products, Dept. EGD, 865 N. Sangamon, Chicago, Ill. 60622.

Transistor Radio Servicing Made Easy

AM and FM auto and transistor radios can now be serviced with higher profit with the Dynascan B&K Model 970 Radio Analyst. The new all-solid-state instrument increases repair profit potential through combining all the necessary functions needed to repair these radios into one time saving unit. It is complete with power supply, in-circuit and out-of-circuit transistor tester, RF and audio signal generators, and a rugged volt-ohm-milliammeter.

The Model 970 Analyst employs an in-circuit signal injection procedure that functions on either power or signal type transistors through introducing a dc test signal into the transistor stage and reads good/bad...
NEW
products

directly on the built-in meter. No circuit alterations or removal of transistors is necessary for this test. This is the first instrument to have the capability of checking power transistors in this manner. Transistor Beta and Leakage may be read directly on the meter scales if the transistor is tested out-of-circuit. The built-in power supply provides 1½ to 12 volts for battery substitution and a separately variable 1½ to 12 volts for bias. For additional information see your B&K distributor or write to B&K Manufacturing Company, Dept. MCA, 1801 West Belle Plaine Avenue, Chicago, Illinois 60613.

![Dynason B&K Model 970 Radio Analyst](image)

**Triceps—A Universal Hand Tool**

This remarkable, all stainless steel instrument eliminates many of the problems encountered by those who work with very small, delicate, oddly shaped, or otherwise difficult to handle objects.

Depressing the Triceps plunger causes three resilient, hooked fingers to flare out from the tip. By properly positioning the extended fingers and releasing the plunger, the fingers retract and an object is firmly but gently grasped. It is then a simple matter to position, adjust, retrieve or just hold an object for as long as necessary without maintaining any finger pressure on the plunger. To release, just depress the plunger momentarily.

The Triceps is a vital tool for servicemen, technicians, assemblers, model makers, engineers, inspectors or anyone who is hampered by the limitations of screwdrivers, tweezers, pliers, forceps, small clamps and other conventional tools. This instrument has innumerable uses in clean rooms and in the field of miniaturization. In electronic and precision mechanical work, the positioning and holding of fine wires and most components during soldering and assembly is made easier and less fatiguing. Many operations in the fabrication of semiconductors, miniature components and modules, are made simpler and safer by minimal contact between tool and part. The Triceps is extremely versatile in positioning, adjusting, and assembling small or irregularly shaped parts and is the ideal means of retrieving objects dropped into a chassis or mechanical assembly.

Six models are available, ranging in length from 4½ to 18 inches. The T6L and the T8L terminate in a 2" long needle-nosed segment. This makes it possible to reach into cramped locations that are inaccessible to most other tools. All models are provided with a finger grip, except for the T4 which has a convenient pocket clip. Priced from $2.85 to $5.20. For more information write to Universal Technical Products Co., P.O. Box 257, Dept. 72-21, Forest Hills, N. Y. 11357.

![Universal Tech. Products Triceps](image)

**Shortwave Receiver**

Lafayette Radio Electronics Corporation has released a new shortwave communications receiver, the HA-226 which is ideal for the shortwave listener, novice ham, or hobbyist, the HA-226 is a sensitive superheterodyne shortwave receiver with a built-in power supply and a 4" speaker covering 550 KC through 30 MC in four bands. Features On/Off Volume Control, Band Selector, Main Tuning and CW Phone switch. Illuminated S-meter shows signal strength and correct tuning for best reception. Large slide rule dial with red pointer and 0-100 logging scale facilitate tuning. AVC reduces fading and blasting on distant stations. The unit has front panel headphone jack for private listen-
ing, 3 tubes and 2 diodes. Size: 10 1/2 W x 6 H x 8" D. For 110-120 volts, 50/60 cycles AC. The imported receiver is $49.95 from Lafayette, 111 Jericho Turnpike, Syosset, L. I., N. Y. 11791; the stock No. is 99-2520WX.

Lafayette Model HA-226 SW Receiver

Free Tape Rack!

The Magnetic Tape Division of Sarkes Tarzian Inc. has announced an unusual offer to introduce tape recorder owners to the fine quality and performance of Tarzian Tape. For a limited time only, Tarzian will give away a good-looking, convenient tape storage rack, absolutely free with the purchase of three reels of Tarzian Tape. This special tape-and-rack package is now available from Tarzian Tape dealers throughout the country. It applies only to Tarzian's standard-play acetate tape, in the 1200 foot (7") reel, the most popular size and type.

Sarkes Tarzian Tape Storage Rack

The tape rack, especially designed by Sarkes Tarzian Inc., will hold twelve boxed reels of tape, in either 5" or 7" size. Although

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The Progressive Radio "Edu-Kit" is the foremost educational radio kit in the world, and is universally accepted as the standard in the field of electronics training. The "Edu-Kit" uses the modern educational principle of "Learning by Doing." You begin by building a simple circuit, then a more complex one, in a progressive manner, and at your own pace. You construct more advanced circuits as your ability and understanding grow, until you can build multimode radio circuits, learn advanced theory and techniques, and do work like a professional radio technician.

THE "EDU-KIT" IS COMPLETE

You will receive all parts and instructions necessary to build 20 different radio and electronic circuits, each substantial to have practical value. Our circuits include all the higher types of circuits and equipment used in radio, TV and electronics, from simple diode circuits, transistor amplifiers, regenerative receivers, to the most complex radio circuits, and complete radio receivers. In addition, you receive various printed and bound manuals, ceramic and paper electrolytic condensers, resistors, timer switches, relays, radio tubes, insulated hook-up wire, solder, soldering iron, and all necessary tools.

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You do not need the slightest background in radio or electronics to enjoy the "Edu-Kit." The "Edu-Kit" was designed for the home, school and club, by engineers and technicians with practical experience in the field of electronics. One of the important features of "Edu-Kit" is the Consultation Service which we provide. We welcome students to send us their problems, whether related to any of the material covered in the "Edu-Kit" course, or encountered in other experiences in the field of electronics.

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February-March, 1966
NEW products

these racks are not for sale separately anywhere, they are equivalent to book and record racks which sell in the $2.00 price category. Although this special offer applies only to standard play acetate tape, Tarzian manufactures a full line of magnetic recording tapes. Included in the Tarzian line are standard and long play acetate tapes, plus long play and extra long play polyester tapes, in all standard reel sizes.

This special premium offer will continue only as long as the current supply of tape racks lasts. So take advantage of this introductory offer immediately. For the name of the nearest Tarzian Tape Dealer, write to Sarkes Tarzian Inc., Magnetic Tape Division, Dept. DV, East Hillside Drive, Bloomington, Indiana.

Packed Solid Solid-State PA

Both the size and weight minimum requirements of amplifiers for PA systems have been drastically reduced by the introduction of the new Geloso transistorized amplifiers. These units

are available in models with outputs of 16 watt, 34 watt or 50 watt, and may be operated from 6- or 12-volt DC batteries or 110-volt AC outlet using a Geloso adapter. Power consumption is low. Separate volume controls are provided for microphone, phono or tape. Dual microphone inputs. Prices for the Geloso amplifiers start at $66.70, professional net. Details and descriptive literature are available from American Geloso Electronics, Inc., Dept. 64, 251 Park Ave. South, New York, N. Y. 10010.

Decor Tape Boxes

Kodak Sound Recording Tape is now available in library box packaging to make the music lover’s tape library shelf as attractive in styling as his living room equipment. Designed to harmonize with any decor, the beige-colored boxes have dark brown “bindings” and are protected before purchase by a removable yellow sleeve.

Effective immediately, all five and seven-inch reels of Kodak Sound Recording Tape will be packaged at no extra cost in the new boxes. The tape is available in lengths ranging from 625' on a Durol base to 3600' of long-play tape on a polyester base. Smaller reels for portable recorder use will still be available in mailer cartons without a library box design.

In actual use, the sleeve is removed after choosing a tape for a specific use. When the user is recording, he identifies his recorded selections by using the lines provided on the back of the box. Library-boxed Kodak Sound Recording Tape is available through Kodak photographic dealers, electronic supply houses and department stores.

High & Low It With Transistors

The “Bullitt Beam Eye” is a new automotive headlight dimmer with advanced performance features and lower price than others previously available in the United States. Design provides adjustable control to select the sensitivity desired; automatic dimming for both oncoming headlights and when overtaking red tail-lights; switch for manual operation, and constant override by the regular dimmer switch control.

The electric eye unit of the Bullitt device is a compact photoconductive cell, only 1/4" in depth, with chromed, swivel bracket for mounting in the windshield area. The control unit is solid-state for trouble-free operation and long life, measuring 1-3/4" x 3" x 4-1/6". Brackets, nuts and screws for mounting under the dashboard are provided, together with color coded wires, plug connectors and simple instruction manual giving full installation information. Required installation time is approximately one hour. List price is $32.50. The transistorized “Bullitt Beam
"Bullitt Beam Eye" Headlight Dimmer

**Guitar Amplifier Line**

Rheem Califone, a division of Rheem Manufacturing Company, one of the world's largest corporations has entered the guitar amplifier field. All of the new Rheem models feature solid state transistored circuitry. An engineer for Rheem Califone explained that guitar amplifiers are mobile, and conventional tube-types have difficulty in withstanding the tortures of travel. The aerospace industry has proven beyond a doubt that transistors deliver better sound, with less distortion, and perform with excellence under the most difficult circumstances.

Rheem Califone Model 1910 Guitar Amplifier

True-tone tremolo, a Rheem Califone feature, permits the musician to obtain special sound effects. Extra large speakers, foot controls, a large number of microphone and instrument plug-in outlets, and specialized controls are some of the features to be found on the models. Prices of the
color coded
nutdrivers
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FOR BENCH, WALL OR TOOL BOX

Sturdy, new pebble-grain plastic cases provide handy means for keeping nutdrivers in good order on the workbench or in tool box for service calls. Lids snap shut, lock tight to protect tools. No. 77 case has hole in lid for wall hanging ... molded compartments keep tools from tumbling out.

No. 77
SOLID SHAFT
NUTDRIVER KIT
7 Hex Openings:

\( \frac{1}{16}, \frac{5}{32}, \frac{1}{8}, \frac{7}{32}, \frac{1}{4}, \frac{5}{32}, \frac{1}{8} \)

No. HS6-18
HOLLOW SHAFT
NUTDRIVER KIT
10 Hex Openings:

\( \frac{1}{16}, \frac{5}{32}, \frac{1}{8}, \frac{7}{32}, \frac{1}{4}, \frac{5}{32}, \frac{1}{8}, \frac{1}{4}, \frac{3}{8} \)

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four entirely new models range from $85.95 to the highest priced model in the line at $159.95. For more information write to Rheem Califone. Div. of Rheem Mfg. Co., Dept. R63, 5922 Bowcroft Street, Los Angeles, Calif. 90016.

Compact Transistor Audio Amplifier

Now you can build your own stereo, or intercom system, or home alarm with Birnbach's new compact transistor amplifier. It may also be used for a public address amplifier, electronic stethoscope, utility amplifiers, science projects, modulation for transmitters.

Featuring a low distortion of 400 milliwatt push-pull output and an extremely high gain of 800 db, it is built to handle low level mikes, phono pickups, telephone pickups, etc. The printed circuit amplifier consists of:

Birnbach
Transistor
Amplifier

No volume control; 5 transistors, 1 thermistor; a shielded input transformer with two primary windings, one for 50 ohms and one for high impedance; and an output transformer with two secondary windings, 8 ohms (for speakers), 500 ohms (for modulation and high impedance loads).

(Continued on page 93)

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February-March, 1966
ASK ME another

By Leo G. Sands

RADIO-TV EXPERIMENTER brings the know-how of electronics experts to its readers. If you have any questions to ask of this reader-service column, just type it on the back of a 4½ postal card and send it to "Ask Me Another," RADIO-TV EXPERIMENTER, 505 Park Avenue, New York, New York 10022. The experts will try to answer your questions in the available space in upcoming issues. Sorry, the experts will be unable to answer your questions by mail.

TD-FM Radio Is No Help

How can I modify the TD-FM radio (June-July 1964 issue) for the 150-274 mc range?

—G. C. M., Jacksonville, Fla. & F. S., Wallington, N. J.

While it is possible to change the coils to alter the frequency range, you probably would not be pleased with the results. The 150-174 mc mobile radio band channels are spaced only 30 kc apart and the FM signals deviate only ±5 kc. In the FM broadcast band, the channels are 200 kc apart and the signals deviate ±75 kc. Even in the 2-meter amateur band (144-148 mc) the signals usually deviate ±15 kc. Extremely good selectivity is required to separate the signals in the 150-174 mc band and an FM discriminator is required which will provide adequate audio recovery. Only a multi-stage superheterodyne receiver with a very sharp selectivity will provide satisfaction.

Add a Phone Jack

On the back of my receiver there are three screw terminals for speaker connections. They enable me to disable the internal speaker and use an external speaker, or use both speakers. How can I install a headphone jack so the internal speaker will be disabled when I plug in the phones? The set is designed for use with a 3.2-ohm speaker.

—J. M., Newark, N. J.

When the internal speaker is to be used by itself, terminals 2 and 3 are strapped together. To use an external speaker, the strap is removed and the external speaker is connected to terminals 1 and 2. Right so far? Remove the strap from terminals 2 and 3. Get a three terminal phone jack and connect it as shown in the diagram. When you plug in the phone jack, the short across terminals 2 and 3 is removed and the phones are connected across 1 and 2. It doesn’t make much difference if the phones are 8-ohms. But, if you want to, connect a 5-ohm, 2-watt resistor across 1 and 2.

BFO

I have an old Philco radio which has short-wave bands. Can I use it as a novice amateur receiver if I add a BFO? If so, can you give me a circuit for a BFO?


You certainly can add a BFO to your set to make it possible to receive CW (code) and SSB (single sideband phone) signals. Meissner and others make BFO Coils that can be used in an oscillator circuit like the one shown in the diagram. L1-C1 should tune to the receiver IF at about the mid-position of C1. The values of R1, R2, C3 and C4 are approximate and vary with the type of tube used. C2 should have a low value (10-50 mmf) and it may be necessary to retrim the receiver IF transformers after the connection is made.
Surplus Savings

In a recent issue, you mentioned the book “Surplus Conversion Handbook” by Tom Kneitel which describes ways of converting equipment from military to civilian use. Can you tell me where I can purchase military surplus equipment?

—M. M., St. Cloud, Minn.

There are probably several military surplus dealers in Minneapolis and St. Paul. You might write to Space Electronics, 4178 Park Avenue, Bronx, N. Y., Fair Radio Sales, Box 1105, Lima, Ohio, G&G Radio Supply Co., 77 Leonard St., New York, N. Y. 10013, and R. F. Goodheart Co., Inc, Box 1220, Beverly Hills, Calif. 90213, and ask them to send you their surplus equipment price lists.

Build a Reflex

What is a reflex receiver and how can I build one?

—E. L. M., Sudbury, Mass.

In a reflex receiver a tube or transistor performs more than one function. For example, in the diagram a single triode tube functions as both an RF amplifier and an AF amplifier. The incoming radio signal is fed from L2 to L1 which is tuned to the frequency of the station with C1. The RF signal is amplified by the tube and is coupled to the detector through T1, an untuned RF transformer. The diode detector output is fed to the primary of interstage audio transformer T2. Capacitor C2 across this winding is an RF filter. The audio signal at the secondary of T2 is fed to the grid of the tube through L1 which has negligible impedance at audio frequencies. Hence, the tube now also acts as an AF amplifier and the audio output signal is fed to the headphones.

Capacitor C3 across the audio transformer secondary provides an RF path to ground for the tuned circuit. Capacitor C4 across the cathode bias resistor increases the gain by reducing degeneration. Capacitor C5 provides an RF path to ground for the primary of the RF transformer.

L1-L2 may be a standard antenna coil
ASK ME another

(transformer). You will have to experiment with T1 to get maximum RF gain in the band in which you operate the receiver. Try an interstage RF coil (transformer). It could be tuned to increase the gain and selectivity, but the circuit might oscillate since the tube is a triode. Instead of headphones, you could use another interstage audio transformer in the plate circuit and feed its output to an audio power amplifier for loudspeaker operation.

Here's One

I live in an apartment and have 148-174 mc receiver which calls for a ground plane aerial. Since I cannot put an aerial on the roof, can I set the ground plane on the window?

You can use a ground plane, coaxial or any of several other types of antennas designed for use in this band. Since a ground plane antenna has horizontal or drooping radials, it may be too bulky to set on the window sill. One that might work out well is a half-wave type, made by Mark Mobile, 5439 West Fargo, Skokie, Illinois, which does not require a ground plane.

Kicking Mc's About

How can I convert a 40-meter band signal into a 20-meter band signal in a transmitter? And, how can I convert a 20-meter band signal into an 80-meter band signal?

—J. N. L., New York, N. Y.

The most straightforward way to convert almost any frequency to almost any other frequency is to use what is known as a frequency converter as shown in the Diagram A. Signal F1 from the transmitter oscillator or a multiplier stage is mixed with signal F2 from a so-called local oscillator in the frequency converter stage to produce a third frequency F3, as in the mixer of a superheterodyne receiver. The new frequency may be equal to the sum or difference of F1 and F2. For example, if F1 is 7.18 mc and F2 is 7.00 mc, F3 could be 14.18 mc (sum) or 180 kc (difference). The desired beat signal is selected by tuning the output of the mixer to that frequency.

Another way to increase a frequency is to use a frequency multiplier, as shown in the Diagram B. For example, if a 7.16 mc signal is fed into the control grid of the sharp cut-off pentode tube and its tank circuit (L-C) is tuned to two times 7.16 mc or 14.32 mc, the output signal will be the second harmonic of the input signal.

The frequency of a signal may be lowered with a frequency converter or with a frequency divider as shown in the Diagram C. Here a signal at 14.32 mc is fed to the control grid of a triode-connected, sharp cut-off pentode (screen and suppressor grids tied to the plate). The plate tank circuit (L1-C1) is tuned to 3.58 mc, one-fourth in the input frequency. The control grid is connected to L2, a tickler coil which makes an oscillator out of the circuit. The oscillator operates at 3.58 mc and its third harmonic, 10.74 mc, or its fifth harmonic, 17.90 mc, mixes with the 14.32 mc input signal to produce a beat signal at 3.58 mc. (10.74 mc subtracted from 14.32 mc is equal to 3.58 mc, or 14.32 mc subtracted from 17.90 mc is equal to 3.58 mc).

What Q Like?

I read with interest the article about mechanical filters. But, a Q-multiplier costs about the same, can be installed as easily, and has variable selectivity. What are the relative merits of a crystal filter which is cheaper yet?

A mechanical filter or a crystal lattice filter is used in commercial communications equipment. Both are excellent, require no adjustment and are stable. A Q-multiplier, on the other hand, may not be as stable, but costs less. For variable selectivity, the old-fashioned, adjustable single-crystal filter is recommended. But, for voice communications reception, the crystal lattice or mechanical filter is recommended. If you're a short-wave listener, you may want both. A modified receiver that can switch in a Q-multiplier or mechanical filter, or both (\(?\)), is worth while having.

**Facts on Part 15**

Can I use Coil-Tenna loaded car radio aerial for a small broadcaster?

—D. S., Virden, Ill.

If the antenna you refer to is for use in the 27-mc citizens band, its use with an unlicensed low power broadcaster, operating in that band, is unlawful. Part 15, FCC Rules and Regulations stipulates that the antenna must be a "single" element not more than 5 feet in length. The loading coil and coaxial cable are also elements. In the AM broadcast band, however, you can use an antenna up to 10 feet long, including its lead-in. The rules say nothing about loading coils for the broadcast band.

