

July 1968

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OFFICIAL JOURNAL OF THE ARRL

10 reasons to buy Hallicrafters' new SR-400 Cyclone

FEATURE	Hallicrafters SR-400	Collins* KWM-2	Drake* TR-4
Power Input	SSB=400 watts CW=360 watts	SSB=175 watts CW=160 watts	SSB=300 watts CW=260 watts
Accessory "dual receive" VFO available	Yes	No	No
Noise Blanker	Yes	\$135.00 Accessory	No
Receiver Incremental Tuning	Yes	No	No
Built-in notch Filter	Yes	No	No
Sharp CW Filter	Yes 200 cycles	No	No
Sensitivity	.3 uv for 10 db S/N	.5 uv for 10 db S/N	.5 uv for 10 db S/N
1 kHz dial readout	Yes	Yes	No
Carrier Suppression	60 db	50 db	50 db
Unit Price	\$799.95	\$1,150.00	\$599.95

*Data from published specifications.

Now: can you think of one reason why you shouldn't?

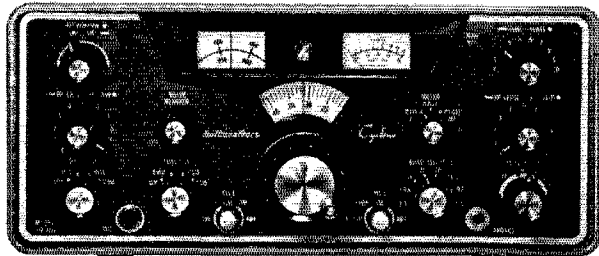
Superb sensitivity, 400 watts RF, 200 cycle CW selectivity, receiver incremental tuning, 1 kHz readout, amplified automatic level control, exclusive notch filter! There's even the HA-20 dual receive VFO for sensational, award winning DX operation. No matter what specifications or features you choose as a standard of comparison, the exciting new SR-400 fixed/mobile transceiver is unsurpassed. Unsurpassed feature for feature. Unsurpassed for rugged dependable performance in all environments. Unsurpassed in value and versatility. Prove it to yourself. Write for complete specifications in a four page brochure. See your Hallicrafters' distributor today.



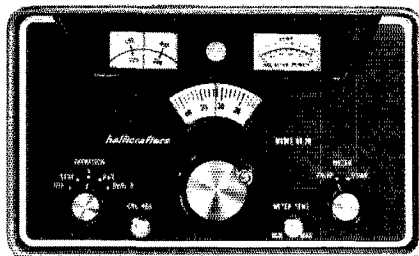
hallicrafters

600 Hicks Road
Rolling Meadows, Illinois 60008
A Subsidiary of Northrop Corporation

SR-400 Cyclone Transceiver

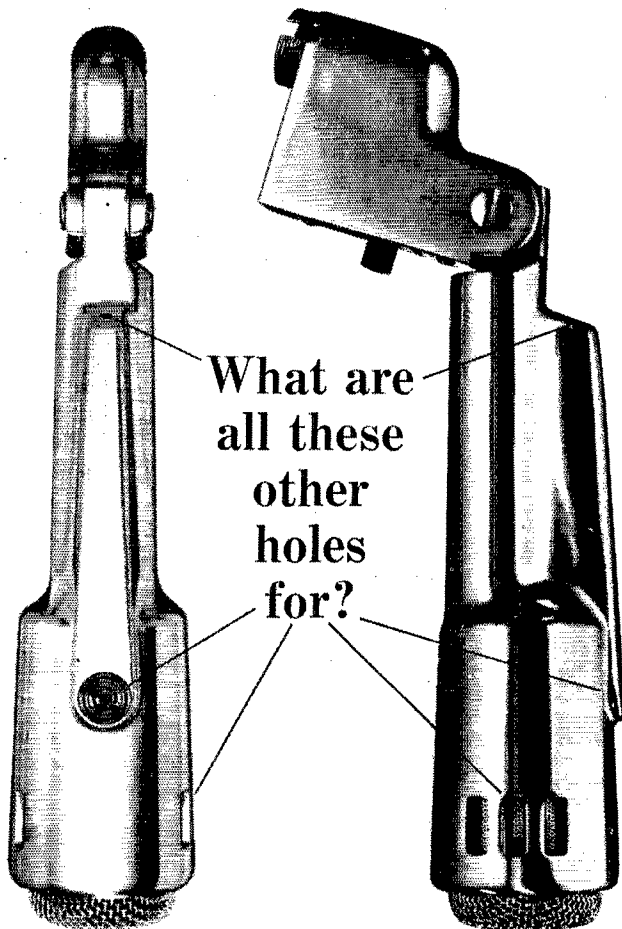
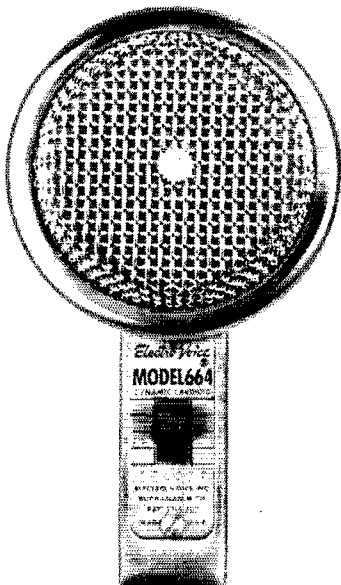