&?*!* Noise

I have noise problems with my CB set. It has a generator or distributor noise I can't eliminate. I have installed wheel noise suppressors, a 0.5 mfd capacitor on the generator, voltage regulator and coil. I am using resistor spark plugs. What else can I do?

—C. L. J., Joanna, S. C.

Try a generator noise filter which is a tunable trap. Several are on the market including Lafayette 99G6018 ($2.49).

**Kick in Some db's**

The transmitter of a local FM station is so close that its signal completely overloads my tuner. How can I attenuate this station on 100.5 mc so I can receive a good music station on 99.9 mc?


Try an attenuator at the antenna terminals, such as JFD's three-step attenuator, which will reduce the strength of the interfering signal. Or, if the stations are in different directions, use a high-gain antenna, with a high front-to-back ratio, aimed at the wanted station.

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**Notice**

The best way to ring up more 10-2s with the new solid-state transceivers is by using one of the new low-impedance Sonotone Ceramikes. They are designed specifically for all-transistor transceivers. Transmission is loud and clear, and Ceramikes are built to take abuse. Get the low-impedance "CM-3050" or the "CM-3050M" with Magnetic Mount, today. Also Models "CM-30" and "CM-30M" for tube transceivers. Prices start at $15.75. Write for Free catalog SAH-7.

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**McGEE'S 1966 CATALOG**

1001 BARGAINS IN SPEAKERS—PARTS—TUBES—HIGH FIDELITY COMPONENTS—RECORD CHANGERS—TAPE RECORDERS—KITS—EVERYTHING IN ELECTRONICS

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**Wireless "Mike" Talks to All Radios**

Now You can Talk-Sing or Play the radio with this NEW WIRELESS MIKE. In connection of any kind—radio by radio waves. Just touch button and talk while skiing, walking, riding, etc. Taste new reception on all nearby car and house radio. Transistor powered with double battery. FCC (1B) Reject (Guaranteed) for work—1 year warranty—Sold lower prices ($10.00) Guaranteed for work—1 year warranty—Sold lower prices ($10.00)

Send Only $2.50 deposit M.O. and pay postage $1.95 delivery first complete-ready to operate. FREE 2 special long-distance antennas given to you order from this ad NOW. Available only from MIDWAY RADIO Dept. WRE-2, Kearney, Neb.
The March/April issue of ELEMENTARY ELECTRONICS discusses this new construction philosophy that is of interest to anyone in the process of building some piece of equipment. You can save time, space and aggravation by "unitizing" your construction project.

CB'ers, in an article called "CB Selective Call—How It Works" can find out all the theory behind their "private line." It discusses the operation of encoders and decoders and how they work.

All this and more is in the March/April issue of ELEMENTARY ELECTRONICS—on your newsstand January 27, 1966.

ELEMENTARY ELECTRONICS, 505 Park Ave., New York, N. Y. 10022.

I don't want to miss a single copy of ELEMENTARY ELECTRONICS. Enclosed is $4.00 for 1 yr.; $7.00 for 2 yrs.; $10.00 for 3 yrs. (Foreign: Add 75¢ a yr.)

The two coil windings, L1 and L2, shown in the diagram were wound on what is known as a "spiderweb" form, a circular piece of fiber or other insulating material with radial slots. The coils were woven in and out of the slots. Tap switches were used to select the amount of inductance in the circuit. S1 selected the number of turns in use in the grid circuit, which in combination with tuning capacitor C1 determined the receiving frequency. S2 selected the antenna to grid coil-turns ratio. S3 selected the number of turns in the tickler circuit and, therefore, gave the user wide latitude in selection of regeneration (positive feedback) at various frequencies. Capacitor C2 was the actual regeneration control. RF choke L3 isolated the tickler coil (for RF) from the headphones.

By means of the three tap switches, it was possible to select frequency bands and optimize the relationship of the antenna circuit, tuning circuit and regeneration circuit. If you attempt to build a receiver using the Reinartz circuit, put an RF stage ahead of it since it is capable of radiating an interfering signal when regeneration controls are set so that the detector is oscillating. The RF stage can be fed into the circuit by disconnecting the antenna and feeding the output of the RF stage through a small capacitor to the junction of the arm of S2 and the stator plates of C2.
Boatman’s Electronic Loudhailer
by Edward A. Morris

Electronic loudhailers and bull horns have always ranked as one of the most useful accessories for a boat owner. DX'ing a shouting fellow-mate from across the channel is nigh impossible, especially in the wind and spray, and quite wearing on the voice box to boot. Of course, on one of the nights when the bay is like a mirror, it’s another story: all of us have lain awake in our bunks at least once listening to the slap, slap, slap of the waves on a lapstraked boat hull off on (Continued Overleaf)

Don’t limit the Loudhailer’s voice to just the sea or lake fronts—its mity-mite voice can also serve the outdoorsman on camping and fishing trips—other applications include indoor functions such as basketball games, conventions, school assemblies and many others!
Cover-off view of the chassis box shows encapsulated solid-state modules with their protruding connectors called out. Base of horn speaker, below, shows suction cup placement for mounting. The schematic diagram details microphone, speaker, module and switching connections for siren-loudhailer.

the horizon. But when the wind blows up and the boat ahead starts dragging anchor and you've got to alert him and communicate fast, then your voice needs an assist. And this loudhailer is just the ticket.

**High Value, Low Cost.** The price of commercially available loudhailers is prohibitive to most boat owners and they forego an accessory that proves indispensable once you have one. But, with this project, you can build your own for less than $25, and an excellent one at that. The unit includes a miniature horn speaker, a ceramic microphone, and an electric siren. The siren circuit drives the speaker well enough to be heard over 200 yards; and the voice amplifier drives it to carry in excess of 150 yards!

Thanks to the use of two pre-packaged, solid-state, electronic circuits—an audio amplifier and siren circuit—this loudhailer-siren is both easy and fun to build. A novice can build it in less than 3 hours! Because the circuits are cast in moisture and shock proof epoxy resin, very little maintenance should ever be required, other than the usual replacement of weak batteries.

Both the horn-speaker and the electronic chassis are equipped with 3-point suction cup mount's, which facilitate placement in almost any location and provides for stowing the units rigidly, preventing damage in rough weather.

**How it Works.** The loudhailer contains two separate pre-packaged electronic modules, one each for the loudhailer and the electronic siren. Each module is a complete working electronic circuit containing all the necessary components to do the job.

Switching the speaker and power between the two modules is accomplished by switch S2 as shown in the schematic diagram. When switch S2 is in the up or AMPLIFIER position, the speaker is connected to the amplifier module, and power is connected to it. When switch S2 is in the down or SIREN position, both the speaker and power are connected to the electronic siren module. With switch S2 in the center position, both modules are disconnected from the speaker and power. The switch has a spring return to off from the SIREN position.

Operating power is supplied by batteries.
PARTS LIST

B1, B2, B3, B4—Size C batteries (Eveready No. E-93 or equiv.)
J1—Phono jack
P1—Amphenol 91-MPM5L plug (included in purchase of microphone listed below)
P2—Phono plug
S1—S.p.s.t. toggle switch
S2—Four-pole, double-throw lever switch, 3 position: on, off, momentary on (Lafayette Radio 99R6158 or equiv.)
S3—Push-to-talk switch (part of microphone listed below)
S01—Amphenol connector No. PCG-6 (Lafayette 32R1962 or equiv.)

ALTERNATE WIRING

The modules used in this unit are the Cardover models listed above, and shown in the schematic diagram. If the Lafayette modules are used, wire them into the Loudhailer by making the following modifications.

LAFAYETTE AMPLIFIER MODULE 19R0111:
With an ohmmeter, determine which of the two green leads on the Lafayette module is connected to the black lead within the module. This green lead corresponds to that from terminal C as shown on the schematic. Clip off the black lead. The remaining green lead corresponds to that from terminal A. The yellow lead on the Lafayette module corresponds to that from terminal D. Clip off the brown lead. The red lead corresponds to that from terminal B on the schematic.

LAFAYETTE SIREN MODULE 19R0105:
Determine which green lead connects to the black lead. This green lead corresponds to that from terminal C. The other green lead corresponds to that from terminal D on the schematic. Determine which yellow lead is connected to the red lead. The red lead is from terminal A. Clip off the yellow lead that connects to the red. The remaining yellow lead corresponds to that from terminal B. Do not connect it to terminal C, however; connect it to terminal A.

1—5 1/4" x 3" x 2 1/2" aluminum chassis box (Lafayette 12R8373 or equiv.)
2—Battery clips for 2 size C cells

Misc.—6 1 1/2-inch diameter suction cups, 1" x 1/4" piece of bakelite, epoxy cement, hardware, hook-up wire, spray paint, solder, etc.

Estimated cost: $25.00
Estimated construction time: 3 hours

Wire lever switch S2 before mounting on chassis; connections are called out here.

B1 through B4 which are connected in series to obtain 6 volts to power the modules.

Mechanical Construction. Start construction by laying out centers for all the holes to be drilled in the small chassis box. Refer to the detail drawings and photographs. The larger holes can be made by first drilling a smaller hole, and enlarging it with a reamer. The slot shaped hole for switch S2 can be formed by scribining the outline on the case with the help of a T-square. Then drill several smaller holes within the outline, and enlarge and shape them into the required rectangle with the help of a file. The cut-out for S01 is made in a similar fashion.

After all the mechanical work has been completed on the case, it's prepared for painting by scrubbing it down with a scouring pad or a household cleaner to remove any grease or oil on the case. Several light coats of spray paint can then be applied to the case.

Depending on the type of suction cups you get, you will either have glue, or screw them onto the chassis bottom. The author obtained the suction cups used on his unit from a suction cup type paper clip, bought in a local stationery store. Some of these clips are provided with screw mounts, in which case simply use the appropriate hardware to mount them. Others, however, are attached with rivets, as were the authors. In which case first remove the rivet and clean the back with alcohol to remove any traces of grease. The suction cups are then mounted using epoxy cement. Make sure to first remove any paint from the bonding surface.

Jack J1 for the external speaker is mounted on a 3/8-inch by 1-inch piece of bakelite so as to insulate it from the metal case and ground. The jack itself is mounted in a hole drilled in the center of the strip. The jack and strip are then mounted in the hole pro-
vided for it in the side of the case using epoxy or some other suitable cement. Again, take care that the jack is centered in the hole in the case, and that it does not touch the sides of the hole at any point. Now mount the two battery clips using 4-40 hardware. STANDBY-OFF switch S1 is mounted in its proper position on the front panel.

Locate and fix the Amplifier and Siren modules in position using epoxy cement. The proper position for the modules can be seen from the photos.

**Electrical Construction.** While the epoxy mounting the circuit modules is curing, attach leads to the terminal of AMPLIFIER-SIREN switch S2, following the inset drawing with the schematic. Attempting to wire the switch once it's been mounted can be a difficult job, so attach and solder the leads first. Just leave the leads long enough to make connections to the terminal strip.

To make certain the switch is wired correctly, hold the switch so that the terminals face you. The mounting holes should be on top. Switch section A will then be on your left, section B on your right. Terminals 1-6 are numbered consecutively from top of each section downward.

Mount and wire microphone socket SO1. Continue to wire the remainder of the unit according to the schematic diagram. Terminate the end of the speaker lead in an RCA plug and recheck the wiring when you're finished to detect any possible errors.

If you plan on using a microphone other than the one specified in the parts list, you may have to rewire or change microphone socket SO1. If the microphone you plan on using does not have a push-to-operate feature, ground terminal B on the amplifier module. Connect terminal D to the hot lead from the microphone. The shield lead on the microphone connects to ground.

**Testing the Unit.** After you've assured yourself that the unit is wired correctly, install the four C cells in the battery holders. A spot of paint can be used to denote the positive terminal in each section of the battery clip, and prevent possible damage to the modules due to an incorrect battery polarity installation.

Plug the speaker plug, P1, into J1, and the microphone into SO1. Set switch S1 to the STANDBY position. Flip switch S2 into the up position—the loudhailer AMPLIFIER position. Depress the push-to-operate switch.
The drawings above provide exact locations for cutting the chassis to receive J1, S2, S1, and S01. Side view of the chassis, at the right, shows contact strips of the lever switch. The wires going out of the picture connect to jack J1 mounted on chassis cover.

S3 in the handset and give the 'ol Testing . . . 1, 2, 3 . . . ; you should come through loud and clear.

Next press switch S2 downward to the SIREN position and hold it there. After about two seconds, the siren will start to wail upward in pitch and the neighbors will know you've successfully completed your loudhailer.

If the unit does not perform properly, turn the unit off and recheck your wiring against the schematic.

Installation and Operation. The unit can be mounted where it will be most convenient for you skippers to use. You can keep it in the cockpit or—if you're one of the big fellows—haul it topside to the flying bridge to have it right at hand.

Before mounting, coat the suction cups with silicon grease or petroleum jelly. This serves a dual function: first, it protects the rubber from attack by salt water spray, and second, it improves the rigidity of the mount to the deck.

The microphone hang-up bracket can either be mounted with brass wood screws, or brass machine screws and nuts, according to your needs.

In normal use, set switch S-1 to STANDBY, and forget it. It's meant to prevent accidental operation while the units being transported. No current drain on the batteries is possible with it in the STANDBY position as long as switch S2 remains in the center off position.

For use as a loudhailer, set switch S2 to the AMPLIFIER position—the switch will lock in this position. Depressing the push to talk switch, S3, in the handset, applies power to the amplifier module. Speak directly into the microphone in a slow distinct, slightly louder than normal voice for the most effective results.

To use the siren, press switch S2 down, and hold it there as long as you want the siren to sound. The switch is under spring tension to return to the center off position. By keeping the siren in short bursts, you'll get a sound not unlike that used by emergency vehicles.

Now, you're ready to leave the dock or mooring with a little added convenience and safety on board. Next time you're out water skiing, fishing, or just lazily cruisin' around, you'll be able to get across a routine or May-day message loud and clear.
"It is unworthy of excellent men to lose hours like slaves in the labor of calculation."

Thus wrote Baron Gottfried von Leibniz, a seventeenth-century philosopher and mathematician, and so irritated was he with the drudgery of computation he set out to invent a machine that would do the job for him. Although von Leibniz failed, the effort symbolizes the persistent dream of a mechanical servant, obedient and infallible, to handle the menial tasks usurping time man could otherwise devote to creativity.

It's taken the science of electronics—the branch of physics that deals with the emission, behavior and effects of electrons—to bring the dream its closest to fulfillment. By harnessing the electron, science has vaulted the gap between the mere mechanical counter (examples: the abacus, the adding machine) and the true computer which can perform in seconds calculations that could take platoons of mathematicians months or years to complete.

**An Extinct Monster.** Twenty years ago there was only one electronic computer in existence—a 30-ton laboratory curiosity that occupied 1,550 square feet of floor space at the University of Pennsylvania and used 18,000 vacuum tubes as circuits and switches. Today, there are nearly 23,000 computers at work in the U.S. in the background of virtually every area of human activity, from
bookkeeping to interplanetary exploration. Specialists are directing computers to do such jobs as deciphering the Dead Sea Scrolls, landing jet aircraft without human help, and "talking" on the New York Stock Exchange; in performance, some operate at speeds measured in billionths of a second and add, say, two five-digit numbers 2½ million times in a second.

What made the difference? How could the once-massive electronic computer be brought to the practical dimensions required if it was to assume an unprecedented role in everyday business, industry and science?

Answer: miniaturization of electronic circuitry, in which the newest development is a technology called microelectronics. Although the techniques vary, one such method utilizes the ancient art of screen printing to produce circuit patterns with precious metal "ink" compositions developed by Du Pont and to which are attached tiny transistors and diodes no larger than the period at the end of this sentence.

As a result, microelectronics is literally shrinking the computer's components and is setting a course that should see the electronics industry's dollar volume topping $20 billion by 1970.

As might be expected, microelectronics has given birth to a "new generation" of computers (the first generation was powered by vacuum tubes; the second by transistors which allow electric impulses to travel through solid material instead of a vacuum) introduced last year by International Business Machines Corporation. Called System/360, these new computers are made in a small-to-large range of sizes (the processing power of the largest is 50 times greater than that of the smallest), can store billions of bits of information, and provide a "whole new family of computers that may ultimately replace all of IBM's present lines."

**New Family of Computers.** Says one industry observer: "It's as if someone were to present the transportation industry with a motor that costs a tenth as much, runs 10 times as long between overhauls with one-tenth the fuel consumption, weighs 5 pounds instead of 500 pounds, requires little labor to produce, and still develops 300 horsepower."

How does System/360 differ from its predecessors? Explains an IBM representative: "All told, System/360, in single system, spans the performance range of virtually all current IBM computers and has a capacity more than twice that of our most powerful earlier models. It achieves extremely high speeds largely because its microminiature circuits permit electric impulses to travel shorter distances; thus, the system's machine cycle time—the basic pulsebeat of a computer—ranges from one millionth to 200 billionths of a second."

You are the key witness in this case; the "culprits" are the scientists and engineers who "did away with" tubes and transistors with their new weapon—microelectronics.
Shrinking Computer

The components are positioned on the substrate, above, to form a complete microcircuit for the Solid Logic Technology module.

Above right, the circuit patterns for IBM's half-inch-square ceramic substrates are automatically printed using DuPont's precious metal Resistor and Conductor Compositions.

At the right, the metal evaporates inside Burrough's vacuum chamber and a thin coat of metal is thus deposited on the wafer's surface.

How does the system work? "Solid Logic Technology," says Yvan Cormier, manager of substrate screening at IBM's East Fishkill, N.Y., manufacturing facility. SLT is IBM's descriptive phrase for the half-inch-square ceramic modules (called "logic circuits") which contain screen-printed circuit paths that direct electric impulses much as a pipe organ produces music by directing air to various pipes. Mounted on the ceramic squares (substrates) are the period-size transistors and diodes ("solid" semiconductor devices) that perform such functions as the switching and amplifying necessary if logic algebra is to be worked electronically.

A Technological Crop. Making the miniature SLT transistors and diodes is a meticulous process that begins with the "growing" of silicon crystals, i.e., lowering a seed crystal into molten silicon, then slowly pulling it out to form a 1½-inch-wide, 12-inch-long crystal. The crystals, when fully "grown," are then sliced into half-dollar-size wafers about twice the thickness of a human hair. Photographic and etching techniques are used to form 1,100 transistors or diodes on a single wafer. Each wafer is given a protective, 60-millionths-of-an-inch-thick film of glass, then is diced with a precision cutting tool into the individual completed device.

The finished transistors and diodes are then mounted on the ceramic substrates. Feeding each such device the amount of signal and power it requires for its job is a network of conductors and resistors (passive devices) which has been imprinted on the substrate. "As their names imply, conductors simply carry the current while resistors set the current level," says Cormier. "So by carefully selecting and screening conductor and resistor materials, we can reliably build the required logic circuits."

Circuit Printing Presses. Unlike earlier computer circuits, whose general image was one of myriad wires, IBM's logic circuits are relative marvels of simplicity. Reason: "Wires" (conductors) and resistors are now screen printed on the ceramic substrate. The printing process is performed in IBM's fully mechanized production line via screen-print-
ing machines in a matter of seconds.

The "ink" IBM uses for its conductor circuits is Du Pont's Conductor Composition, a dispersion of precious metals and glass in an organic material. For its resistors, the firm uses Du Pont's Resistor Composition, a specially treated mixture of noble metal powders and glass which has been dispersed in an organic solution.

But screen-printed circuits aren't new to electronics. Explains Wayne Pearson, manager of ceramic products for Du Pont's Electrochemicals Dept.: "For more than 25 years, Du Pont has taken an active part in developing and improving Conductor Compositions for a wide variety of applications in the electronic components industry, and in 1960 introduced a series of Resistor Compositions for application by the screen-printing process—a relatively simple process.

"For example, some other methods for making microminiature circuits, such as silicon monolithic or vapor-deposited thin film techniques, provide reliable circuits but require elaborate, complicated equipment such as photo-etching devices or sputtering and evaporating machines that operate in a high vacuum. The cost of such machinery itself is high; furthermore, it's expensive to operate, for the procedure is a slow and meticulous one. Screen printing, on the other hand, calls for relatively elementary equipment, the most elaborate of which is a continuous belt furnace that fires the composition onto the substrate."

**Short or Long Runs.** Another advantage is that circuit designs can easily be changed by merely changing the screen on the printing machines. "There's virtually no limit to the configurations that can be printed on a circuit module," says Pearson. "And, because the screens are easily changed, the method is economical for either short or long production runs."

The result: rugged, reliable and high-quality printed circuits that have high power stability and are relatively insensitive to moisture and abrasion.

Other computer manufacturers also screen print microelectronic circuits for their new
Shrinking Computer

At the right is the fine stainless steel screen which is used to print the conductor patterns.

The "Nixie" tubes, shown below, test performance of the circuits when they are completed.

Pile of silicon wafers glow in Burrough's furnace, bottom right, during diffusion process.

high-speed machines. But the technique is not limited to computer applications; such components are finding wide use today in all forms of electronics equipment.

Burroughs Corporation, for instance, uses the screen-printing technique at its Electronics Components Division, Plainfield, N.J., to make an inexpensive line of microcircuit products which it sells to electronics systems manufacturers.

Screen printing at Burroughs is a two-step process similar to applying colored bands on a dinner plate. First, Du Pont's Conductor Composition is squeezed through a 200-mesh stainless steel screen onto a ceramic substrate; the module is then fired in a continuous belt furnace at temperatures as high as 1900°F. The procedure is repeated for printing the resistors, which are fired at about 1400°F.

After firing, the module is dipped in a solder bath so as to provide leads and pads for attaching transistors and diodes. Last, the circuit is given an organic coating and baked to form a hard protective shell over the circuit.

Microelectronics at Work. Burrough's postage-stamp-size components are used in industry in a multitude of electronic applications, including counting, decoding and latching devices. One principal user is Burroughs' own "Nixie" tube, a display device used for such things as numerical readout in digital instrumentation and the displaying of stock quotations in a broker's office.

"In another application, we make screen-printed circuits for miniature binary decoders with memories used with 'Nixie' tubes," says Ivar Larsson, Burroughs' manager of microcircuit development department. "The module is one of the smallest electronic display devices with a memory in existence and is designed for aerospace applications where space is at a premium.

Burroughs, like other firms in the components manufacturing field, has found that microelectronics creates some rather startling changes in the industry. Explains Larsson: "Circuit designers were once limited by the integrated circuit manufacturer's capabilities; thus, electronic firms had to design their circuits around the devices that were available. Today, however, thanks to screen printing and other techniques, such limitations are reduced and designers can retain the freedom they enjoyed with discrete components. That, in effect, is the reason for the popularity of hybrid circuits.

"Microelectronics is said to be today's most expanding technology," Larsson adds with a grin. "But, in the process, it's shrinking the size of everything it encompasses."
How about digging up that discarded children's phonograph and setting it spinning again? But do more than just getting it to crank over: convert it to a stereophonic phonograph or—as it's more popularly known—a stereo compact!

All it takes is two transistor amplifier circuit boards, a stereo cartridge, an inexpensive power supply, and a second speaker. Just put 'em all together.

A New Twist. It makes no difference that the original one-tube amplifier in the old phono is on the bum, because you'll be replacing it with two circuit boards. Each amplifier circuit board uses 4 transistors and delivers a push-pull output of 1 watt. The complete board is readily available (see parts list) and need only be mounted and wired into the phonograph.

The amplifiers are designed to work into 8-ohm speakers, but they'll push the 3.2-ohm speakers usually found in the small phono with practically no noticeable difference.

The speaker cone on the unit shown here was damaged so two new 4 x 6-inch oval 8-ohm speakers were used.

In and Out. A glance at the schematic diagram shows the stereo cartridge pickup which passes the signal to the left and right channel balance controls through a scratch filter. Switch S1 switches the scratch network in and out. Controls R2 and R4 are 25,000-ohm balance adjustments for the right and left channels, respectively.

The 12-volt power supply is transformer operated and uses a filament step-down transformer, T1. The 6.3 vac output of the transformer is boosted in a unique voltage doubler circuit. (Refer to the schematic diagram.) Voltage doubler capacitor C3 and CR1 and CR2 form a voltage doubling network. Actually, the output voltage from the positive side of CR1 is 14 volts DC. A filtering network of R6, C4 and C5 takes out the AC ripple from the power supply. You will note that resistor R6 is a very low value.
Also, capacitors $C_4$ and $C_5$ are very high in capacity. With the two transistor amplifiers pulling 8 milliamperes of current, $R_6$ can only drop the output voltage 2 volts. No 60-cycle hum is heard with a high capacity filter network. A 2200-ohm resistor, $R_7$, is a stabilizing resistor and helps lower the B+ voltage to 12 volts.

**Mono to Stereo.** Start by removing the old one-tube amplifier from the turntable mounting board. Take off the amplifier and volume control. Remove the old crystal cartridge from the pickup arm. Cut the AC phono-motor wires going to the small amplifier. If this phono motor operates directly from the AC line, without being in series with the amplifier tube, the additional voltage dropping resistor, $R_5$, shown in our schematic will not be needed. (See the drawing of the phono motor hookup.) Most phono motors that are in series with the filament of the amplifier tube are 85 or 90-volt AC motors. Simply use a 100-ohm 50-watt resistor in series with the motor if this happens to be your case.

Cut a piece of aluminum to use as a chassis for the transformer. Drill and prepare the power supply chassis to mount on one end of the transistor amplifier. Mount the chassis on the end where the speaker lead is run out of the turntable board at the rear and is coiled around the fabricated brackets. The original tube amplifier, above, is removed from phono and replaced with amp board, left.

As shown, above left, the original phono speaker is mounted in the enclosure (note perforations). The second speaker is mounted in the cover of the phonograph. In selecting the speaker, make sure it clears turntable and arm when the cover is closed. The speaker lead is run out of the turntable board at the rear and is coiled around the fabricated brackets. The original tube amplifier, above, is removed from phono and replaced with amp board, left.

### PARTS LIST

<table>
<thead>
<tr>
<th>Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_1$, $C_2$</td>
<td>150-mmf fixed capacitors</td>
</tr>
<tr>
<td>$C_3$</td>
<td>100-mfd, 15 WVDC electrolytic capacitor</td>
</tr>
<tr>
<td>$C_4$, $C_5$</td>
<td>1000-mfd, 15 WVDC electrolytic capacitors</td>
</tr>
<tr>
<td>$CR_1$, $CR_2$</td>
<td>Silicon diode rectifiers, 750 mil 400 PIV (Lafayette Radio 19R3002 or equiv.)</td>
</tr>
<tr>
<td>$I_1$</td>
<td>Neon indicator lamp assembly (Leecraft &quot;Snaplite&quot; or equiv.)</td>
</tr>
<tr>
<td>$R_1$, $R_3$</td>
<td>10,000-ohm, 1/2-watt fixed resistors</td>
</tr>
<tr>
<td>$R_2$, $R_4$</td>
<td>25,000-ohm volume controls (with s.p.s.t. switch $S_2$ on $R_4$)</td>
</tr>
<tr>
<td>$R_5$</td>
<td>100-ohm, 50-watt fixed power resistor</td>
</tr>
<tr>
<td>$R_6$</td>
<td>47-ohm, 1/2-watt fixed resistor</td>
</tr>
<tr>
<td>$R_7$</td>
<td>2200-ohm, 1/2-watt fixed resistor</td>
</tr>
<tr>
<td>$S_1$</td>
<td>D.p.s.t. toggle switch</td>
</tr>
<tr>
<td>$S_2$</td>
<td>5.p.s.t. switch (on $R_4$)</td>
</tr>
<tr>
<td>$T_1$</td>
<td>Filament transformer (Stancor P4134 or equiv.)</td>
</tr>
<tr>
<td>2</td>
<td>1-watt, solid-state, push-pull, transistor audio amplifier circuit boards (Lafayette 99R9038)</td>
</tr>
<tr>
<td>1</td>
<td>Stereo/monaural crystal cartridge (Sonotone 12-TH-5577 or equiv.)</td>
</tr>
<tr>
<td>1</td>
<td>4-inch PM speaker (or size to match present speaker)</td>
</tr>
<tr>
<td>Misc.</td>
<td>Aluminum mounting angles, terminal strips, hardware, hookup wire, panel marking, speaker grille, solder, etc.</td>
</tr>
</tbody>
</table>

Estimated cost: $22.00
Estimated construction time: 4 hours
Nearly completed conversion of the phonograph is shown from the underside. Amplifier circuit boards are piggy-backed and the power supply components are attached to one of the boards on their own subchassis. There is generally more than enough room under the average phonograph to easily mount all the components. Note the placement of R5 and the perforations in the turntable board. The resistor becomes quite hot so be sure to position it away from wiring and components and provide vent holes above it.

Detail drawing, right, indicates how phonograph is converted to supply 12 volts DC to the amplifier circuit boards and the AC voltage to the phono motor. Schematic diagram, below, shows connections from transformer to rectifier and filter network. Leads from the boards are color coded.
transformer is located. You will then keep all AC components away from the crystal input, eliminating possible hum pickup.

A ¾-inch hole is drilled near the power transformer mounting for a rubber grommet. The 6.3 VAC leads go through this opening. The power transformer is a Stancor R6134, although any 6.3 VAC filament transformer will do. After the power transformer is mounted, wire the other smaller components into place as the soldering process goes on. Keep the small components as close together as possible. Use a 4-lug soldering terminal strip to hold these small parts in place. Tape up the yellow center-tapped unused voltage lead.

After the power supply wiring is completed check the output voltage. You will note that when there is no load on the power supply, the DC voltage is quite high. Now bolt the power supply chassis to the perforated transistor amplifier board. Use short bolts to hold the unit, as they will be pulled out later for long spacer bolts.

Now cut four plastic or metal spacers ¾-inch in length. Small copper tubing or small aluminum TV antenna bars will make good solid spacers. Cut and bend two small L-brackets to secure the amplifier boards to the turntable board.

**Wiring the Amplifiers.** Bolt the two transistor amplifiers together with spacers between. Use long bolts and cut off any protruding ends. Attach the small L-brackets to the amplifier boards.

Run the red leads from each amplifier to the B+ connection of the power supply. Solder the black leads to the negative terminal. Cut off the yellow leads and solder them together. These two yellow leads were the wire terminals for an on-off switch. We are switching the unit on and off at the primary of the power transformer.

Plug the AC transformer leads into the AC outlet and check the voltage on the power supply. This voltage should be close to 12 volts. You will notice a hum when the blue leads are touched on the amplifier. Be careful when working around the transistor boards that no parts are disturbed and shorted.

Bolt the amplifier units to the turntable board. This amplifier section should be no bigger than the old one-tube job. If the compartment under the turntable is too small, the transistor amplifiers can be mounted flat against the sides. If the small PM speaker is going to be replaced for a larger one, drill out and pull off before the amplifiers are mounted.

Run another flexible phono wire up through the arm to the stereo cartridge. Mount the small turnover cartridge in place of the old one. If there happen to be lead weights glued on the plastic arm, remove them. Solder the small cartridge connectors to each wire. Cut a flexible piece of wire one inch long and solder the small tip on one end and the other end to the black or ground lead. Slip the four tips over the small cartridge male prongs. A key to left, right, and ground connections will be given with the cartridge you purchase.

Bring the cartridge leads down through the arm to the scratch-filter switch S1. Wire up each balance control.

**Left Channel Speaker.** Cut off 8 feet of regular flat rubber AC cord and solder to the left channel amplifier speaker leads.

Prepare your stereo compact for a left channel speaker by removing the hinge pins from the phonograph cover. Cut off one half of the hinge and solder the pin to the top end. Now the top lid will slip right into the stationary hinge on the bottom unit. Take a circle cutter and cut two holes for the speaker opening. Drill the four speaker holes and four holes for a metal or plastic grille.

Solder the two wires to the speaker and bolt into place. Use a plastic strip to secure the cord to the cover and keep it from pulling out of the speaker terminals. Fasten the grille in place and on the back side, at the bottom, mount two cord brackets. The speaker cord can be wrapped around them before closing the top lid.

**Final Assembly.** Hookup the phono motor as shown in the photograph. This motor happens to be a 90-volt unit and a 50-watt resistor is wired in series. Position the resistor so its heat is dissipated through the perforations in the turntable board. Tie a knot in the AC power cord so it cannot be pulled out and solder the leads to the terminal tie point.

Drill a hole for the neon indicator, I1, in the front of the turntable board, so it can be seen. The hole should be snug to keep the unit in place. Solder the leads of I1 to the primary of the power transformer. Mount the balance controls on the turntable board and complete wiring.

**Check Out.** Turning on the left channel volume control. Rub your finger lightly over the crystal cartridge. Now turn the left chan-(Continued on page 92)
In cold weather, an automobile is more difficult to start. This harder starting is caused by a combination of two conditions: the amp-hour capacity of the battery is a function of the temperature (the lower the temperature the lower the amp-hour capacity), and the thickened crankcase oil and grease put a heavy load on the starter. This causes a heavy current drain from the car battery. Since the initial current drain is about 500-amps for a 6-volt system and 300-amps for a 12-volt system, the battery voltage is greatly reduced in cold weather. This reduced voltage often supplies insufficient spark to the ignition system.

Separate Ignition Supply. The simple yet effective circuit described here automatically connects a separate battery to the ignition system when the car is started. Your auto battery turns the starter and the auxiliary battery supplies the ignition spark. As soon as the motor is running, the circuit automatically disconnects the auxiliary ignition battery and reconnects the car battery. Circuits to do this have been described before. Most of them have four shortcomings: high cost, complexity, manual on-off switch, and adaptability only to certain polarity and/or voltage systems. This circuit is adaptable to either grounded-positive or grounded-negative, 6-volt or 12-volt systems. It can be constructed, exclusive of the auxiliary battery, for under $10.00. Often the parts can be salvaged from the junk box. No switch is required and only two components are used.

Operation. The schematic diagram shows the circuit and the connections for installation in a car. As the starter-motor is actuated by the car starting relay a voltage appears at the starter-motor terminal. This voltage, applied to bulb I1 and relay coil, which are connected in series, energizes relay K1. The car battery is then disconnected from, and the auxiliary battery B1 is connected to, the ignition system. The starter-motor is, of course, disengaged once the engine starts. The voltage is removed from the starter-motor terminal and relay K1 reverts to its normally de-energized position, thus disconnecting the auxiliary battery and reconnecting the car battery.

An AC relay is used for K1. It is necessary to have a relay which will operate at reduced car battery voltage. A sensitive low-voltage DC relay would be delicate, costly, and unreliable due to car vibration. An AC relay

### COLD WEATHER
### CAR STARTER

*By Richard C. Peterson*

February-March, 1966
will operate satisfactorily at much lower DC voltage. Although the indicated relay was used in the original circuit, any relay with approximately the same characteristics may be used. The particular relay used had a 5-ohm, 6.3-volts AC, .3 ampere coil. It had DC pull-in characteristics of 1.5-volts and 1/4-amp.

A bulb, I1, is used for current limiting, rather than a resistor, in order to utilize two unique characteristics of incandescent bulbs: non-linear resistance and constant-current control. At low car battery voltage, the cold bulb has low resistance and allows the relay to operate. At high car battery voltages, the resistance of the hot bulb is several times higher and is used to limit the relay coil current to a safe value. When used with the indicated bulbs the circuit has pull-in characteristics of 2-volts on a 6-volt system, and 4-volts on a 12-volt system. The relay coil's AWG 28 wire is adequate for the maximum bulb current of .6 amperes.

Simple Construction. The small size and simplicity of the starting aid unit did not warrant the use of a commercial chassis. A chassis was fabricated from scrap aluminum (Continued on page 85)
Light-powered this unique transistor-tester is completely isolated from the power line—never needs batteries and eliminates expensive power-supply components.

If you've always wanted a transistor checker that's free from all the disadvantages of the conventional types, this photoelectric model is for you. There is no problem of periodic battery replenishing and constant resetting of the meter as cell power runs down, as was a battery operated transistor checker; there is no need for an expensive separate power supply as with power-line type transistor checkers; there is only the need for two inexpensive little photocells.

The Circuit. The checker circuit consists simply of two small photoelectric cells, PC1 and PC2, connected to a d.p.d.t. toggle switch, S1, to provide base power and collector power to either a pnp or npn transistor under test. A 0-1ma milliammeter, M1, in the collector circuit, indicates transistor condition.
Light shining through chassis apertures from an outside light source energizes the photocells sufficiently to provide enough energy to give transistors a quick check. The only circuit component that might fail is the light bulb which is replaced easily enough. Otherwise, once the tester is set there should be no need for further adjustment.

**Catching the Light.** Since the number of parts is few, they can be packaged in a comparatively small chassis box. The box shown was fabricated with wood scrap, but a commercial enclosure can be used (See Parts List). The transistor sockets should be easily accessible and a slanted front is desirable for ease in reading meter M1. Perhaps the only critical part of construction will be the location of the photocells. They should be placed so they receive the light directly from the light source through the chassis apertures. The amount of light falling on the faces of the photocells can be controlled by any type of home-brew shutter. Shown here are two strips of aluminum attached to the chassis by their one end so they can be moved to open or close the apertures completely. Photocell PC1 needs very little light to generate the required current; therefore its aperture can be made comparatively smaller than that for PC2 which must deliver slightly more than one milliampere.

As far as the selection of photocells is concerned, you can use any type on hand, or you can order two from any of the electronic mail-order houses. The two used in the unit shown here were salvaged from a broken silicon cell by carefully soldering the leads to the top and bottom of each, being careful not to short the edges.

The outside light source may be any type light bulb that produces a response of at least 1 milliampere of current in the photocell. The bulb can be energized directly from the power line as in the schematic diagram (using a GE 7½-watt bulb, for example). Or, it can be operated from a filament transformer. Almost any output transformer with a sufficiently high primary resistance connected to a 115-volt AC line will deliver...
A good desk lamp can be a replacement for I1. It may be necessary to recalibrate the tester every time it is set up since the distance from the lamp to PC1 and PC2 will not be exactly the same each time. Variations in line voltage will also change the light output and the voltage output from PC1 and PC 2 will be different.

**Parts List**

I1—Light source for PC1, PC2 (115vac, 7 ½-watt incandescent lamp or equiv.) (See text.)
M1—0-1 DC milliammeter (Lafayette Radio 99G5052)
PC1, PC2—Cadmium photocells (Lafayette 99G6315) (See text)

Short-lead transistors with triangular basing may not fit into inline transistor sockets. Enough power to light a conventional pilot light. Check the output voltage and use a bulb with the closest voltage rating. Note that the bulb can be operated at a reduced voltage.

**Calibration.** To adjust the transistor checker, first light the bulb you've selected as an outside light source. Short the emitter to the collector with a wire fine enough to fit into either socket, and make sure that both light apertures are closed. Then slowly move your shutter, opening aperture PC2. The milliammeter should move. Open the aperture until M1 reads full scale. If you can't get a full scale reading, move the light source closer to the aperture. Remove the shorting wire from the transistor socket.

Select a transistor that you know is good—one with a high beta—and insert it into the proper socket. Slowly open the shutter covering the aperture of PC1 until you get a reading somewhere in the middle of the milliammeter scale—about .5 to .6 ma. If the transistor you're using is known to be good, this setting will suffice for general testing; but if you have a transistor with a known beta, you can make a more accurate setting by adjusting the aperture of PC1 until you read the proper beta value on the scale.