HA-20 VFO



Export: International Dept. Canada: Gould Sales Co.

If the
Electro-Voice
Model 664
picks up
sound here...



What are
all these
other
holes
for?

(E-V) The holes in the top, sides and rear of the Electro-Voice Model 664 make it one of the finest dynamic cardioid microphones you can buy. These holes reduce sound pickup at the sides, and practically cancel sound arriving from the rear. Only an Electro-Voice Variable-D® microphone has them.

Behind the slots on each side is a tiny acoustic "window" that leads directly to the back of the 664 Acoustalloy® diaphragm. The route is short, small, and designed to let only highs get through. The path is so arranged that when highs from the back of the 664 arrive, they are cut in loudness by almost 20 db. Highs arriving from the front aren't affected. Why two "windows"? So that sound rejection is uniform and symmetrical regardless of microphone placement.

The hole on top is for the mid-range. It works the same, but with a longer path and added filters to affect only the mid-frequencies. And

near the rear is another hole for the lows, with an even longer path and more filtering that delays only the bass sounds, again providing almost 20 db of cancellation of sounds arriving from the rear. This "three-way" system of ports insures that the cancellation of sound from the back is just as uniform as the pickup of sound from the front—without any loss of sensitivity. The result is uniform cardioid effectiveness at every frequency for outstanding noise and feedback control.

Most other cardioid-type microphones have a single cancellation port for all frequencies. At best, this is a compromise, and indeed, many of these "single-hole" cardioids are actually omnidirectional at one frequency or another!

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*Pat. No. 3,115,207

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Subscription rate \$7.50 per year post-paid, U.S. funds, in Canada and U.S.; \$8 elsewhere. ARRL Membership, including QST, available only to individuals with a bona fide interest in amateur radio. \$6.50 per year, U.S. funds, in Canada and U.S.; \$7 elsewhere. Single copies, 75 cents. Foreign remittances should be by international postal or express money order or bank draft negotiable in the U.S. and for an equivalent amount in U.S. funds.

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INDEXED BY Applied Science and Technology Index. Library of Congress Catalog Card No.: 21-9421

PUBLISHED MONTHLY. AS ITS OFFICIAL ORGAN, BY THE AMERICAN RADIO RELAY LEAGUE INC., NEWINGTON, CONN., U. S. A. OFFICIAL ORGAN OF THE INTERNATIONAL AMATEUR RADIO UNION

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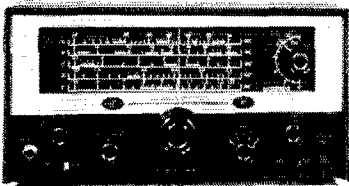
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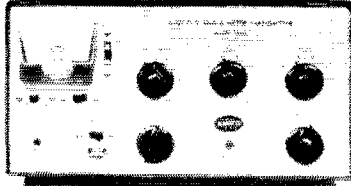
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VFO-621