Once the checker is set, it should require only very little attention thereafter.

**Eliminating Variables.** One observation you should make is the nature of the ambient lighting where you use the checker. If variations in its level will upset the balance of your initial calibration, you might enclose the outside light source, I1, and the apertures completely, leaving only a means of actuating the shutters.

With the checker complete, you only need some questionable transistors. Insert them in the proper socket and note the first reading which is the leakage. Now flick switch S1 and meter M1 will indicate the condition of the transistor.

The circuit shown here does not include a switch for the outside light source, I1, since, for occasional use, it is easy enough to just plug the line cord into the nearest socket.
Millions of dollars are tagged for putting a man on the moon but the first intelligent creature to reach our lunar satellite may well be a chimpanzee. Just as a chimp named Ham preceded Alan Shepard's space ride back in 1961, so will one or more astromonks blaze the way for man's exploration of the moon.

Some 83 chimps are now being trained for the job at Holloman Air Force Base in New Mexico. Researchers at the base's Bioastronautics Research Laboratory expect to obtain clues to human reactions during extended space flights. Some chimps will ride orbital rockets, others will journey aboard a space platform to be established as a way-station between earth and moon. A few should get to circle the moon itself.

In space the monkeys will perform the same tasks they're learning here on earth. Information telemetered back to earth will provide scientists with data on their reactions during flight. George Meeter, a program director at Holloman, says that four or five chimps now at the center will probably go into orbit during the lunar exploration program. "They may be sent out alone, or even teamed up with an astronaut," Meeter said. "And sometime in the next decade, one or more of them may land on the moon—providing that there's a way to get them back. We aren't in favor of tossing intelligent animals into space and leaving them there," Meeter added. "If a method is found to put a rocket on the moon and retrieve it automatically, the passenger will probably be a Holloman chimp. For initial flights, such as the space platform and automatic circuits around the moon, our chimps will almost certainly be the first passengers."

Meanwhile, back at the lab the chimps are pampered in keeping with their status and purchase price. Cost has recently skyrocketed to $1,000 each since surgeons also use them in some kinds of transplant operations. These chimps, too, are better-educated than their earlier mates in the space program. They can operate more complicated devices and are trained to count up to eight, as against Ham's three.

Only young chimps between the ages of four and five will see outer space. The older ones will be retired to an earth-bound existence in zoos around the country. So the next time you visit the monkey house, don't do a double-take if you see some ape running through a countdown. He's just reminiscing.
Caged monk waits turn in million-dollar test lab at Holloman while comrade in photo below him sits out high-altitude chamber. This simulates thin air of upper atmosphere. Below, closed-circuit TV camera keep watch on chimp. Wires on body pick up pulse, pressure, etc.

Masked monk at left wears oxygen gear to check out rigors of space flight. Above, chimp is ready for long trip from Holloman to Cape Kennedy—not through space, but in secure steel crate.
Alligator clips are the handiest items on the electronic hobbyist’s work bench. Though mostly for making temporary electrical connections, these versatile little clips are also fine for just about every third-hand job; from holding open a magazine at a selected page, to serving as a heat sink while soldering delicate diodes and transistors. The accompanying photos illustrate several ways—some old, some new—that clips can make tinkering easier.

Hooking up that extra pair of headphones for a visitor to the radio shack is done quickly this way. Unscrew the insulating cap from the regular phone plug and add the second pair of phones in parallel using a pair of clips. It’s handy for an amateur field day or other contest when an assistant monitors to hear information for the log book. This method may also be used for quickly connecting your receiver to a tape recorder when you want to make an off-the-air recording.

Above; temporary connections of trial components when, say, trying various values of resistors in an experimental circuit, can be quickly made with alligator clips. Once the right component for the job is selected, it’s soldered in permanently. Remove circuit power while using clips.

Another way to hold a component in place while soldering is to attach it to an alligator clip which, in turn, is suspended from the bench lamp by another clip and piece of wire. The suspending wire can be maneuvered around to hold the component at various points on the work bench surface.
An alligator clip by itself makes a handy heat sink for use when soldering delicate diodes and transistors which are easily damaged by too much heat. Hook the clip to the lead between the diode body and the connection to be soldered, as shown. After soldering the connection, leave clip in place until the joint cools.

At right; special clips seen at bottom of photo have sockets that can be plugged on to standard test probes, pin or banana plugs. They can save much time by making a temporary, but solid connection with a test lead in a way that doesn't require holding by hand.

The "coil" shown above is a useful accessory for the ham or CB mobile operator. It forms a coupling link between a grid-dip meter and the whip antenna. To use it, disconnect the coax feed line from the base of the mobile antenna and attach this gadget. One clip goes to the base of the antenna and the other to a good ground on the car body. Move the grid-dip meter near this coil and operate the meter to find the antenna's resonant frequency.

A pair of alligator clips attached to a lamp cord with a wall plug at the other end provides a temporary hookup to house current for a component under test. (Shown here is a surplus transformer.) Be sure to put insulating sleeves over the clips to prevent short circuits.

Several sets of patch cords like these are good for making temporary connections while checking newly constructed or modified equipment. A few feet of lamp cord, with an alligator clip soldered to each end of each wire is all that's necessary. A spot of paint can be added for color-coding so you can match up the correct clips at either end.

February-March, 1966
The new has been added to the old in this novel desk stand mike for the ham shack or tape recordist. As shown in the photo, a desk stand telephone of yesteryear has had its old carbon transmitter replaced with a brand new crystal mike cartridge. If you don’t have one of these old telephones around, they are still available at some second hand stores, antique dealers, auctions, or from the firms listed in the footnote below.

The face-plate and mouthpiece are removed from the transmitter housing by removing four small screws. Disconnect the two wire leads which go to the carbon element, and then remove the carbon element from the back of the face-plate. The old wire leads can either be clipped off or pulled down into the phone stand. The new crystal mike cartridge is mounted in a sponge rubber ring, as shown, but first connect a mike cable to the microphone cartridge and pass the cable down through the stand. Use rubber cement or Goodyear Pliobond to hold the microphone cartridge in the sponge rubber ring and the ring in the transmitter housing.

If desired, you can wire the receiver hook switch so that the mike is switched on when the receiver is lifted off the hook. You can even use the receiver as a low-impedance earphone for radio use.

Write to the following companies to obtain literature on what’s available and prices: Lewins Antique Telephones, 5215 W. 77th Terr., Prairie Village, Kansas 66208; Telephone Company, Turtle Lake, Wisconsin; Continental Telephone Supply Co., 49 W. 46th St., New York 36, N. Y.; Telephone Engineering Co., Lincoln Bldg., Simpson, Pennsylvania; Telephone Repair & Supply Co., 1760 Lunt Ave., Rogers Park Station, Chicago 26, Ill.; Delta Electronics, Box 2262, Dallas 21, Texas.
A plug-in black box can save fuses and the steps wasted in replacing them

GO BETWEEN CIRCUIT BREAKER

By James A. Fred

How many times have you been embarrassed by a fuse blowing out and plunging your house into darkness when you plugged a newly repaired electrical appliance into a wall outlet? Or perhaps you were showing your latest electronic creation to your wife and the wires crossed and blew a fuse. This has happened to me and I know that it has happened to most of you experimenters. I have often thought of making some kind of a circuit breaker box to use between the suspected appliance or circuit and the wall outlet. The availability of circuit breakers in low current ratings for TV sets brought the project to completion.

Current Rating. The most widely used circuit breaker in TV sets have been the Mel-Rain type manufactured in Puerto Rico. This circuit breaker is now available from Mallory in nineteen different current carrying ratings. The highest rating is 4.14 amperes. To go above this value, you can use Wood Electric Corp. Circuit breakers which have ratings from 5 to 20 amperes. The Allied Radio Corp. also stocks the Wood circuit breakers. Both types are quite reasonable in price and give complete protection from short circuits within their current ratings.

After much thought I decided to house all the necessary parts for the circuit breaker in a plastic box with a phenolic cover. This makes a completely insulated unit with no chance for shock. Follow the layout drawings in preparing the box to mount components.

All the needed parts are listed for either the Mallory-Mel-Rain circuit breaker for currents under five amperes or for the Wood circuit breaker for currents from five to twenty amperes. You may build either or both as I did to meet your needs. If you desire you may use the grounded type AC socket and plug. The pilot light II is for convenience only and lights up when circuit breaker CB1 trips or opens up. This will be a useful indication if you aren't nearby when the breaker trips. Be sure and use a wire that will carry the breaker overload current when
HOLE TO FIT CKT BREAKER USED

PARTS LIST

CB1—Circuit breaker of required current carrying capacity: Mallory CB8 series up to 4 amperes; Wood Electric Co. Model 375 from 5 to 20 amps (Order Model 375 from Allied Radio; Cat. No. 33Z438C; specify 5, 7, 10, 15 or 20 amperes.)

I1—Indicator lamp ("Econoglow" type 116, Allied Radio No. 7EE906 or equiv.)
P1—AC plug (Amphenol 61-M1 or equiv.)
R1—47,000-ohm, 1/2-watt resistor
SO1—AC socket (Amphenol 61-F or equiv.)

1—2 1/2" x 4" x 1 3/4" plastic case (Allied Radio 87U895 or equiv.)

Misc.—Plastic cover for case (cut to size from 6" x 3 1/2" cover, Allied 87U887), ring nut and nickel plated washer (Mallory 233 and 225, respectively), hardware, decals, hookup wire, solder, etc.)

Estimated cost: $4.00
Estimated construction time: 1 hour

Inside view of the plastic case and back of cover reveals installation of components.

wiring up the box. The decals add a professional touch to the appearance of the unit.

As you can see from the photograph, the P1 plugs directly into a wall outlet. The device under test is then plugged into breaker box socket SO1. When a short circuit occurs in the Mallory type breaker the circuit opens and the red button pops up. From a distance it would be hard to tell whether or not the red button is out farther than it was. With the red light however there is no doubt when the circuit breaker is open. When the Wood circuit breaker trips, the button pops up and shows white and red making it easier to tell when it is open.

Check It Out. When you have finished the assembly and wiring, test the circuit in the

(Continued on page 120)
It's often amazing how we overlook simple solutions; take for example hi-fi listening with headphones. Here is an ever-expanding market, more headphones are being sold than at any other time—even more than forty years ago when all listening was done with phones; yet we use a $200 powerhouse with a 35 to 100 watt rating to drive headphones which can rattle the eardrum with only one milliwatt of power. And as a reward for not thinking we must worry about fusing the headphones, attenuating the drive level, and how to get around the inevitable hum when using a headset with a high power amplifier. How much simpler, and certainly cheaper, to use a very low power amplifier specifically designed for headphone listening—something like Shure's Model SA-1 Solo-Phone.

**What Is It.** The Solo-Phone is a miniature AC powered solid-state (all transistor) amplifier specifically designed for high-fidelity listening with headphones. Two stereo inputs are provided: an equalized magnetic phono and a high level input for a tuner or tape recorder. Either input source is selected by a switch on the front panel. Two output jacks are provided so that two separate stereo headsets can be plugged in at the same time. The volume level of both channels is adjusted by a dual-concentric control with a friction lock. Once each channel is adjusted for optimum balance rotating either control adjusts the output levels for both channels simultaneously.

A switched AC receptacle is provided on the rear apron for simultaneous power control of the input equipment; tuner, record player or tape machine.

Keep in mind that the Solo-Phone is strictly a headphone amplifier, it is not something which can double at several jobs; it cannot drive a speaker, that is, not for most practical purposes. You will get very

**Frequency-response curve**

for SA-1 reveals boost in bass response around 100 cps to improve performance on headphones. At the high, or treble, end, drop-off in response is negligible to the upper limits of human hearing.

Switch on SA-1 front panel is used to select phono or high-level inputs such as tuner or tape. Knob to right is dual-type control for stereo balance and volume. Although fully transistorized, the SA-1 has self-contained power supply for operating from 117 VAC. Audio output power is 20 milliwatts; more than ample for listening on headphones.
Contrary to headset sound listening to a speaker, however. Since Shure claims that the Solo-phone can be used with headset impedance from 4 ohms up, that’s the way it was checked, with phones of various impedances. True to the claim, the Solo-phone performed well with low or high impedance (crystal) phones. An interesting effect was obtained with budget headphones of the two dollar variety. While we aren’t certain why we got the effect we did, inexpensive phones sounded quite good, so much so that when listening to a communications receiver we preferred driving the phones through the SA-1 rather than through the receiver’s headset jack. Perhaps it was due to the low frequency boost below 100 cps.

Lab Checking. As shown in the graph, the SA-1’s frequency response into an 8-ohm load, there is a slight bass boost or “compensation.” We found the compensation a decided asset as it gave a little more “body” to headset sound—which is generally needed. Contrary to popular opinion, headsets may be flat on the low end when checked with instruments but not necessarily so when checked with your ears.

Distortionwise, the Solo-Phone exceeded Shure’s specs, being .6% THD (total harmonic distortion) at the rated output of 100 mv., rather than the specified “less than 1%” (which implies .99%).

Sensitivity for rated output is 6 mv. for the phono input and 140 mv. for the high level phono input.

Our Views. Though the Solo-Phone is intended for high-fidelity headphone listening some other uses come to mind. It makes an excellent isolation amplifier for monitoring while tape recording; and it is particularly attractive as a headphone amplifier for the hard of hearing (such as when connected to the TV receiver) since when one must use a headset for several hours low distortion, balanced sound is an absolute necessity to avoid ear fatigue.

Another use came to light when the maintenance chief of a local FM station borrowed the test model for a tryout. Now we can’t get it back: he claims, “it’s the best turntable cueing amplifier he’s run across in years.”

We’re similarly impressed; for $45, including the walnut case, the Solo-Phone is about the least expensive way to get true high-fidelity headphone listening. For more information and complete specifications write to Shure Brothers, Inc., Dept. HH, 222 Hartrey Ave., Evanston, Illinois.
By now there isn’t a Ham or CB’er who isn’t an expert on talk power, and that includes you. You know that maximum range is achieved when the transmitter is modulated to 100% as much of the time as possible; and you know that a clipper or compressor is the device which amplifies the low speech volumes to 100% while preventing the loud volumes from exceeding 100%. And we’d be fools to bet against you knowing that while CB transceivers are adjusted for 100% modulation with a so-called average voice level, your voice might need a smidgen or two of extra amplification to really get maximum talk power.

Knowing all the facts there’s now no good reason to put up with anything but the best in modulation, for the Knight-Kit C-577 combines clipping, compression and preamplification in one unit, with both adjustable compression and output level controls.

The Knight-Kit C-577 is a completely self-contained add-on unit; that is, it requires no direct connections or modifications to the transceivers existing wiring, and any CB’er, whether a full fledged technician or an all thumbs fledgling, can add the C-577 compressor to any CB transceiver—whether relay or electronically switched.

What’s Inside. The compressor utilizes three transistors and two diodes to provide both compression and limiting action. At low volume levels only compression is employed. The mike signal feeding through the compressor automatically adjusts the input transistor’s gain so that the loud volumes are held back while the lower volumes are amplified. A front panel compression control allows the unit to be pre-set so that a 10 db increase in input signal level is translated into a 4 db increase in output level; in effect, this is a 6 db boost to the lower volumes. If the signal input is suddenly increased—such as by shouting—the excess signal increase is “trimmed” or clipped by the two diodes (two diodes needed for full wave clipping) so that the compressor’s output level cannot exceed a preset value that’s needed for 100% modulation. Since a modulation “ceiling,” so to speak, is established, once properly adjusted the compressor does not permit over-modulation with its attendant distortion and sideband splatter.

To permit critical adjustment of the compressor the unit is equipped with a compression level meter which indicates, via a red scale section, when you are getting compression. However, in our tests there was moderate compression even when the meter pointer stayed in the white or no compression region. When the voice level was raised or the compression control was adjusted so the meter pointer swung into the red region full compression and mild clipping was obtained. The compressor is normally adjusted by speaking into the mike and adjusting the compression control until the meter rises into one-third of the red region. Note that unlike some other compressors the meter is connected to the compressor circuits, not to the transceiver’s modulator. As we said, there is no need to modify the transceiver’s wiring.

Once the compression level is set to your own voice level the output control is adjusted till the transceiver is modulated to 100% on speech peaks. It’s all a simple pro-

Fully assembled compressor—note rather wide layout. No tight corners to complicate a beginner on his first kit attempt.
Laboratory Check

Procedure with no careful balancing required for optimum performance.

**Build It Yourself.** The kit is not even a one evening project; if you can’t throw it together in an hour or so you’re doing something wrong. All the electronics—actually a handful of components—is assembled on a wide-spaced printed circuit board. And special precautions have been taken to insure that even the newcomer to construction will have no trouble with the kit. For example, the transistors aren’t wired to the board; sockets are used so there’s no chance of damaging the transistors with excess soldering heat. Then, the printed wiring is protected with a special coating except at the soldering points. Even if you crash in with a 150 watt soldering iron there’s virtually no chance you’ll flow solder across two “wires.” (Though you should not use an iron rated higher than 75 watts.) And typical of Knight-Kit the connecting wires are precut to size and ends stripped.

The compressor uses a standard type 2U6 9-volt transistor radio battery which should last from three to six months depending on the service periods.

**Our Comments.** The C-577’s performance is very good, about the best we’ve run across in CB compressors. However, there’s one note of caution. The C-577’s input impedance is in the order of 250,000 ohms. This value will load down a high impedance ceramic (or crystal) mike, resulting in some low frequency attenuation. While the attenuation is not severe, at most making the signal crisp which is the way it should be, if your transceiver already has low frequency attenuation built into the modulator to improve communications quality, combined with the attenuation caused by the compressor’s mike loading the resultant modulation can be shrill, or at best thin. If such is the case simply change to a dynamic mike; not only will it not be affected by the loading but its relatively smooth frequency response will result in a superior modulation quality.

The kit’s $19.95 price (less battery) makes the Knight-Kit C-577 the best buy in Allied’s 1966 catalog. So, if you want to compress or clip your audio check your 1966 Allied Catalog (page 73) or write to Allied Electronics, Dept. JR, 100 N. Western Avenue, Chicago, Illinois 60680.

More than just a diode clipper, the C-577 begins to compress the audio signal at -45 db.
Limited space antennas have been treated so frequently in various magazine articles and handbooks that the patient is practically cured! But what about the limited space shack? Often this problem remains unsolved. The ham forced by circumstances to live in a small apartment, a furnished room, a mobile home or even a house trailer is still, after all, a ham; the yearn for a station of his own is always there but...where to put it?

The relatively recent development of exceedingly compact equipment and particularly that of the transceiver type, has contributed greatly to a compact arrangement for the actual electronic gear, but it still leaves a number of problems to solve. Where do we put a suitable table or desk on which to mount it? Can we concentrate our accessory equipment—key, mike, headphones and such station supplies as call book, log, scratch pad, pencils, handbooks and manuals and copies of at least the current ham magazines?

Or, do we have to scatter such items on obscure shelf space or drawer corners? If so, this all contributes to disorder, disarray, inconvenience and certainly contributes nothing to efficient, effective and pleasant operating conditions.

Necessity Fathers Ingenuity. Not long ago I had this problem presented to me by a newly licensed novice. He was a high school lad living in a three room apartment shared with his parents and a younger sister. Space was really at a premium. He was anxious to get started toward his General Class license and, as it is practically unanimously agreed among the ham fraternity that actual on-the-air operation is the most practical method by which to accomplish this goal, he needed an actively operating ham station.

Jerry had saved a little money earned through summer odd jobs and had acquired a small receiver and transmitter in kit form. These he had assembled and wired on the kitchen table. I had checked them over and...
tested them out; his workmanship had been good and both units performed well. His parents, although sympathetic to his ham ambitions simply could see no place in their limited quarters where he could have an operating table. A card table was offered as a compromise but with the proviso that after each operating session he must disconnect his equipment, stow it away under his bed, fold the card table and return it to the closet. Hardly an encouraging start toward a ham career, was it?

The problem intrigued me; not only did it concern the novice class but many hams of wider experience and higher license grades with more extensive equipment, frequently found themselves in the same boat. They were competent hams, all of their gear, but they faced the same old stumbling block—where to put it. I decided to make a try at doing something about it using Jerry, our young novice friend for my subject. He was enthusiastic and we started planning. There is no need to go into the various solutions at which we arrived (or so we thought!) in this little story. The important point is that we finally did solve the problem not only to Jerry’s delight but to the full satisfaction of his parents. How? We built a complete ham station including all essential accessories, in a caster-mounted pedestal enclosure occupying but one square foot of floor area during operating sessions and, when the end of the on-the-air periods were over, Jerry unscrewed a coax fitting, pulled the AC plug from the wall outlet and rolled the complete station into an obscure closet corner to await the next session!

**Design Around Your Equipment.** This article details construction for a unit to house Jerry’s Conar rig, so you’ll have to make adjustments depending on your equipment. The photos really tell the story, but some amplification will assist in clarifying a number of points for the ham who finds a solution to his problem in what Jerry and I accomplished and wants to do likewise. The over-all dimensions for the Roll-Away Shack are easily adjusted to fit the equipment you want to house.

Early in our planning we dallied between
a metal frame covered with either metal, masonite or wooden panels or all-wood construction. Two factors finally swung us to wood; first, neither Jerry nor I had a great deal of background in metal working. The second consideration was economy. Jerry secured permission to construct the enclosure as part of his school manual arts course and could thus buy the bit of plywood we would need on the school cost basis.

We arrived at a pedestal that was 30 inches tall plus 3/8 inches at each end for the top and bottom. The overall dimensions of the latter two pieces was 12 x 12 x 3/4 inches. The pedestal itself was 11 inches square overall also made of 3/4 inch plywood assembled with finishing nails and glued. The full length door was hinged on the left so that it would not obstruct the operating area when open. Rather than a conventional cupboard handle and clasp, we used a small hasp so that the pedestal could be padlocked when not in use. This prevented tampering with the transmitter and control switches by unauthorized persons (not forgetting little sister!).

**Parts List**

F1, F2, F3—Standard 3AG 1, 2, and 5 ampere (depending on your rig) fuses, respectively; with fuse posts

11, 12, 13—Pilot light assemblies (incandescent or neon, 115 vac)

J1—RF coaxial connector for antenna cable

K1—Antenna switching relay (Potter & Brumfield KT11A, specify 115 vac)

S1, S2, S3, S4—S.p.s.t. toggle switches

SO1, SO2—Chassis AC receptacles

Misc.—Power distribution center chassis box; key and headphone jacks; casters; plywood, masonite, and aluminum construction materials (see text); handles; hardware; glue; paint; decals; license frame; solder; etc.

Estimated cost: original Roll-Away unit for Conar rig: $11.00

Estimated construction time: 8 hours

**Schematic Diagram**

Schematic diagram shows wiring of power distribution center. Transmitter and receiver are plugged into SO1 and SO2, respectively. Switch S4 is master switch for control center. Below, Jerry's rig is set up ready for operation.

**Design for Convenience.** Shelving was spaced to accommodate Jerry's equipment: a Conar Model 400 transmitter and a companion Conar Model 500 receiver. The latter unit was mounted on top of the pedestal and, for dust protection when not in use, a cardboard grocery carton neatly covered with adhesive-backed shelf paper was telescoped over it. (The receiver could of course be mounted inside by sacrificing some shelf and drawer space but Jerry chose the arrangement shown). To avoid the phone and key cords draping across the panels when operating, plugs for both of these were wired from the equipment to two jacks installed on the right hand side of the pedestal 2" below the top. We also installed a s.p.s.t. toggle switch, S1, in a horizontal line with the jacks. This served to switch the antenna relay, installed internally within the pedestal, from transmit to receive.

A shelf below the transmitter provided more than adequate space for stowage of the key and headphones when not in use, so we added a little refinement by partitioning
this space. The smaller compartment then easily accommodated a small metal cabinet housing a *power distribution center* which we made up. (See the schematic diagram.) This merely contains three pilot light brackets with panel jewels, I1 through I3, three insert type fuse holders and fuses, F1 through F3, and three s.p.s.t. toggle switches, S2 through S4. Adequate space remained behind this unit for the antenna change-over relay, K1. On the inside rear of the pedestal we mounted single convenience sockets, SO1 and SO2, into which the transmitter and receiver AC cords could be plugged. The main AC supply from a living room wall plug enters the pedestal in the back center and thence to the power cabinet. We then could switch the fused main power from the wall plug on or off (when in the *off* position it killed everything); switch either the transmitter, receiver or both on or off and each of the three circuits were fused avoiding the necessity of removing equipment panels and digging into the gear to replace an occasional blown fuse. The pilot lights of course, in-

(Continued on page 118)
There's really no reason to suffer the everyday irritations that seem too small to waste time resolving and too large to ignore—irritations like: Walking down to the basement several times to see if the washing machine cycle is over; leaving the house in bitter cold weather to call in the children; getting up from a good steak dinner to answer the doorbell only to find it's a salesman selling a cookbook. Or how about shouting through the rooms, "who'll answer the phone?"—and it turns out you didn't answer but the call is for you. Aha, now you're thinking, and you could probably compile a list t-h-i-s-l-o-n-g of everyday irritations.

But there's a good, easy solution to these household irritations—an intercom. With modern transistorized intercoms providing highly flexible communications and signals at rock bottom prices, even the average household can afford a communications service which until a few years ago was limited to luxury homes.

A Typical Setup. Take a practical example, Lafayette Radio's 99 G 4531 three-station intercom. If the master unit is set up in the kitchen, say near the telephone, the wife can easily check if basement washing equipment is still working by simply pressing the button which connects a remote unit located near the washing center. If an outdoor remote unit is connected in the back yard the children can be heard and paged from the master unit. Similarly, if an outdoor unit
is connected at the front door, the family can answer the doorbell from the master.

One of the advantages of the modern transistor intercom is built-in signals. For example, an outdoor unit has a button which when pressed causes the master to emit a tone burst even if the power supply is turned off. And many intercoms have signal lights which indicate, again even with power turned off, which station is calling. Of course, while low cost systems handling three or four remotes are in the twenty-dollar price class, an additional few dollars buys extra remote-station facilities.

You Can Do It! Unlike the complex tube-type, multi-station intercoms, the budget priced transistor intercoms can be installed by anyone reasonably competent with ordinary household tools. Even difficult thru-the-wall wiring can also be simplified through the courtesy of the telephone company (though they would be unhappy with the procedure).

Installing the intercom system only requires a general idea of the layout, you don't even have to put it on paper. First, locate the master unit (generally in the kitchen). If you're a homeowner drop a multi-wire master cable from the intercom to the basement and terminate the wire on a terminal strip (the number of wires in the master cable is usually one more than the number of stations). If you're a cliff-dweller, just run the master cable to the nearest closet. To avoid possible damage staple all cables to the cellar beams or floor molding—any of the staple guns with a wire adaptor can be used. The adaptor insures that the staple won't go too deep and sever the cable.

Indoor remote units can be simply placed on the furniture or mounted on the wall. If you use ultra-thin speaker wire for the remote unit wiring, the installation will hardly be noticeable.

Outdoor remote units are a little more trouble. If your home is wood or shingles mark the outline of the remote unit, drill a 1/2-inch hole in each corner of the outline.
and cut-out the opening with a saber or key-hole saw. If your home is brick faced mount a waterproof electrical box on the brick and mount the remote in the box—most outdoor remote units have rubber seals for weatherproofing.

Normally, a ¼-inch drill is long enough to pass through the basement ceiling, actually the first floor sub-floor, for running wiring in-between the walls coming up from the basement. When you must pass through two walls, as when wiring from room to room, a long drill is required. Many hardware stores sell a special “electrician’s drill,” about 18 inches long and designed to fit a brace.

**Ready-Made Wiring.** If you get hung-up and can’t get the wiring from one room to another the telephone company may supply the answer. Many new phone installations are four wires even though only two are used—the idea is the first installer puts in provisions for an extra phone. If two wires are free (make certain your phone doesn’t use three wires) you can use the two free wires for the intercom. Generally, you’ll find the extra two wires just hang loose at the telephone input terminal block. You can connect to the free ends and pick-up the wiring at the telephone connector blocks. If you have several phones in the house, the same pair can be used at several locations to provide multiple remotes on one circuit. While the multiple speakers might cause some distortions to the intercom’s sound quality, it won’t be too bad.

Another easy out is old telephone wiring, commonly found in apartment houses. Each new tenant generally has his own idea where the telephone(s) should be, and usually the old wiring is disconnected at the main terminal block and left intact. Since old wiring is of no use or interest to anyone, there’s no good reason why you can’t utilize it!

So, all you have to do is follow these hints, conquer your fear of your floors, walls, and ceiling looking like Swiss cheese, and you’ll have your intercom installed in very short notice.
MECHANIZING HUMAN BEHAVIOR

Man always has had the choice of either accepting the heavy responsibility of his freedom, or surrendering it to authoritarian institutions that are all too ready to manipulate his destiny. Will the future see these institutions using electronics to extend their control of human behavior?

by K. C. Kirkbride

In the not too distant future, you may define freedom as your former Constitutional right to be a grouch. For today, you can be as sullen as you please, as stupid as you deem fun, and not one soul can do one thing about it. True, only the other sullens may choose your company, but if you can eschew the cheery folk, you can have yourself a merrily-miserable old time.

But not tomorrow. Tomorrow you will be bright, optimistic, industrious, aggressive, happy, successful, and as smart as all get-out, whether you like it or not. And if the National Giant Computer indicates to the National Director of Human Beings the country needs a fresh batch of Einsteins, your number may be chosen, and presto, by simple chemical injection, you will become, in a matter of seconds, an ersatz Einstein.

Sound incredible? Not when you ponder the implications of experiments carried out in laboratories in the United States and Europe. Experiments that indicate a radio or electrical wave can beam pleasure, pain, euphoria, or a fighting mood. Chemical experiments that point the way to the day when you will be spared the arduous years of study to earn a Ph.D. Much easier, in
the future, to Ph.D. by chemical injection.

**Going to the Cats.** These experiments began in the early 1900's in Zurich, Switzerland, when a Swiss-English physiologist named Walter Hess was researching blood pressure, blood viscosity and circulation changes. To probe central nervous system control over internal organs, Hess first implanted electrodes into the brain stems of cats. After the gadget was placed in the brain of the animal and the wound healed, Hess would beam an electrical stimulus into the wired animal's noggin, then study reactions.

He found he could electrically stimulate any feline to eat, attack or run at his whim. When stimulation was really "turned on", the animal would chew an inedible object near it, or even attack a human friend rather than a known enemy.

**Mapping Brains.** When his experiments were finished, Hess anesthetized his animals, dissected their brains, to map the points of stimulation which had been stained. Thus, he first suggested certain moods, and drives were linked to defined zones in the brain.

The Zurich experiments excited other men working in laboratories: H. W. Magoun,
then with Northwestern University, Chicago, Illinois, researched the lower part of the mid-brain, suggested it controlled sleep and wakefulness. James W. Papez of Cornell University, New York, explored the rhinencephalon (smell-brain), said he found it might control more than the sense of smell, that it could control emotional experience and behavior.

But it took B. F. Skinner of Harvard, an experimental psychologist, to work out a technique that could measure the degree of a stimulus by testing the frequency with which an animal performed an act which led to a reward.

**It’s in the Box.** He placed one animal at a time in a bare box container, adding a lever to each box the animal could manipulate. If the rat received no reward when he pressed the lever, he pressed only five to ten times an hour. But when a pellet of food dropped into the cup by the lever, he responded like any other performer with an increase in pay, he pressed the lever up to 100 times per hour!

On the West Coast, James B. Olds of the University of California picked up Skinner’s experiment, added electrical stimulation to prove the performing rat would respond even more enthusiastically when his reward was electrical.

Olds put electrodes in the heads of his animals, using ordinary house current, reduced by a small transformer, gave each rat a shock lasting one second. When one electrode missed its mark, landed in the nerve pathway of the rhinencephalon rather than the mid-brain reticular system, Olds himself felt a shock of discovery.

For the electroded animal kept returning to corner A of the Skinner box until Olds grasped the fact the rat was responding to a “reward” pulse. Soon he could guide Mr. Rat all around the box by offering him longer shocks for preferred behavior.

Next he placed the animal in a T-shaped box, stimulated it to turn right at the crossing of the T. then to turn left. Olds next withheld food for 24 hours, and returned it to the T, baiting each end of the T with food mash.

When the animal was going toward the mash, but was rewarded by electrical stimulus half-way down the bar, it refused to go on to get its food. This test convinced Olds the stimulus reached a reward center more satisfying to the hungry rat than actual nourishment.

**Do-It-Yourself.** He then put the animal

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**GRAY MATTER IN A BLACK BOX**

The human brain is like the classic “black box” of electronics. What’s inside is a mystery; you can put a signal in, and get a response out, but how and why are two unanswered questions.

**Brain Kicking Pulses.** Experiments reported by Robert G. Heath, M.D., in “Electrical Self-Stimulation of the Brain in Man”, which appeared in *The American Journal of Psychiatry*, reveal the responses of a patient to electrical stimulation of various areas of the brain. The pulses were triggered by the patient himself using a set of buttons. This self-stimulation resulted in the patient favoring stimulation of some areas of his brain more than others. The results—frequency of self-stimulation and the experienced response—are shown in the table at the right.

Note, from these results, that the patient did not necessarily press the button solely for pleasure. The greatest number of pressings resulted in anger and frustration when the patient kept pressing the button in attempting to bring into focus a vague memory that was evoked by intracranial self-stimulation (1CSS). Such is the fact, but the basic

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<table>
<thead>
<tr>
<th>ICSS IN MAN</th>
<th>Reward (?) Sites</th>
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<tbody>
<tr>
<td><strong>REGION</strong></td>
<td><strong>AVERAGE/STIMULATED HOUR</strong></td>
</tr>
<tr>
<td>L. Centromedian</td>
<td>488.8</td>
</tr>
<tr>
<td>R.P. Septal</td>
<td>394.9</td>
</tr>
<tr>
<td>L. Caudate</td>
<td>373.0</td>
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<tr>
<td>Mesenceph. Teg.</td>
<td>280.0</td>
</tr>
<tr>
<td>A. Amygdala</td>
<td>257.9</td>
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<tr>
<td>P. Amygdala</td>
<td>224.0</td>
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**Aversive Sites**

| Subjective Response | | |
|---------------------|------------------|
| R. Hippocampus | 1.77 | Strongly aversive; “feel sick all over” |
| L. Paraolfactory | 0.36 | Moderately aversive |
| R. Parietal Cortex | 0.50 | No significant subjective response |
| R. Frontal Cortex | 0.00 | |
| R. Occipital Cortex | 0.00 | |
| R. Temporal Cortex | 0.00 | |
in a do-it-yourself circumstance letting it press a lever to stimulate its own brain.

It took Mr. Rat about two to five minutes to learn to do his own stimulating, but when he did learn, he pressed the lever every five seconds, and when the current turned off and there was no rewarding shock, the animal calmly stretched out on the floor, went to sleep.

It Goes to Their Heads. To test the thought definite sections of the brain affect behavior, Olds next put a pair of electrodes of insulated silver wires one hundredth of an inch in diameter, into the brains of a number of rats, to compare stimulation in various areas.

When the stimulating tip electrodes were implanted in sensory and motor areas of the upper brain, response rates remained at chance level of 10 to 25 responses an hour. When implanted in deeper mid-line sections, response rose to levels of 200 to 5,000 an hour. Animals have been known to press the lever over a period of 24 hours without rest.

But when electrodes reached into lower mid-line areas, the animal pressed the lever once, refused to press again, suggesting to Olds that the stimulus shocked an area representing either pain or punishment.

In Seewiesen, Germany, Director Erich von Holst of the Max Planck Institute for the Physiology of Behavior tested aggressive drives in chickens. He inserted into the skulls of chickens and roosters small plastic fittings with four electrode wires each. Each electrode was inserted slowly into the brain stem of the animal, and 50 cycles of low-voltage alternating current applied.

Turning Chicken. Then von Holst and his assistants watched the chickens' behavior as they responded to stimulation at different levels. One stimulated rooster attacked a stuffed creature it had ignored only moments before.

After sustained stimulation, another proud rooster flew at its keeper's face, and attacked with its spurs. When von Holst stimulated the "sleep" area in the brain of another fellow, the animal stopped eating, looked around him, fluttered his eyelids, yawned, closed his eyes and went to sleep.

Von Holst believes moods cannot only be stimulated but maintained over long periods of time. And when stimulation is turned off, an almost euphoric, self-assured mood follows, much as humans experience after a period of trial or depression.

(Continued on page 91)

If your intracranial flip-flop starts flop-flippin', it may be due to a cold solder joint!

secret of the motivation for this behavior still goes unexplained.

Nature of the Pulse. One variable in experiments with ICSS is the nature of the stimulating pulse. Changes in current intensity, wave form, pulse width, and frequency, in many instances altered the patient's responses. The pulses from the circuit of the Subcortical Stimulator at the left were used in these experiments. To minimize the effects of DC polarization, a bi-directional pulse was chosen. This allows restoration of the DC level to zero after each 1.0 millisecond stimulus and maintenance at zero during the 10-millisecond dead time. A silicon unijunction timing circuit generates the 10-millisecond interval. The output from the transistor was gated off after 0.5 second operation by a diode gate driven from an R-C charging circuit. When the diode gate is open, the unijunction transistor drives two one-shot multivibrators with the falling edge of the first triggering the second. They both have equal periods of 0.5 millisecond. The multivibrator timing circuits saturate complementary output transistors which feed voltage to the load (the brain) through isolating capacitors.

As you've noticed, there's something missing from the block diagram—because it does not yet exist—a schematic equivalent for the human brain!
Up until a few years ago the newcomer to amateur radio trying to operate "phone" was almost certainly doomed to failure; for while two or three hundred dollars worth of CW gear could work the world the same monies spent for an AM phone rig was slated for burial under the California kilowatts. Then came a major breakthrough—sideband transceivers at virtually the same price as AM equipment; with the difference that 100 or so watts of sideband can cut through while 100 watts of AM is lost in the QRM.

Today, we find rather good sideband transceivers selling for considerably less than a separate transmitter-receiver combination, yet there are few sacrifices in terms of operating conveniences. The primary limitation of early transceivers is gone—no more is the operator limited to working stations only on the same frequency as he is transmitting—with receiver offset tuning the modern transceiver can compensate for the drift of a received station without changing the transmit frequency. This is the big improvement which makes the modern transceiver highly attractive—it now has almost the same flexibility as the considerably more expensive transmitter-receiver combination. Add to this the high "decorator styling" used on the new transceivers and you've come up with an efficient, attractive "vest pocket" station suitable for use in the living room.

The EICO 753 Tri-band Transceiver is typical of the new breed of quality SSB transceivers. Operation is limited to the 80/75, 40- and 20-meter bands with a switch selected choice of the SSB, CW and AM modes. (Actually, the AM mode is just a throw-in on an SSB rig. If you're running sideband, why use AM?) Typical of low-cost transceivers the SSB mode is pre-set to the more-or-less universal standards: lower sideband on 80 and 40, upper sideband on 20.