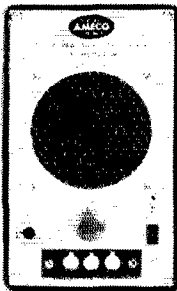
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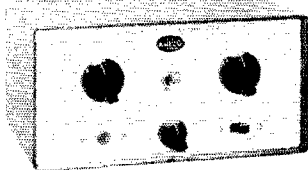
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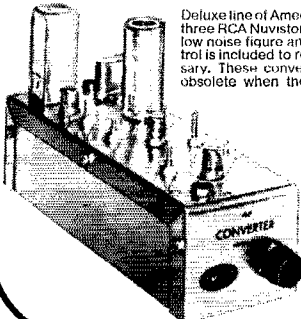
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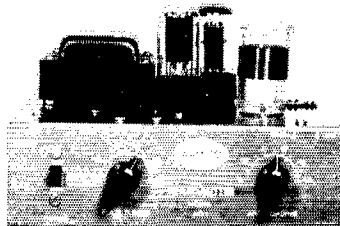
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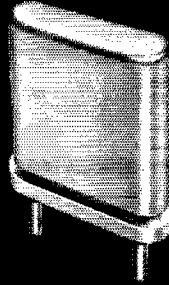
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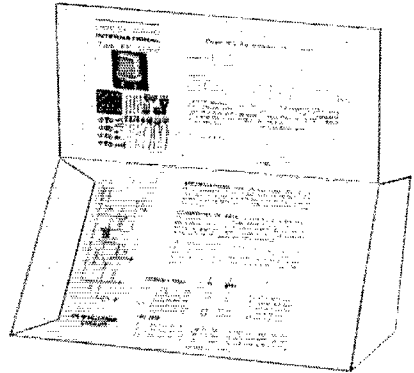
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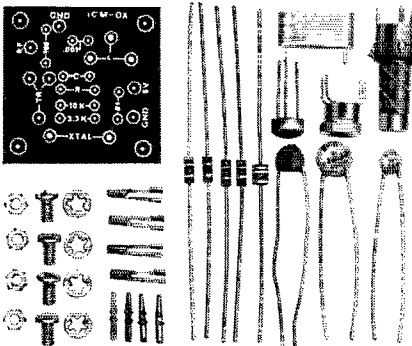
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It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

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* Member Executive Committee

"It Seems to Us..."



Paul M. Segal, ex-9EEA, W3EEA, former director (1924) from the Rocky Mountain Division, and General Counsel of ARRL from 1928 to 1961, passed away in Washington, D.C., May 24, 1968. Of his many achievements and contributions to the advancement of amateur radio (see page 40, January 1962 *QST*), we know of no more fitting tribute to his memory than to reprint here the six "commandments" he authored more than 40 years ago, and which principles are still applicable today.

THE AMATEUR'S CODE

• ONE •

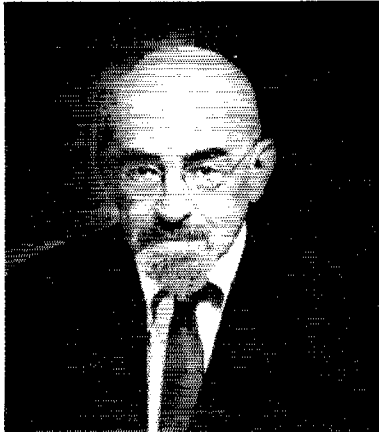
The Amateur is Gentlemanly . . . He never knowingly uses the air for his own amusement in such a way as to lessen the pleasure of others. He abides by the pledges given by the ARRL in his behalf to the public and the Government.

• FOUR •

The Amateur is Friendly . . . Slow and patient sending when requested, friendly advice and counsel to the beginner, kindly assistance and cooperation for the broadcast listener; these are marks of the amateur spirit.

• TWO •

The Amateur is Loyal . . . He owes his amateur radio to the American Radio Relay League, and he offers it his unswerving loyalty.



• FIVE •

The Amateur is Balanced . . . Radio is his hobby. He never allows it to interfere with any of the duties he owes to his home, his job, his school, or his community.

• THREE •

The Amateur is Progressive . . . He keeps his station abreast of science. It is built well and efficiently. His operating practice is clean and regular.