The EICO 753 contains the usual features: crystal lattice filter; offset tuning which allows the receiver to be detuned ± 10 kc. from the transmit frequency; VOX (voice operated transmit); 40 to 80 ohm pi-net output; fast attack AGC (receiving automatic gain control); high level ALC (automatic transmit level control—sort of like compression); front panel hairline set for user recalibration; and an honest to goodness plate current metering—not relative power output. (Continued on page 98)
Discover why marine traffic control is switching to VHF.
Learn how FM line-of-sight communications is unsnarling traffic in our major shipping lanes.

Most readers have heard of such devices as ship-to-shore telephone, distress and calling frequencies, long wave beacons, etc. But waterways and ocean routes are, like every other form of transportation, rapidly changing. Number of ships, canals, major ports and tonnage increase every year. To cope with these increases, new communications systems have been brought into action, and more changes are in the works. • Up until recently, 99% of the Earth's marine communications took place on short, medium or long wave with most voice transmissions on the 2 mc band. The latter frequencies provide coverage ranging from 100 miles (daylight) to a maximum of 1000 miles (on "good" nights). When backed up by appropriate short-wave channels, the system is adequate for high sea operations. But it's not on the high seas where real traffic headaches occur. The critical communications problem is within major harbors like New York, Chicago, Montreal—and becomes even more acute along such congested man made waterways as the Panama Canal and St. Lawrence Seaway (linking mid-America with the Atlantic Ocean). Here, distant reception is no advantage at all. It simply creates Interference. And we do mean interference. If you doubt us, take a listen on the 2 mc calling and distress frequency 2182 kc. There are nights when it sounds almost as bad as most CB channels. • The answer is VHF—where reception is usually limited to "line-of-sight" and interference almost nil. Further, FM modulated VHF is static free, something which certainly cannot be said for 2 mc. during summer months. The VHF band allocated for marine use runs from 156.25 thru 157.5 mc.
Roof-top antennas (above) are smaller and lighter than those used for transmissions on the 2-mc. band. The VHF antenna can be made extremely directional to eliminate interference, increase pickup from low-power transceivers while listening and increase the e.r.p. (effective radiated power) when transmitting. A typical control-tower operating position is shown at top-right and a scale-model canal plotting board setup is shown at right.

This is just 20 mc. below channel-7 TV signals. The VHF calling and distress frequency is 156.8 mc while "working" channels are staked out at 100 kc (.1 mc.) intervals on either side. Every station using this band is equipped to operate on 156.8 and one or more of the working frequencies. Channels on 157.1 and 157.2 are assigned exclusively to government owned stations.

With the addition of VHF has also come precision marine traffic dispatching, the like of which only aeronautics has known before. One of the most modern marine "plot boards" is displayed in the photos. Traffic control is extremely important on canals where bottlenecks such as locks, bends, narrows, etc., can cause serious delays if vessels are not spaced just right. The plot board shown is for the Welland Canal, a particularly narrow portion of the St. Lawrence Seaway System. Through the use of VHF traffic control, the slightly antique Welland has been able to cope with double the tonnage.

It's also interesting to note that many foreign vessels don't have the modern VHF gear and the Seaway Authority must loan it to them upon their entry at Montreal.

**Put the Blame on Man.** On the other hand, no matter how good the VHF marine communications itself, traffic dispatching is no better than the man who runs it—the dispatcher. If he goofs, traffic is snarled. Already, studies are under way to determine whether computers could do a better job. It's human common sense vs. that perfect electronic memory. Time will tell.

And whatever "time" does tell, some experts are also advocating further improvements in the communications system itself. The most drastic of these proposed changes is separation of calling and distress onto 2 different channels. Such a move would require most stations to keep a watch on three different frequencies (working channel would be the third). Without increasing staff, this move would be impossible on medium-wave communications. At night, there'd often be signals audible on all three frequencies at once and it would take three pairs of ears to determine which calls were actually for the station. However, in view of the current unsafe conditions on 2182 kc., the increase in personnel is probably justified.

Meanwhile, separate VHF distress and calling frequencies would not require more personnel. Because of that short reception range, the distress frequency would be quiet 99% of the time and a visual monitoring device (common in other forms of VHF communications) could be employed. Then

(Continued on page 94)
The real change in Citizens Band Radio came around 1990. That year the FCC opened up these new frequencies—535 thru 1605 kc—the old Broadcast Band. By 1988 all sound broadcasters had either been forced out of business by TV competition or were put on FM by the FCC. So they gave us the band, allowed up to 100 watts power, any antenna, any kind of transmission (even way out “attention getters” like mine) and work whatever station you could reach.

However, not everything in CB had changed. Some of us working types still bought our gear second hand. Like yesterday I came across 400 feet of slightly used antenna wire at Barney’s Electronic Swap Center. Barney himself was an ex-sailor (radio operator) who’s CB career went all the way back to 1966. You could say the same for some of his wares. But the old man swore up, down and sideways that the antenna I purchased for 200 WR (World Rupees) would positively be no older than 1995.

So on December 31, 1999 yours truly, KKEZ7NNN with his 300 foot dipole found himself fishing for DX. Not just trans-continental stuff (I’m 20 miles south of Buffalo, N. Y.) but a super catch—like Bermuda or maybe even Europe. It was the kind of night you could do nothing but DX. Half snow, half rain. From the window I could see ice forming on my antenna as it was lit by a flashing red traffic light at the corner—in 1999 every intersection no matter how remote is blessed with a traffic light. And even 1995 style antenna wire supposedly didn’t break under the weight of ice.

Someone came on the channel, identified herself as “Atlantic 9” and went off again.

I pushed power up to maximum and put myself on the air. “CQ Caribbean, CQ Europe, this is KKEZ7 aka. CQ DX.” With my attention getter waiting in the wings.

Nothing! Absolutely nothing! A few California CB’ers came back to me but the good catches went right on chasing the rare states—Nevada, Delaware, etc. New York just too easy on a good DX night.

Atlantic 9 appeared on the channel again. “Atlantic 9, I read you okay. How me?”

Atlantic 2 also a YL but way down in the hash came back but she was unreadable. Atlantic 9 with flutter, QSB, “My location is Ymir city. What is your QTH?”

Tried to place the name, drew a blank. Also tried to break into their QSO. No luck in that department either.

Her signals really began to nose dive. “The weather at Ymir is cold. There are a few ice bergs to the North of us.” She dipped below the noise level.

A few more frustrating CQ’s then I de-
ecided my attention getter would be the only answer and I had dreamed up a beauty, literally. I hitched a transistorized turntable into the circuit and put on this record—"Honey, Honey" sung by an "earthy" young lady. Yes, you guessed it, both the turntable and record came from old Barney. I played it continuously for 15 minutes, identified and listened on the channel a moment. Second time I listened, there were more CB'ers calling KKEZ70000 than you could count—"Honey, Honey"—my never fail secret CB weapon.

I could take my pick. Spain, Bermuda, all the way up to Iceland. And Atlantic 9 was back in there too. I should have picked Iceland which is even rarer than Spain. But after pushing the On button, I decided on Atlantic 9—now her voice seemed ever so slightly familiar.

"Atlantic 9, do you read KKEZ70000?" Make it short I promised myself, check out that voice then grab the DX.

She came back immediately. "KKEZ70000, I read you pretty good. Hey, you're playing my song."

"What do you mean? Over."

"I mean you're playing the record I made a couple years ago."

Grabbed the disc off my turntable. "Atlantic 9, you're kidding me." But I knew she wasn't. And now I told myself, as the real DX slipped by—how often on CB do you make contact with a genuine recording star?

She laughed. "You spotted my voice before you came back to me. Right?" Her signal barely overriding the QRM.

"Yes, Atlantic 9, maybe I did." I looked for her name on the record, found it, then I did a double take. "What kind of a name is Neptuna? Over."

"KKEZ70000, Neptuna is a mermaid name." Now she pushed my meter up another couple S units. "And Atlantic 9 is a mermaid CB call." One thing for sure, she had a voice to go with the part.

"Not only does the little girl sing but she's got a sense of humor too." Sarcastic. I looked for her recording company but other than the Neptuna bit, the label was blank.

Deadpan. "I'm not kidding." Someone in Ohio tried to cut in but Neptuna held her own. "Where else would I get a call like Atlantic 9?"

The nonsense had already run overtime but I decided to give her a little more rope. "How long have you girls been on CB?"

"Oh, we were licensed way back in 1958." A new sleet storm outside raised the noise level. "But our signals wouldn't penetrate through the ocean until we came down on these frequencies." She faded into the QRN and I missed the rest of her transmission.

"Come back again, funny girl. I missed the last sentence."

Neptuna spoke slowly and distinctly. "Where did you find my record? Over."

"At Barney's." Over one shoulder and through the window, I could see my antenna begin to sag. If the wire really is 1995 vintage, it was certainly made very early in the year.

"Oh yeah, the old man and I have been friends for a long time." Some mermaid laughter. "He used to be quite a sport in his younger days."

"I suppose he acts as your QSL manager?"

"That's right."

Right then my break-proof antenna broke which ended the contact. And with this weather I won't be able to fix it until morning. So the question is—do I march into Barney's and demand my money back? Ask him to deliver a QSL to Neptuna? Or maybe I should trade my whole rig to the old man for her address?"
SOLID-STATE AUDIO AMPLIFIER

By Art Trauffer

It's not 50 watts, doesn't have input switching, has no headphone jack, but neither does it have a $100 price tag!

The move is to solid-state hi-fi components! But chances are you're still cooking away with your old tube amplifier—probably a monophonic unit at that. The old amp is putting out and it helps keep your listening room warm during the winter as well, so why trade in just now? But why not get a feel for the clean, transformerless, transistor sound while you're scanning the market and saving your pennies? Here's the perfect construction-introduction to the solid-state audio amplifier.

The Circuit. As shown in the schematic diagram, all three transistors, Q1, Q2, and Q3, are pnp types. Preamplifier stage, Q1, is an RCA 2N217, which is resistance capacitance coupled to the driver stage, Q2, another 2N217. Driver Q2 is direct-coupled to power-output stage, Q3, an RCA 2N301. A PM speaker (4 to 16 ohms) is connected in an emitter-follower configuration to Q3. The power supply is 4.5 volts (three "D" flashlight cells in series), but using 6 volts will give you a little more volume.

The input signal is applied through volume control, R1, and coupling capacitor, C1, to the preamplifier stage Q1. Q1 base bias is supplied by voltage-divider, R2-R3. Resistor R4 is the stage's collector load. The amplified output signal from Q1 is applied through inter-stage coupling capacitor, C2, to the driver stage, Q2. Transistor Q2's base bias is supplied through resistor R5. Driver stage Q2 is direct-coupled to power output stage Q3. The input circuit of Q3 acts as the driver's emitter load, while Q2's emitter current provides base bias for Q3. The speaker's voice coil is Q3's emitter load.
Shown above is the rear of the amplifier front panel. All of the components except the batteries are mounted on the panel. The two terminal strips TS1 and TS2 provide additional convenience in mounting the parts. Front panel controls and some construction details are shown at the left.

The three batteries of the solid-state amplifier are easily replaced from the bottom.

The Chassis. The amplifier front panel, a piece of compo board 6½"x2½"x½", is also the chassis. The panel was painted white on the backside only so the parts would show better in the photographs. The leads of transistors Q1 and Q2 can be clipped off to about one-half normal length, and then soldered to the lugs of 3-lug terminal strips, as shown. Use long-nose pliers as heat sinks when soldering. Do not solder directly to the base and emitter pins on Q3; use small photo-cartridge-pin clips, or socket lugs removed from a miniature tube socket. Transistor Q3 is bolted directly onto a 2"x1½" plate of copper or aluminum to act as a heat sink. Place a couple of washers between the

(Continued on page 94)
100 kc Calibrator

Before you read on to the next paragraph take a look at the high-priced, top-quality receivers shown in Allied's, Radio Shack's or Lafayette's catalog. Note that they all feature a "standard" item, namely a 100 kc. calibrator. And if the calibrator isn't supplied as original equipment provision is made for one to be easily connected. In fact, the better a receiver's calibration the more dependent it is on an accurate receiver standard to which the selected calibration can be "locked."

For you newcomer's to Ham radio or SWLing, we'll explain. A calibrator is a device which generates a signal every 100 kc. across the dial from 100 kc. to generally 30 mc. Some calibrators even go past 30 mc., some as high as 6 or 2 meters; and some calibrators provide 1 mc. markers, though they are rare as 100 kc. is far more convenient. Thus, regardless of the receiver's bandspread or main dial calibration the user can at least peg the tuning close to the desired frequency. For example, suppose you are trying to find an SWBC station at 7310 kc., and your receiver is a typical budget job with calibration at 7 and 8 mc. Obviously there's a lot of space between the 7 and 8 mc. markers. But if you have a calibrator, the third 100 kc. signal after the one tuned in with the dial set at 7 mc. is 7300 kc. At least now you're close, ease the dial a smidgeon as you find the station at 7310.

Or say you're a Ham with a two dial receiver, one dial being the Ham band bandspread. If your transmitter is VFO controlled only, how to calibrate the main dial so the bandspread is accurate can be a formidable problem. But not with a calibrator. For example, for 20 meter calibration you might set the bandspread to 14.4 mc. Then, adjust the main tuning around the 20 meter index mark (usually 14.4 mc.) until you pick up the calibrator's signal—voila, the bandspread is calibrated.

While you can always buy a calibrator that will dangle at the end of a few power cables tapped into the receiver's power supply, or a transistorized job in a relatively large box that becomes another accessory to take up valuable desk space, you can build a Perf-Board calibrator which can be tucked inside the receiver's cabinet, thereby becoming an integral part of the receiver.

Make Your Own. The Perf-Board calibrator shown in the photographs is built on a stock section of 2 7/8 x 3 3/8 inch unclad perforated board (unclad means no copper coating for printed circuits). Flea clips are used for terminal points.

Transistor Q1 can be any I. F. amplifier type, even the two or three for a buck surplus specials will do.

To simplify wiring (actually to avoid a rat's nest) the crystal socket and L1 are mounted so their terminals are on the component side of the board (see photograph). To facilitate C1's adjustment, which zero-beats the calibrator with WWV, drill a 1/4 inch hole in the board so you can get at the adjustment screw even though C1 is mounted "face up" on the wiring side of the board. Make certain C1 is mounted rigidly by using at the least #20 wire for its connecting leads.

Note L1's connections carefully as there
is no color-dot or other code on the coil. One coil terminal has two internal wires while the remaining terminals have only one wire. Orient L1 so that when facing the coil, not the slug adjusting screw, the terminal with two wires is pointed down; then, as shown below, the collector terminal is at the right and the crystal terminal (connected to crystal socket SO1) is at the left. If you have any doubts double check with an ohmmeter. The collector terminal measures about 3.2 ohms to the two wire terminal while the crystal terminal measures approximately 2.8 ohms to the two wire terminal.

Q1's leads should be kept short, to avoid soldering heat damage a heat sink on each of Q1's leads when soldering is a must. If you don't have standard soldering heat-sinks you can use an alligator clip, preferably a copper one with tight jaws to carry away the excess heat.

B1 can be any 9 volt transistor radio battery—round or flat it doesn't make a difference. The battery is held in place with two wire "straps" passed through the board and twisted together. Since the battery will last its shelf life of one to two years (assuming normal service) there's no need to use battery

Estimated cost: $11.00.
Estimated construction time: 1 1/2 hours.

PARTS LIST

B1—9-volts battery (Eveready 226 or equiv.)
C1—4-80-mmft. trimmer (Lafayette Radio 34R-6830 or equiv.)
C2—500-mf., 500-WVDC ceramic disc capacitor
C3—50-mf., 500-WVDC ceramic disc capacitor
L1—1.5-mh. tapped width coil (Miller 6321)
Q1—if pnp transistor (Lafayette Radio 19R-1504 or equiv.)
R1—91,000-ohms, 1/2-watt resistor
SO1—Socket for xtal (Texas Crystals CE-1 or equiv.)
Xtal—100 kc. crystal (Texas Crystals TX-100 or equiv.)
Misc.—Perforated board, Flea clips, wire, solder, etc.
clips, the power leads can be soldered directly to BI’s terminals.

Note that no power switch is shown. For maximum convenience the power switch should be on the front of the receiver. If your receiver has an RF gain control simply replace the existing control with a similar value having a push-pull switch and connect the calibrator’s power leads to the switch. To turn on the calibrator it’s then only necessary to pull out the switch—regardless of the RF gain control setting. If your receiver doesn’t have an RF gain control mount a SPST miniature switch on the front panel for convenience.

If you’re only interested in 100 kc. markers to 15 mc. or so it’s not necessary to connect the calibrator to the receiver. If it is positioned within three or four inches of the antenna input lead, radiation will provide sufficient signal. If you need markers to 30 mc. connect a short length of wire to the free end of C3 and wrap the other end around the antenna input lead—a direct connection to the antenna terminal(s) of the receiver is not required.

Adjusting the Calibrator. Run in L1’s slug as far as possible (full clockwise). Set the receiver to a low frequency, say 600 kc., and slowly back out L1’s slug a turn at a time. At each turn slowly rock the receiver’s tuning back and forth with the BFO (beat frequency oscillator) on. When the calibrator kicks-in you’ll hear the beat note. (Note that it is possible for the calibrator to be operative with the slug full in.) Then adjust L1’s slug for the maximum S-meter reading attainable.

Turn the calibrator off and tune in WWV at any of its frequencies—depending on the time of day WWV will be received at 5, 10, 15, 20 or 25 mc. Turn the calibrator on and adjust its frequency by adjusting C1 for zero-beat with WWV. If the calibrator’s output is so strong it jams WWV, turn the calibrator off, turn the receiver’s BFO on and adjust the BFO for zero-beat with WWV. Without changing the BFO’s setting, turn-on the calibrator and adjust C1 till the calibrator’s signal is zero-beat with the BFO. Effectively, since WWV and the calibrator are zero-beat to the BFO they are zero-beat to each other. It is possible that the ambient heat inside the receiver cabinet will cause the calibrator’s frequency to shift very slightly. If this occurs, heat up receiver for 15 minutes.

Troubleshooting hints. The normal total current supplied by the battery is about 5 ma. If the current is in excess of 7 ma., or very high, check that Q1 is a PNP transistor and the battery is installed with the correct polarity. If L1 just seems to be approaching resonance with the slug all the way in (full clockwise) and you cannot obtain a definite "peak," parallel C2 with a 150 mmfd. capacitor.

—Herb Friedman

| Cold Weather Car Starter | Continued from page 52 |

by bending it into a U shape. Barrier terminal strip TS1 was mounted on the side and the relay socket and I1 were mounted on top. Socket pins are then wired to the terminal strip to complete the job.

Installation and Wiring. The starting aid unit and auxiliary battery BI may be installed in either the passenger or engine compartment. Keep them away from the engine manifold. Ground the same posts on the auxiliary and car batteries. When making connections between the unit and the ignition system, be sure to break the proper ignition coil lead. There are three connections on the coil: one heavy lead to the distributor rotor, one light lead to the distributor breaker points, and a third lead of light wire. Lift this third lead from the coil, and, as shown on the diagram, connect this coil post to terminal 5 of the starting aid. Connect the lead that was disconnected from the coil to terminal 1, connect the ungrounded post of the auxiliary battery to terminal 2, and ground terminal 3 at some convenient point on the car. Connect terminal 4 to the single large terminal on the starter-motor housing. Use fairly heavy stranded insulated wire, such as AWG 16, for connections to terminals 1, 2, and 5 of the starting aid. You may use fairly light stranded insulated hookup wire, such as AWG 22, for connections to terminals 3 and 4. Be sure there is a good ground for the auxiliary battery. Use a good body bolt free from corrosion, preferably with a star washer. Tin the ends of all wires and clamp them firmly in place. You may use inexpensive dry batteries for the auxiliary ignition battery since the ignition current is not great: it’s about 5-amps maximum for 6-volt systems and 3-amps for 12-volt systems.
Literature Library

Numbers in heavy type indicate advertisers in this issue. Consult their ads for additional information.

ELECTRONIC PARTS

1. This catalog is so widely used as a reference book, that it's regarded as a standard by people in the electronic field. Have you the latest Allied Radio catalog? The surprising thing is that it's free!


3. Progressive "Edu-Kits" Inc. now has available their new 1966 catalog featuring hi-fi, CB, Amateur, test equipment in kit and wired form. Also lists books, parts, tools, etc.

4. We'll exert our influence to get you the Olson mailing list. This catalog comes out regularly with lots of new and surplus items. If you find your name hidden in the pages, you win a free merchandise!

5. Unusual scientific, optical and mathematical values. That's what Edmund Scientific has. War surplus equipment as well as many other hard-to-get items are included in this new 148-page catalog.

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

7. Whether you buy surplus or new, you will be interested in Fair Radio Sales Co.'s latest catalog—chuck full of buys for every experimenter.

8. Want a colorful catalog of good buys? John Mehnin, Jr. has one that covers everything from assemblies to zener diodes. Listed are government surplus radio, radar, parts, etc. All at unbelievable prices.

9. Busstein-Applebee offers a new giant catalog containing 100's of big pages crammed with savings including hundreds of bargains on hi-fi kits, power tools, tubes, and parts.

10. Now available from EDI (Electronic Distributors, Inc.) a catalog containing hundreds of electronic items. EDI will be happy to place your mailing list.

11. VHF listeners will want the latest catalog from Kuhn Electronics. All types and forms of complete receivers and converters.

22. A wide variety of loudspeakers and enclosures from Utah Electronics lists shapes and prices. Types are covered in this heavily illustrated brochure.

23. No electronics bargain hunter should be caught without the latest copy of Radio Shack's catalog. Some equipment and kits are so low, they look like mis-prints. Buying is believing.

25. Unusual surplus and new equipment/parts are priced "way down" in the new 32-page flyer from Edie Electronics. Get one.

75. Transistors Unlimited has a brand new catalog listing hundreds of parts at exceptionally low prices. Don't miss these bargains!

HI-FI/AUDIO

13. Here's a beautifully presented brochure from Alee Lansing Corp. Studio-type mikes, two-way speaker components and other hi-fi products included.

15. A name well-known in audio circles is Acoustic Research. Here's its booklet on the famous AR speakers and the new AR turntable.

16. Garrard has prepared a 32-page booklet on their full line of automatic turntables including the Lab 80, the first automatic transcription turntable. Accessories are detailed too.

17. Two brand new full-color books are being offered by Electro-Voice, Inc. that every audiophile should read. They are: "Guide to Outdoor High Fidelity" and "Guide to Compact Loudspeaker Systems."

19. Empire Scientific's new 8-page, full color catalog is now available to our readers. Don't miss the sparkling decorating-with-sound ideas. Just circle #19.

24. Here's a complete catalog of high-styled speaker enclosures and loudspeaker components. University is one of the pioneers in the field that keeps things up to date.

26. Always a leader, H. H. Scott introduces a new concept in stereo console catalogs. "At Home With Stereo" the 1966 guide, offers decorating ideas, a complete explanation of the more technical aspects of stereo consoles, and, of course, the complete new line of Scott consoles.

27. An assortment of high fidelity components and cabinets are described in the Sherwood brochure. The cabinets can almost be designed to your requirements, as they use modules.

28. Very pretty, very efficient, that's the word for the new Betacom intercom. It's ideal for stores, offices, or just for use in the home, where it doubles as a baby-sitter.

30. Tone-arms, cartridges, hi-fi, and turntable parts are included in this 32-page new catalog. These heads and conversions are listed in a complete Shure Bros. catalog.

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

33. Become the first to learn about Norelco's complete Carry-Corder 150 portable tape recorder outfit. Four-color brochure describes this new cartridge-tape unit.

34. The 1966 line of Sony tape recorders, microphones and accessories is illustrated in a new 16-page full color booklet just released by SuperSCOPE, INC., exclusive U.S. distributor.

35. If you are a serious tape audiophile, you will be interested in the new Viking of Minneapolis line—they carry both reel and cartridge recorders you should know about.

91. A comprehensive analysis of Uher tape recorders and a complete listing of accessories are all in their up-to-date 16-page brochure.

HI-FI ACCESSORIES

76. A new voice-activated tape recorder switch is now available from KINEMATIX. Send for information on this and other exciting products.

39. A 12-page catalog describing the audio accessories that make hi-fi living a bit easier is yours from Switchcraft, Inc. The cables, mike mixers, and junctions are essentials!

KITS

41. Here's a firm that makes everything from TV kits to a complete line of test equipment. Conar would like to send you their latest catalog—just ask for it.

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

44. A new short-form catalog (pocket size) is yours for the asking from EICO. Includes hi-fi, CB rigs and amateur equipment—many kits are solid-state projects.
AMATEUR RADIO
46. A long-time builder of ham equipment, Hallcrafters will send you lots of info on the ham, CB and commercial radio-equipment.

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

49. Want to see the latest in communication receivers? National Radio Co. puts out a line of mighty fine ones and their catalog will tell you all about them.

50. Are you getting all you can from your Citizens Band radio equipment? Amphenol Cadre Industries has a booklet that answers lots of the questions you may have.

52. If you're a bug on CB communications or like to listen in on VHF police, fire, emergency bands, then Regency Electronics would like to send you their latest specs on their receivers.

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

55. Interested in CB or business-band radio? Then you will be interested in the catalogs and literature Mosley Electronics has to offer.

93. Heath Co. has a new 23-channel all-transistor 5-watt CB rig at the lowest cost on the market, plus a full line of CB gear. See their new 10-band AM/FM/Shortwave portable and line of shortwave radios. #93 on the coupon.

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

SCHOOLS AND EDUCATIONAL
56. Bailey Institute of Technology offers courses in electronics, basic electricity and drafting as well as refrigeration. More information in their informative pamphlet.

57. National Radio Institute, a pioneer in home-study technical training, has a new book describing your opportunities in all branches of electronics. Unique training methods make learning as close to being fun as any school can make it.

36. Coyne Electronics Institute offers home/resident training in electricity, radio-TV, electronics, refrigeration and air conditioning.

59. For a complete rundown on curriculum, lesson outlines, and full details from a leading electronic school, ask for this brochure from the Indiana Home Study Institute.

60. Facts on accredited curriculum in E. E. Technology is available from Central Technical Institute plus a 64-page catalog on modern practical electronics.

61. ICS (International Correspondence Schools) offers 236 courses including many in the fields of radio, TV, and electronics. Send for free booklet "It's Your Future."

74. How to get an F.C.C. license, plus a description of the complete electronics courses offered by Cleveland Institute of Electronics are in their free catalog. Circle 74.

94. Intercontinental Electronics School offers three great courses: stereo radio & electronics; basic electricity; transistor. They are all described in Inesco's 1966, 16-page booklet.

ELECTRONIC PRODUCTS
62. Information on a new lab transistor kit is yours for the asking from Arkay International. Educational kit makes 20 projects.

TELEVISION
70. Heath Co. now has a 25" rectangular-tube color TV kit in addition to their highly successful 21" model. Both sets can be installed in a wall or cabinet: both are money-saving musts!

73. Attention, TV servicemen! Barry Electronics' "Green Sheet" lists many TV tube, parts, and equipment buys worth while examining. Good values, sensible prices.

72. Get your 1966 catalog of Cislin's TV, radio, and hi-fi service books. Bonus—TV tube substitution guide and trouble-shooter chart is yours for the asking.

29. Install your own TV or FM antenna! Jeffers-King's exclusive free booklet reveals secrets of installation, orientation; how to get TV-FM transmission data.

TOOLS
78. Color coded, solid and hollow shaft Xcelite nutdriver sets are now being offered in handy, pegboard, molded plastic cases that keep tools in good order on workbench or in toolbox. Form S665 gives all details.
By C. M. Stanbury II

February/March 1966

By the time you read this, or shortly thereafter, we should experience our first major ionospheric storm of the new sunspot cycle. When this disturbance hits, the upper bands will go dead except for equatorial powerhouses like HCJB, and most northern stations (Asia, Europe and North Africa) will disappear from the lower bands too.

For the general (non DX'ing) SWL, this is certainly a nightmare. Such favorite easy-to-hear stations as the British Broadcasting Corporation, Radio Japan, the Voice of Germany, etc. will simply not be available. Happily for this type listener, these abnormal periods seldom last more than 48 hours.

But for the DX'er who knows how to use it, an ionospheric storm can be a real opportunity. Most European/Asiatic QRM will be gone from 31 meters, and all will be gone from 49 meters. Between 1500 and 1800 listener's time, Africa will dominate 31 meters while during the evening, 49 meters, already a good Latin American band, will become an even better one.

Meanwhile, big things will be happening on the tropical bands—60 and 90 meters. Most U.S. and Canadian utility station QRM, particularly those ear splitting radioteletype signals, will be considerably weakened during those same evening hours. This is an ideal time to hunt for those rare stations in Bolivia, Ecuador and Peru plus seldom heard broadcasters in all other South-of-the-border countries.

To use the table put your finger on the region you want to hear and log, move your finger to the right until it is under the local standard time you will be listening and lift your finger. Underneath your pointing digit will be the short-wave band or bands that will give the best DX results. The time in the above propagation prediction table is given in standard time at the listener's location which effectively compensates for differences in propagation characteristics between the east and west coasts of North America. However, Asia and the South Pacific stations will generally be received stronger in the West while Europe and Africa will be easy to tune on the east coast. The short-wave bands in brackets are given as poor second choices. Refer to White's Radio Log for World-Wide Short-Wave Broadcast Stations list.
Mechanizing Human Behavior
Continued from page 77

Humans Too. When Dr. Robert G. Heath of the Department of Psychiatry at Tulane University, School of Medicine, New Orleans, Louisiana, read of animal experiments, he wondered would the same tests apply to humans?

To find out he built a small portable self-stimulator machine equipped with three buttons, each button to direct stimulation to a separate section of the brain. The transistorized stimulator was fashioned to be worn on a patient’s belt.

Next he chose a group of patients whose cases were already diagnosed as beyond conventional help. Of these, we will report tests on just two, one called B-7, a twenty-eight-year-old narcolepsy and cataplexy victim. Dr. Heath implanted electrodes into 14 brain regions, fixed them to stay in position for months. The small silver ball electrodes (3 leads each separated by 2 mm) was placed in the septal, hippocampus and mesencephalic tegmentum regions. Then, to insure against post-operative trauma, Dr. Heath waited six months before starting his stimulation experiments.

Push-Button Moods. Free to push the button he chose, B-7 first explored the three, found stimulation of the mesencephalic tegmentum startled him into a quick, alert frame of mind, but the feeling was followed by intense discomfort, and he looked around, frightened, fearful. His reaction to this stimulus was so intense he stuck a hairpin under the button to make certain it could not be pressed again.

Next trying the hippocampal stimulation, he found it rewarding, but to a mild degree. But when he pressed the button that stimulated the septal region of his brain, his mood elated fast. The stimulation of pleasure was keen enough to overcome disease effects, first suggesting to Heath stimulation of pleasure zones could overcome pain and disease symptoms.

B-7’s septal stimulus, the “pleasure” button, was also closely linked with sexual associations.

Happy Days Are Here Again. The second patient tested was twenty-five-year-old B-10, a psychomotor epileptic with sudden bursts of impulsive behavior that did not yield to conventional treatment.

Heath implanted 51 leads into 17 brain sites, 24 leads of stainless steel, .003 in diameter coated with Teflon; 27 were small silver ball type electrodes. B-10 seconded B-7 in that he reported pleasant feelings—he said he felt “good”—when he pressed the septal button, but B-10 found sexual response when he stimulated the septal section of his brain, with reaction far more enthusiastic than B-7’s.

Regardless of the subject his companions discussed, B-10 referred to sex, grinning broadly. When asked why he emphasized this subject, he said, “I don’t know why that came to mind, I just happened to think of it.” When he turned off septal button and turned on amygdaloid nucleus and the caudate nucleus, he again felt “good” but this time without the broad grin.

Memories. B-10’s favorite stimulation button though did not reach a pleasure center. He pushed continually the button touching off centromedian thalamus, making him irritable. Asked why now he persisted in making himself miserable, he said he almost recalled an old memory through this stimulation. Another time, he pressed the hippocampal electrode and saw light flashes suggesting to Heath that B-10 had stimulated close to the optic nerve.

Radio Waves Put You on the Beam. As startling as these experiments seem, Dr. Dr. Otto Schmitt of the University of Minnesota told an annual meeting of the American Medical Association that more amazing developments were in the works.

Electrical means of control of human beings could be achieved, he said, by introducing signals into the nervous system, at command from a scientist in a controlling station to either stimulate or depress.

Chemical means of controlling behavior had been achieved by implanting pellets in the body containing hormones that could be controlled by radio. In this way, Schmitt said, a pilot might have his mood regulated by an external control station.

Applied to medical use, Dr. Schmitt said as many as twenty to thirty special sensing instruments could be implanted in the human body, instruments that would lie idle until set off by outside signal, the signal to call the sensor into action, and relay power.

But the progressive Doctor warned then: “There is no question but that we have modified behavior this way. We can make a man rough or aggressive, or we can calm him

(Concluded on next page)
(Continued from previous page) down. Now we must study how we can use this ability for the good—to make a man better able to do his job."

Close the Schools! Tests worked out by scientists on the West Coast may help man do a better job when the process can be applied to man, and Dr. Heath has already said behavior has been changed by chemical injection, orally and intravenously.

Drs. Frank R. Babich and Allan L. Jacobson of the University of California injected ribonucleic acid, RNA, taken from the brains of trained animals into untrained, found the untrained could then respond as though trained.

First Babich taught eight rats to go to a food cup in a Skinner box at the sound of a click. A second control group were fed the same amount of food as the experimental rats but were not trained.

When the first group had fully learned their homework, responding to click and sound, they were killed with ether, their brains removed and the RNA extracted, then injected into the untrained animals with a 22-gauge needle.

The RNA-injected animals who had not been trained were then put into the Skinner box with the control group, and all assigned numbers so experimenters and judges could not guess which rat belonged to which group.

High Scores: Each animal was then given 25 trials and scores kept. At the end of the experiment, scores in order of the RNA-injected animals were 5, 13, 9, 12, 9, contrasted with scores of the control rats which were 3, 2, 1, 1, 1, a definite "win" for the fellows running around with the injected "trained" RNA.

As many scientists believe memory storage system is the same in rats and humans, this experiment could have overwhelming implications for human beings in the future, transferring learning from the superior to the less adept person.

And as Dr. Schmitt has said, personality control and mood control can have tremendous connotations for good in the future. But it can have fearsome applications too. For with this bright promise in the future, we may see the day when we need not struggle years to achieve a Ph.D. We might, by the whim of a needle, become an instant Einstein. We could also become robots wired for sound.

A dead phono motor may be caused by improper hookup. Check over the wiring and voltage dropping resistor. Place a speed disc on the turntable and check for correct speed. A dirty or worn idler wheel will cause slow or erratic speeds. Clean off the turntable rim and brush on liquid rosin.

Dress up the phono controls with decals or a lettering gun as a final touch. And enjoy the sounds now that you’ve gone stereo!
NEW products

Continued from page 28

Powered by any 9-volt DC source, the transistor amplifier may also be run with a 15 volt power, which will increase output by 80%. The entire amplifier is mounted on a printed circuit board, which is 5¼" long by 1¾" wide; it weighs only 3½ ounces.

This new transistor audio amplifier, at $8.95, is available immediately from Birnbach distributors or post paid from Birnbach Radio Company, Inc., Dept. ADA, 435 Hudson Street, New York, N. Y.

Household Intercom

Bringing new added convenience and safety to every home, a new, economically priced 2-station intercom for baby-sitting, or calling room-to-room has just been introduced by Fanon Electronic, Industries. Priced at a low $10.95 for the pair, the little intercom system has been designated as the model ECHO-2 and comes complete with 50 ft. of cable which simply plugs into the units (requires no tools for a hook-up).

As a “step-saver,” the ECHO-2 intercom is indispensable. It can be used to check on the baby without running up the stairs; call the kids to lunch or get the man of the house out of his workshop.

Powered by a single 9 volt transistor battery that will last for months, one unit may signal the other even when the intercom is “off.” This patented “beep-tone” signal circuit prolongs the overall life of the battery since no current is required until the system is actually used. Attractively styled in an ivory and grey hi-impact plastic case, each unit has gold-tone appointments and is only 3" x 4" square.

The voice quality is excellent and so sensitive, it can be easily heard across a large room or nursery. Since it requires no AC power, the ECHO-2 system can be used anywhere—on patios, boats, campsites, or auto-trailers. Up to 150 ft. of additional cable can be added between units. For complete information, write to Fanon Electronic Industries, Dept. MCQ, 439 Frelinghuysen Avenue, Newark, N. J. 07114.

Panza Power

A portable amplifier that works on flashlight batteries and delivers “professional quality” sound is now available from Perma-Power. The Ampli-Vox Model S-700 Portable Amplifier features all-transistor design for instant performance and utmost dependability. It is extremely easy to use; instead of a panoply of complicated controls, it offers one-knob operation. A single control turns it on and off, and adjusts the volume.

The amplifier delivers high power, too. It is rated 25 watts, E.I.A. music power, 40 watts peak. It is excellent for music, paging, public address, and most sound system applications. Since the Model S-700 is battery-powered, it can be readily used indoors or out. Ten flashlight batteries will provide 200 hours of operation. The unit was originally designed for use as original equipment in an auto portable sound system.

The amplifier has a frequency response of 50 to 15,000 cycles per second. It has two inputs, so that it can be used with a microphone and auxiliary equipment such as phonograph, tuner, or tape recorder. It also provides outputs for two 8-ohm speakers. The unit, measuring 8½ inches wide by 3¼ inches high by 8¾ inches deep, weighs only seven pounds with batteries installed—can be readily adapted to AC opera-

(Concluded overleaf)
tion, with a plug-in power adapter available separately.

The unit is available throughout the United States and Canada, through electronic and sound outlets, school and office supply houses, photographic and audiovisual dealers, etc. It sells for $69.95 net, without batteries. Descriptive literature is available on request from the manufacturer, Perma-Power Company, Dept. 764, 5740 N. Tripp Ave., Chicago, Illinois 60646.

**Tote-and-Talk Tape Recorder**

Automatic Level Control (ALC) and solid-state electronics are top features of Craig Panorama's new Vista 525 6-transistor, AC-operated two-speed tape recorder. Automatically maintained recording level and 4-hour recording capacity make unit ideal for large conference meetings. Speed equalization control at 1-1/2 and 3-3/4 ips standard speeds, with capstan drive. Design features include jam-proof single-lever control, AC bias record, fast forward, PM dynamic microphone, record level and power indicator.

**Craig Panorama's Vista Tape Recorder**

Equipped with inputs for microphone, radio and AC power, outputs for earphone and external speaker. Dimensions are 5-1/2" by 11-3/4" by 9"; weight 8 lbs. Priced at $69.95. Accessories include microphone, patch cord. For further information, please write Dept. 201A, Craig Panorama Inc., 3412 So. La Cienega Blvd., Los Angeles, Calif. 90016.

**Solid-State Audio Amp**

Continued from page 84

metal plate and the front of the panel: they provide a small space between panel and plate allowing air to circulate all around the plate.