• SIX •

The Amateur is Patriotic . . . His knowledge and his station are always ready for the service of his country and his community.

— Paul M. Segal

League Lines . . .

A hundred thousand members are too many to invite as guests to an ARRL Board of Directors meeting, but the minutes in the Happenings Department -- and particularly the picture story intermingled therein -- we hope makes it almost an "I-was-there" experience.

Special 50- and 25-year League lapel pins will soon be in production to recognize holders of those terms of continuous (no breaks permitted) membership. There's no charge, but requests will be handled on a first-come, first-served basis. So please let us know promptly (postcard will do, with your complete name, call and current address including zip) if you qualify for one of these distinctive pins.

Field Day is not affected this year, nor is any other club communications activity up until November 22, but remember that thereafter your club station may operate only in the subbands authorized to BOTH the trustee and the operator on watch. For full use of all band segments, make sure your trustee gets the Extra Class by this autumn.

Conflicts between amateur gatherings (conventions, hamfests) the same weekend, with sponsors unaware of each other's plans until too late, has occasionally caused much gnashing of teeth. Responsive to Board direction, Hq. will act as a registration center for coming events during the next two years. Please let us have information on any plans you or your club has for major gatherings -- conventions, hamfests or other affairs covering more than local territory. We'll keep a master and send a copy of the current calendar listings to anyone furnishing an s.a.s.e. This will not guarantee complete protection for your own dates, but will at least give you a chance, when you start your own plans, to avoid the same weekends already picked by others.

Effective Tuesday July 2 (GMT), on a temporary trial basis, an extra ten minutes each of 20 and 25 w.p.m. code practice will be transmitted by W1AW during the 0130 GMT code practice period (Tuesdays through Sundays GMT). It's an additional service for Extra Class applicants.

Two amateurs from Kentucky have been indicted by the Department of Justice for use of obscene and profane language. They were participants in the rubbish which has been appearing all too often on 75-meter voice (see January League Lines), apparently under the guise of "free speech." Those of us thoroughly disgusted with such antics, which badly damage amateur radio's image, can be reassured that enforcement authorities are not ignoring the problem, but are taking the necessarily-slow steps to solve it.

When was the last time your club held open house -- inviting family, friends and neighbors to a special meeting? Can be great fun for all, especially if the program includes a demonstration of something reasonably new like RTTY, amateur TV, etc. See pages 79 and 60 for ideas on how both small and large projects can be accomplished.

We've recently updated our list of source material for blind amateurs -- Braille texts, tapes, records, etc. -- and will be glad to send a copy on request. A self-addressed envelope will speed our handling.

Loop and tuning unit mounted on author's sedan. Supporting braces toward rear are of aluminum tubing, which must be insulated from the loop.



The MABAL Antenna

Mobile All-Band Amateur Loop

BY WILLIAM S. BRIDGES,* K1KLM

An interesting and effective application of the "Army"-type loop antenna, for increased efficiency and convenience in mobile operation.

IN common with most other mobile operators, the author has never been quite satisfied with the performance of the loaded-whip antenna, in respect to either performance on the lower-frequency bands, or facility in changing bands. Therefore, an article that appeared in a recent issue of *Electronics* describing a loop-type antenna^{1,2} was of more than passing interest.

In attempting to apply this principle to a mobile installation, the chief difficulty was in solving the mechanical problems. It was obvious that vertical mounting of a loop of such size on a car was impractical. However, it was reasoned that, since such a loop is essentially non-directional, it should work in a horizontal position. Accordingly, several models were built and tested. The final arrangement is shown in the photographs.

Although 75-meter operation was the prime objective, it was found that the loop could be resonated, and a match to 50-ohm line obtained, at frequencies from 2.8 to 7.3 Mc., and from 14 to 22 Mc. with the matching and tuning

*547 Bishop Drive, Orange, Conn. 06477.

¹Patterson, "Down-to-Earth Army Antenna," *Electronics*, Aug. 21, 1967. This antenna was also reported in *QST* for March, 1968.

²The advantages of loop-type mobile antennas have been pointed out by other amateurs in past issues of *QST*, e.g., W4IBZ (Feb., 1951), W4TKL (July, 1953), and W4IMM (June, 1954). — Editor.

values available. It was also found possible to extend the operation to as high as 30 Mc. with an s.w.r. not exceeding 3 to 1.