**The Enclosure.** Construction of the wood case can vary somewhat to suit your requirements. Our case measures 61/2"x 43/4"x2 1/4", and is tacked and glued together from %" stock. The case is left bottomless for easy replacement of batteries, as shown in the photograph. Finish the outside of the case to suit yourself (the unit shown is covered with self-adhesive plastic material).

The three size-D flashlight cells are secured with a Keystone No. 176 twin holder, and a Keystone No. 175 single holder, but three No. 175 holders could be used instead. There is room for another No. 175 holder if 6 volts are desired.

Now, just put your amplifier to use with your FM tuner, AM tuner, crystal receiver, or high-output crystal or ceramic phono pickup. You can even use it as a utility amplifier for signal tracing, etc. Or build another—on a separate or on the same chassis—and do a little stereo listening!

**Big-Time Marine Radio**

Continued from page 80

with distress traffic removed from the calling frequency, it could then be used for the transmission of position reports. At present, position reports must be sent on the over worked “working” frequency, if they are sent at all by the ship. In practice, many position reports are supplied, via an intricate system of land lines, by lock masters (or his assistants), lift bridge operators, etc. While such an “intercom” certainly does work, increased use of radio would probably be better. Unfortunately, to separate calling and distress frequencies requires a change in international law.

Another proposed, less drastic, change would simply increase the number of working frequencies per station, certainly feasible, on VHF, but an operator would be required for each additional channel. Happily, this one wouldn’t run afoul of international politics.
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You Get More. Among “extra” features is a built-in power takeoff and panel mounted on-off switch for a 100 kc. calibrator; a front panel carrier balance control; a set of extra relay contacts keyed with the transmitter; and all VOX and bias adjustments available outside the cabinet on the rear apron.

The frequency dial utilizes a relatively uncommon vernier mechanism which provides a basic 6:1 vernier in combination with an automatic 30:1 vernier. As the dial is tuned towards the desired frequency the vernier is 6:1. If the dial is turned slightly past the desired frequency and then backed off the vernier shifts to 30:1. The 30:1 vernier covers approximately 10 degrees of any part of the scale. If you shift frequency beyond 10 degrees of scale the mechanism shifts back to a 6:1 ratio to avoid a long “cranking” session.

After a 15 minute warmup the EICO 753’s stability was well within the specified 400 cycles—in fact, we were able to work relatively long contacts with but one or two tuning corrections (done with the receiver offset). We must allow for the other ham’s station having some drift.

Final amplifier efficiency in the CW and SSB mode was quite good with a 200-watt input resulting in an output of slightly more than 100 watts. Typical of SSB transceivers with thrown-in AM, the AM output was only 30 watts for a 100 watt input.

On the Air. SSB audio transmit quality was excellent, as attested to by the unsolicited comments of many stations we worked. AM quality, typical of AM on SSB on crystal filter rigs, was just about passable. CW note was excellent—stable, no clicks or chirps.

Perhaps the most outstanding feature of the transmitter section is the VOX—about the best we’ve seen. Using a sensitive high quality mike placed 8 inches to the front and side of the loudspeaker we were able to adjust the VOX so there was no falsing (tripping of the transmitter) with normal voice levels (no shouting)—even with unusually loud speaker volume. The delay adjustment is quite good, the VOX can be adjusted to hold-in for full sentences or release at the syllable rate. VOX adjustment is very easy.

In the SSB and CW modes the receiver performance was notably good. A clean CW note, and excellent SSB—crisp with low distortion. There is an unusual amount of reserve audio gain—more than enough to overcome the high ambient noise levels of mobile operation. AGC action is good with virtually no speaker blasting when shifting from weak to strong signals. Sensitivity is about 1 uv. for a 10 db S+N/N ratio. Selectivity is about 2.7 kc. at the 6 db points.

There is no variable BFO; to obtain a beat note in the CW mode the receiver offset is detuned just enough to produce a comfortable note. But you must remember to allow for the offset when tuning a station to zero beat—zero beat is then equal to the offset.

AM reception, which is accomplished by modifying the SSB product detector into a grid leak detector—rather than using a diode detector—is just about passable. Better AM reception is obtained by using the SSB mode and tuning for zero beat.

Both a 115 VAC and a 12 VDC power supply are available. The AC power supply contains a built-in speaker and is styled to match the transceiver. The mobile supply is strictly a power supply; either a separate speaker or the auto radio speaker must be connected to the transceiver.

EICO’s 753 ham transceiver contains the significant features of more costly equipment, at equal or superior performance, at a kit price of $179.95 ($299.95 wired) less power supply and speaker. So far the EICO 753 stacks up as the best ham transceiver buy for 1966. The Model 751 AC Supply/ Speaker Console sells for $79.95 in kit form ($109.95 wired). Mobile bugs can pick up the solid-state power supply, Model 752, for $79.95 in kit form ($109.95 wired). For more information and complete specifications write to EICO Electronic Instrument Co., Inc., Dept. PP, 113-01 39th Ave., Flushing, New York 11354.
In this issue of White's Radio Log we have included the following listings: U.S. AM Stations by Frequency, Canadian AM Stations by Frequency, U.S. Commercial Television Stations by States, U.S. Educational Television Stations by States, Canadian Television Stations by Cities, and the World-Wide Short-Wave Stations.

In Our Next Issue. April-May 1966, the Log will contain the following listings: U.S. AM Stations by Location, U.S. FM Stations by States, Canadian AM Stations by Location, Canadian FM Stations by Location, Mexican and Cuban AM Stations by Location, and the expanded Short-Wave Section. The short-wave listings will always be completely revised in each issue of Log to insure 100% up-to-date information.

In the June-July issue of Radio-TV Experimenter, the Log will contain the following listings: U.S. AM Stations by Call Letters, U.S. FM Stations by Call Letters, Canadian AM Stations by Call Letters, Canadian FM Stations by Call Letters, and the expanded Short-Wave Section.

Therefore, in any three consecutive 1966 issues of Radio-TV Experimenter magazines, you will have a complete cross-reference listings of White's Radio Log that is always up-to-date. The three consecutive issues are a complete volume of White's Radio Log that offers up to the minute listings that can not be offered in any other magazine or book. If you are a broadcast band DX'er, FM station logger, like to photograph distant TV test patterns, or tune the short-wave bands, you will find the new White's Radio Log format an unbeatable reference.

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Every effort has been made to ensure accuracy of the information listed in this publication, but absolute accuracy is not guaranteed and, of course, only information available up to press time should be considered. Changes could have occurred by 1955 as shown by the Watkins & Mechanics Publishing Co., a subsidiary of Davis Publications Inc., 505 Park Avenue, New York, New York 10022.
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**Radio-TV EXPERIMENTER**

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**Notes:**
- The data includes FM and AM radio stations across the United States and other countries.
- Frequencies range from 88 MHz to 108 MHz for FM and 530 kHz to 1700 kHz for AM.
- Cities and states are indicated for each station.
- The table lists a variety of station call letters and their respective locations.
WISN Milwaukee, Wis.
WISW Whitehall, Ill.
WJSU Columbus, Ga.
WJSY Huntsville, Ala.
WJW Cleveland, Ohio
WJXN Providence, R.I.
WJYK Oklahoma City, Okla.
WJZ Baltimore, Md.
WJZC Jackson, Miss.
WJZF Richmond, Va.
WJZP Columbus, Ohio
WJZU Chicago, Ill.
WJZV Fort Wayne, Ind.
WJZS Jacksonville, Fla.
WJZZ Chicago, Ill.
WKST San Antonio, Tex.
WKBV Charleston, S.C.
WKBH Crystal Lake, Ill.
WKBZ San Antonio, Tex.
WKBX Milwaukee, Wis.
WKBW White Plains, N.Y.
WKBP Alexandria, La.
WKBB Boston, Mass.
WKBO Bakersfield, Calif.
WKBD Lebanon, Pa.
WKBC Boulder, Colo.
WKBM Bakersfield, Calif.
WKBB Buffalo, N.Y.
WKBW New York, N.Y.
WKBX Hartford, Conn.
WKBW Des Moines, Iowa
WKBX Milwaukee, Wis.
WKBZ Milwaukee, Wis.
WKCQ Hollywood, Fla.
WKCG San Antonio, Tex.
WKGW Cleveland, Ohio
WKGW Cleveland, Ohio
WKGD Madison, Wis.
WKGX Providence, R.I.
WKGW Madison, Wis.
WKGZ Dallas, Tex.
WKGX Providence, R.I.
WKGX Providence, R.I.
WKJN Pittsburgh, Pa.
WKJL Cleveland, Ohio
WKJL Cleveland, Ohio
WKJW New York, N.Y.
WKJZ Chicago, Ill.
WKJZ Clearwater, Fla.
WKJZ Chicago, Ill.
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<td>WAFH Allentown, Pa.</td>
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<td>WDFL Oklahoma City, Okla.</td>
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<td>WWOA New York, N.Y.</td>
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<td>WAFJ Jacksonville, Fl.</td>
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<td>WLIB Brookline, Mass.</td>
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<td>WAKA Columbus, Ohio</td>
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**FEBRUARY-MARCH, 1966**

**105**
WMCK McKeesport, Pa.
WWBZ Vineland, N.J.
WICR Williamsport, Md.
WMAC Dayton, Ohio
10
KTLD Tallulah, La.
KXGI Ft. Wayne, Ind.
WOBS Jacksonville, Fla.
WPDR Kalamazoo, Mich.
WICR Williamsport, Md.
KCAR Caruthersville, Mo.
WRKM采矿, Miss.
WKBK Ocean Lake, Ore.
WCAB Kankakee, Ill.
WAYZ Wyomissing, Pa.
WAGL Washington, D.C.
WGBK Wavelry, Ohio
WLHS Abbeville, S.C.
WBNX New York, N.Y.
WDBS Baltimore, Md.
WDBN Boston, Mass.
WDDC Washington, D.C.
WDBT Winsted, Conn.
WKBW Syracuse, N.Y.
WDRB Louisville, Ky.
KSBW Salinas, Calif.
KSBK Ft. Worth, Texas.
KSL Sid, Calif.
KCHS Cheyenne, Wyo.
KCI Radio, Ark.
KBMW Baltimore, Md.
KADV Crush, N.Y.
WKBK Ocean Lake, Ore.
WDBT Winsted, Conn.
WKBW Syracuse, N.Y.
WDBS Baltimore, Md.
WDDC Washington, D.C.
KSBK Ft. Worth, Texas.
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<tr>
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<td>CFBB Sudbury, Ont. 10,000</td>
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<tr>
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<td>CFCF Corner Brook, Nfld. 10,000</td>
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<td>620</td>
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**Canadian AM Stations by Frequency**

Canadian stations listed alphabetically by call letters within groups. Abbreviations: KC, frequency in kilocycles; W.P., power in watts; d, operates daytime only; n, operates nighttime only. Wave length is given in meters.
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**U.S. Commercial Television Stations by States**

**Location** | **C.L.** | **Chan.** | **State** | **City** | **City** | **Frequency**
--- | --- | --- | --- | --- | --- |
**ALABAMA** | | | | | |
BIRMINGHAM | WAPI-TV 13 | KOLG-TV 2 | WSFA-TV 12 | WSLA | |
<p>| Daetor | WBRG-TV 6 | KPHO-TV 5 | WMSL-TV 23 | WTVV | |
| Florence | WOVL-TV 15 | WTVV 19 | WTVV 19 | WTVV | |
| Huntsville | WAAV 31 | KTVG 2 | WHTN-TV 19 | WTVV | |
| Mobile | WKRQ-TV 3 | KTVF 4 | WKRQ-TV 3 | WTVV | |
| Montgomery | WCOV-TV 20 | KTVF 2 | WCOV-TV 20 | WTVV | |</p>
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U.S. Educational Television Stations by States
Includes Non-Commercial Stations. U.S. Stations listed alphabetically by cities in state groups. Territories and possessions fellow states. Abbreviations: Chon., channel; C.L., call letters.
# Canadian Television Stations by Cities

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## Abbreviations:
- **C.L.** - Channel letter
- **Chan.** - Channel number

*Note: Locations and channel numbers are for reference and may vary.*
World-Wide Short-Wave Stations

The World-Wide Short Wave Stations section of White's Radio Log is, as its name implies, a log that lists stations actually monitored by listeners in the United States, Canada and overseas. It is not intended to be a listing of all shortwave transmitters licensed as such listings contain numerous inactive transmitters, and low-powered stations which are rarely heard by DX'ers. The stations listed here, therefore, are those most often reported and consistently heard during the past few months. Many have been monitored by DX CENTRAL the official Radio-TV EXPERIMENTER monitoring post in New York City.

In our listings, a station or frequency marked with an asterisk (*) indicates a non-broadcast station or frequency. This might include aeronautical, maritime, military, or other type of transmission, either in regular AM or single sideband (SSB). In instances where many non-broadcast stations use the same frequency, we have given you a clue as to the type of stations to be found there, rather than pin down only one station.

Let Us Know. Listeners are invited to submit their loggings to us for publication in the Shortwave section of White's Radio Log. Be sure to include the following information for each station you report: approximate frequency, callsign and/or station name, city and country, and time heard in Eastern Standard Time, 24 hour clock. Address your reports to: DX CENTRAL, White's Radio Log, c/o Radio-TV EXPERIMENTER, 505 Park Avenue, New York, N. Y. 10022, U.S.A.

Time To Listen. All times shown in White's Radio Log are in the 24 hour EST clock system. For example, 0800 is 8:00 AM EST, 1200 is noon EST, 1800 is 6 PM EST, and so on. For conversion to other time zones, subtract 1 hour for CST (0800 EST is 7 AM CST), 2 hours for MST, 3 hours for PST.

The following abbreviations are used in our listings: BC—Broadcasting Company, Corporation, or System; E—Emissora: R—Radio or Radiodiffusion; V—Voice or Voz. Tnx. We are indebted to the following DX'ers who added their loggings to those of DX CENTRAL, the official Radio-TV EXPERIMENTER monitoring station in New York City, to bring you this month's listings:

John E. McLeod, Vancouver, B. C.
Richard Palandri, Melrose Pk., Ill.
Julian M. Sienkiewicz, Brooklyn, N. Y.
Leonard Thomas, Jr., Orlando, Fla.
Thomas Kushaer, Elmhurst, N. Y.
Ralph Trace, Avon, Conn.
Harry Nechetsky, Valparaiso, Fla.
Roger Camire, Manchester, N. H.
N. S. Jortner, New York, N. Y.
Dennis DiGalbe, Garfield, N. J.
Bob Neumann, West Chicago, Ill.
Donald Burns, Rego Park, N. Y.
Barry Firth, Lakeland, Fla.
Allan Bach, Allentown, Pa.
David Burstein, Bayside, N. Y.
Bill Wickersham, Detroit, Mich.
Sol Nussbaum, Brooklyn, N. Y.
Tom Kneitel, K2AES, New York, N. Y.
Kevin Shaw, Wilmington, Del.
E. F. Classen, Birmingham, Ala.
Frank Passage, Clifton, N. J.
John Day, Key West, Fla.
Larry Bauder, Oliver, B. C.
Dale Koby, Van Nuys, Calif.
Bradley Connors, Chevy Chase, Md.
Charles Hefferman, Auburn, Wash.
Larry Heaton, Weaver, Ala.
Gerald Clough, San Marcos, Tex.
Russell S. Sützer, Bridgeville, Pa.
Harvey Brody, Far Rockaway, N. Y.

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- Kuala Lumpur, Malaysia: 0615
- Rio de Janeiro, Brazil: 2008
- Valse, Austria: 0000
- Montevideo, Uruguay: 2030
- Vancouver, B.C., Canada: 0300
- St. Johns, Nfld., Canada: 1830
- Fort Lamy, Chad: 0000
- Mexico City, Mex.: 2325
- Kuala Lumpur, Malaysia: 0615
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duction just which circuits are hot.

**Finishing Touches.** Rubber-tired chest type casters were fitted to the bottom of the pedestal making the entire unit roll-away. A wooden rack mounted on the lower inside portion of the door easily accommodated the log and the call book. Ample space was available below the bottom shelf for a generous drawer fitted with a handle and in which a supply of QSL cards, stationery, extra pencils and various other miscellaneous station supplies were kept. The final paint and polish was added by labelling all controls external to the transmitter and receiver with the neat little AMI-CAL dry transfer titles.

Sand and paint the pedestal before installing your rig. Choose your own color scheme, of course; we used an olive green exterior to match the door and window trim in Jerry's abode. The interior was done in a cream buff which contrasted nicely with the equipment. The top of the pedestal and the top surface of the shelves as well as the front of the drawer were covered with a pale grey adhesive-backed shelf paper and \( \frac{1}{2} '' \times \frac{1}{2} '' \) aluminum angle was fitted around the pedestal top and on the facing edges of the shelves for finished appearance. And last, but by no means least, the station and operator license card in a small frame, was secured to the inside of the door near the top. Handbooks, manuals and current ham magazines found a neat resting place at the bottom of the pedestal below the drawer.

The result was an absolutely complete ham station with all accessories and supplies, safely enclosed and attractive in appearance both when in use and in storage and readily mobile by merely unplugging the RG58U antenna coax and the main AC cord. The coax feeder from the antenna entered through a window board and, when not connected to the gear, was wound in a coil of a few turns and hung behind the window drapes, completely concealed. Grounding of course was present in the copper braid shield of the coax.

Jerry can now dash from school, pull his roll-away shack out of the closet, plug in the AC and antenna connector, pull up his typewriter stand operating desk and in five minutes from the time he drops his school books on the bed, he's ON-THE-AIR!

**For the Big Rigs Too.** And now, before we wind up this little saga which puts the ham shack on a rolling pedestal, a few words to you older hams who say, "Sure; that's fine for the novice with little gear but what about us who have more sizeable equipment and other gadgets?" I think I can answer that one too, with an example. After a number of local hams had admired Jerry's ham shack in a box, Gene, a ham of the General class and in his middle thirties with quite a few on-the-air years behind him, decided that the roll-away set-up was for him too. With just a two-room apartment for he and his wife, he had been setting up some rather heavy gear on the kitchen table, manipulated various plugs and cords, hunted up his log and call book, dug his key, mike and phones out of a bureau drawer and about half an hour later was set up for business among a scattered bunch of gear. After looking over Jerry's compact shack, he saw no reason why he could not follow suit.

Carpenter work however, was not for him. He had no shop, no woodworking tools and claimed his woodcraft ability was something he'd rather not talk about! So... he had a local metal shop cut and drill a few pieces of aluminum angle (\( \frac{1}{2} '' \times \frac{1}{2} '' \) and of suitable lengths) and the local cabinet shop cut him out a plywood top and bottom and masonite panels for the four sides of the pedestal. With a small handful of machine screws and nuts he assembled the whole shebang in less than half an hour and in another fifteen minutes he had the whole assembly painted in a pleasing color from a spray can! Incidentally, his pedestal was a bit larger than Jerry's to accommodate his Johnson Ranger II transmitter and his Hammarlund receiver, which it did superbly. Fitted with rubber tired casters he simply had a big brother model of the roll-away we built for Jerry and every bit as convenient to use or store. A unit like this can be rolled alongside an available table or, as Gene later did, fitted with a drop leaf operating shelf on the right hand side. OK, so you say you're left-handed, then put the shelf on the left side and hinge the door on the right. Before you do anything though, it's best you give your quarters a close look to check out dimensions.

And now... who said they had a limited-shack-space problem? With a bit of ingenuity and resourcefulness and using the foregoing ideas, is there any good reason why you can't get your equipment together in a Roll-Away Shack?
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JAPAN & Hong Kong Electronics Directory, Products, components, supplies, 50 firms—just $1.00. Ipanpo Kaisha Ltd., Box 6266, Spokane, Wash. 99207.

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