Careful comparisons made by rapidly switching between the loop and a conventional center-loaded whip invariably have shown the loop to be better by 6 to 10 db. In some instances, fixed stations have reported an improvement of as much as 18 db. No directional characteristics are apparent.

In spite of its size, the loop has some physical advantages over the whip. It is possible to drive directly into the garage without having to get out to telescope a whip. (However, an encounter with a car-washing machine is not recommended!) The loop-type antenna also lends itself well to installation on station wagons and panel trucks where whip antennas often present problems.

Control Circuit

As shown in Fig. 1, the loop is fed with a capacitive network. The balanced network suggested by Patterson was tried. Although the loop could be tuned to resonance with this configuration, signal reports were down. (I suspect that this may be a result of some capacitive effect between the car body and ground.) The fixed capacitors used are some that I happened to have on hand. The Vitramon capacitors had been tested earlier and found to be capable of handling the necessary r.f. current. Transmitting-type mica capacitors would probably be equally satisfactory, although they take up more space.

To make adjustment of the antenna compatible with the flexibility of the multiband

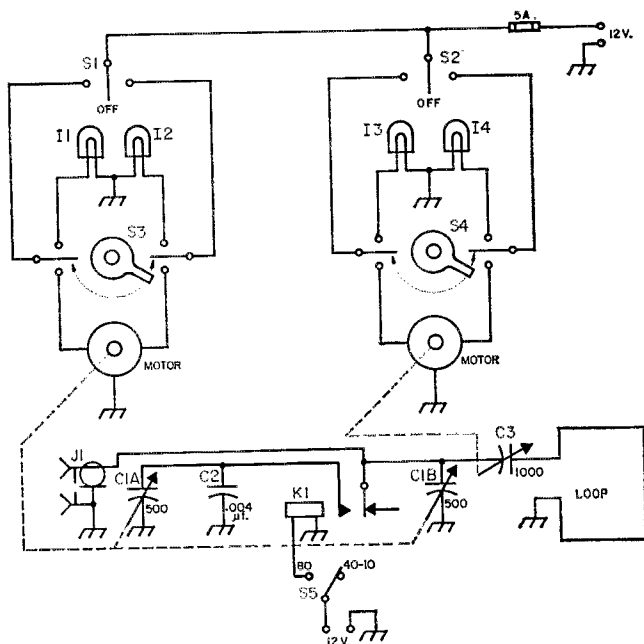


Fig. 1—Wiring diagram of the remote tuning system for the mobile loop antenna. If desired, relay-contact connections may be altered to connect in the 80-meter padding in the unenergized position.

C_1 —Dual t.r.f. variable, approx. 500 pf. per section.

C_2 —Parallel combination of fixed capacitors. These capacitors must be capable of carrying significant r.f. current. The combination used by the author consists of two 500-pf. 20-kv. ceramic TV "doorknob" capacitors, and two 1500-pf. 500-volt ceramic capacitors (Vitraron) in parallel.

C_3 —Same as C_1 , sections connected in parallel.

I_1 — I_4 —12-volt indicator lamp.

J_1 —Chassis-mounting coaxial receptacle.

K_1 —12-volt d.c. d.p.s.t. relay, 25-amp. contacts, poles in parallel.

S_1 , S_2 —S.p.d.t., center off, spring-return lever switch (Switchcraft 3033, nonlocking, suitable). Each may be replaced by two momentary-contact push-button switches, one button for forward, and one for reverse.

S_3 , S_4 —Limit switch (included as part of motor). Motors are available from Electro Sales Co., 356 Mystic Ave., Somerville, Mass. 02145, Stock No. M4012EVB3 (\$9.50 each). These are actually 28-volt motors, but operate very satisfactorily at 12 volts.

S_5 —S.p.d.t. toggle switch.

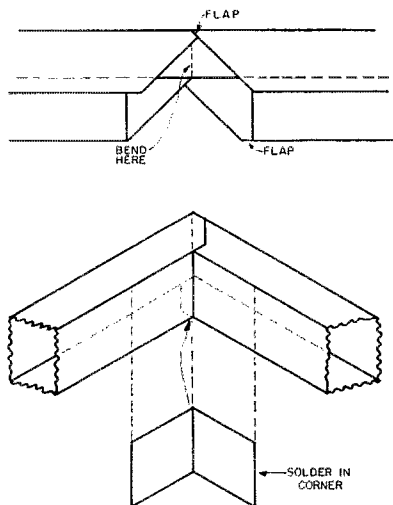


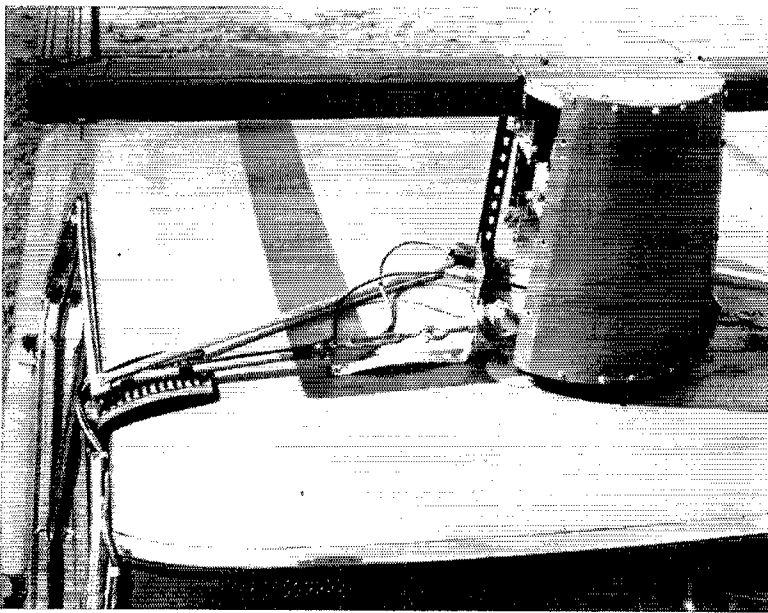
Fig. 2—Method of making loop corners to minimize resistance.

transceiver used, it was decided to provide for remote operation of the tuning and matching capacitors from the driver's seat. This was accomplished by using small motors (surplus aircraft control actuators) to drive the two multi-section variable capacitors, C_1 and C_3 . A relay is used to switch in additional capacitance (C_{1A} and C_2) for 75-meter operation.

The motors used have built-in limit switches. These switches can be adjusted to limit rotation to anything between 45 and 180 degrees. When rotation has reached the limit for which the switches have been set, rotation in that direction ceases automatically, and a lamp (I_1 - I_4) lights, signifying that the limit has been reached. Adjustment is monitored by means of an s.w.r. meter permanently installed in the coax line, while a field-strength meter is used for output indication.

Construction

The importance of low r.f. resistance in the loop circuit was stressed by Patterson. In constructing the mobile loop, both aluminum TV



This view shows the general construction of the tuning-unit housing, and the manner of fastening it to the roof of the car. One side of the loop feed point may be grounded; the other side must be kept insulated from ground.

masting and plain rectangular aluminum downspouting were tried initially. However, both presented difficulties in achieving reliable low-loss joints. In the final and most-satisfactory model, copper-plated aluminum down-spouting was

used. This material has the advantage that it can be readily soldered for good low-loss joints.

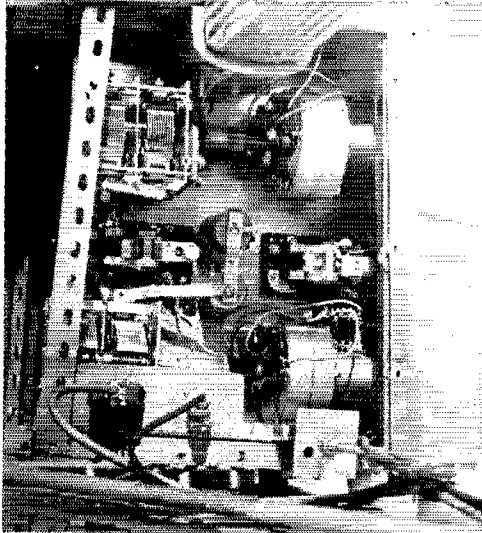
The dimensions of the loop used by the author are approximately 4 feet wide by 8 feet long. The downspouting comes in 10-foot lengths, so three lengths are required. To minimize r.f. resistance, it is advisable to make the loop with as few joints as possible. The corners should be made as bends in the downspouting, as shown in Fig. 2, rather than to attempt to join two pieces together at this point. The two rear corners should be made by bending a single length of downspouting approximately 3 feet from each end. All joints should be made watertight by the generous use of solder and patching plates (not to exclude water, but to assure maximum electrical contact).

The housing for the tuning unit was made of sheet over plywood top and bottom pieces fashioned to teardrop shape. All connections in the unit should be made with the shortest possible lengths of heavy copper braid, or wide copper strap.

Adjustment

Tuning is simply a matter of adjusting the two variable capacitances for maximum output as indicated on the field-strength meter, and minimum s.w.r. as indicated by the s.w.r. meter. Segments of about 50 kc. can be covered on 75 without readjustment of the tuning or matching. By making slight readjustments, an s.w.r. of 1 to 1 can be maintained across the entire band.

In conclusion, I would like to thank all those who assisted in testing and evaluating the antenna, especially WA1BHU, and also my wife, Penny, for her patience and understanding.



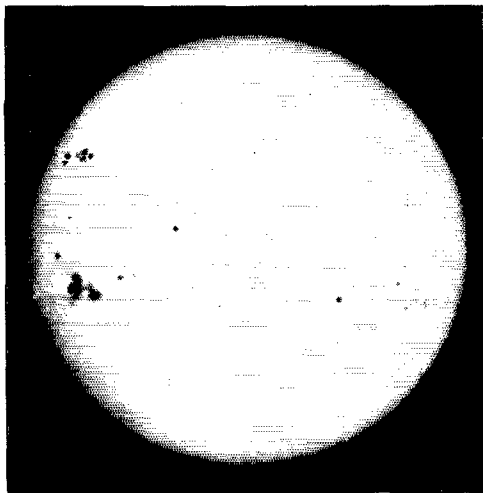
Interior of the tuning unit, showing remote-control motors coupled to the variable-capacitor shafts. The original motor covers have been removed. The shaft coupling must be insulated for at least C₃. The 80-meter relay and padding capacitors are at left center. The relay at right is for the insertion of additional capacitance for future expansion to 160 meters. Notice the insulating sheet between the loop feed-point ends at the top of the photograph.

• *Beginner and Novice*

Where Did The Signal Go?

How Your Signal Gets To The Other Guy's Station.

BY LEWIS G. MCCOY*, W1ICP



Which is the best band to use for local contacts? Is high power necessary to work DX? What are the best DX bands? These are some of the questions covered in this article on radio wave propagation, written especially for the beginner.

I'd like a set that will work at least 500 miles; how much power will I need?" Or, "I want to work foreign countries, can I do this as a Novice?" These and similar questions frequently asked by newcomers point up the need for understanding what to expect when operating on the different bands available to the Novice. How far one can work and what power is required depend on several factors, the more important of which are the choice of band, time of day, and radio propagation conditions. While power is a factor, it is not nearly as important as many newcomers think.

Many Novices have the mistaken concept that all bands (frequencies) are the same. They assume that if an 80-meter signal can go 500 miles at a given time, a signal on any of the amateur bands can do the same. Actually, each band is different and has its own characteristics, as will be shown.

Possibly your first interest in getting into amateur radio is to "talk to far away places, with strange sounding names." Or perhaps you would just like to talk to local hams, or do both. Whatever your desires are, it is a good idea to know how your signal reaches another station, or vice versa. Once you have a clear picture of how this happens, then you can choose the band best suited for the purpose.

To keep your thinking as clear as possible, let's dispense with transmitters and receivers for

the moment and just visualize an antenna from which radio signals are radiated. Think of the radio waves as you would think of light traveling from a light bulb, in all directions. In actual practice, some antennas concentrate the radiation in certain directions just as a flashlight would concentrate its light in a beam. Other antennas would "broadcast" the signal in all directions. In our discussion, we'll be talking about component parts of the light being radiated, or rays. Radio waves, like light, travel in a straight line until they are bent, refracted, or reflected.

When radio waves leave an antenna, some of the rays travel along the surface of the earth. These are called *ground waves*. As the wave travels along the surface of the earth it continually loses power in the earth's resistance; thus the "attenuation" of such signals is quite rapid. This attenuation puts a rather strict limit on the distance a ground-wave signal can travel.

The Ionosphere

If ground-wave signals can only travel relatively short distances, then how is it possible to communicate with stations on the other side of the earth? Some of the rays leaving our antenna travel up into the sky and this part of the signal is called the *sky wave*. Of course, if these waves traveled up into the sky and then out into space, with no way of returning to earth, they would be useless for long-distance communication. Earlier we said that the rays travel in a straight line until they are bent, refracted or reflected; fortunately, this is exactly what happens.

Extending around the earth is a region in the atmosphere known as the ionosphere. If you could see the earth from space and the ionosphere were visible (it isn't), you would see a halo or aura around the earth, extending from about 35 miles above the earth's surface to approximately

*Novice Editor

200 miles up. The ionosphere is made up of three layers or regions of ionized, rarified air. The lowest layer is called the "D region" and starts about 35 miles high, extending up to approximately 70 miles. At 60-70 miles we have the "E layer" which goes up to about 175 miles. Extending above this is the "F layer." During daylight hours, the F region breaks up into two layers, called the "F₁" and "F₂" layers. The lower, or F₁, layer starts at about 140 miles and the F₂ layer at about 200 miles. See Fig. 1 for an illustration of the ionosphere.

The amount of ionization is believed to be controlled by the sun's radiation, since the intensity of ionization in the various layers goes through pronounced changes from daylight to darkness. In fact, the lowest region -- the D region -- doesn't even exist after darkness. The E layer similarly disappears at night or is considerably weakened, although sporadic clouds of ionized air sometimes exist in this region at night.

For signals to travel any appreciable distance they must go via the sky, and this is where the ionosphere gets into the act. As an example of how the ionosphere affects a signal, let's say we are transmitting on 3700 kc., at noon, local time. Our signal leaves the antenna and travels up into the ionosphere. The first region it encounters is the D region. The D region does not reflect radio signals, it only weakens them. After our signal -- or what's left of it -- gets through the D region it enters the E layer. The E layer serves as a reflector and reflects our signal back down to earth. Of course, the signal has to pass through the D region to get back to earth and this further weakens the signal. Fig. 2 illustrates this process. The interesting point about 80 meters under the conditions just described is that in order to work somebody say 10 or 20 miles away, your signal has to travel about 150 miles -- about 75 miles up and 75 miles back. A ground-wave signal would usually be attenuated to the point where it couldn't be heard 10 or 20 miles away.

During the daylight hours, only the high-angle components of your signal are useful on 80 meters. Low-angle rays have to travel considerably farther through the D region and consequently are completely absorbed. After dark, the lower two regions disappear and the lower-angle signals are reflected back from the F layer, permitting contacts of several thousand miles. Not only are the signals reflected back to earth, but on reaching the earth again they can be reflected back up to the F layer and again back to earth. Depending on the condition of the F layer and the amount of absorption in the earth at the reflection point, many such "hops" can take place, extending communication to large distances. When a signal is reflected successively in this way it is called *multihop* transmission. Fig. 3 shows it.

Fading, or QSB

After a little thought, it should be apparent that a radio signal can travel by several paths

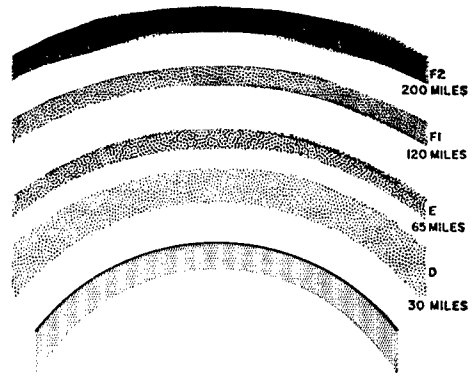


Fig. 1—This drawing shows the ionosphere as it would be during the daylight hours. After dark, the lower layers would disappear, leaving just the F₂ layer (Not drawn to scale).

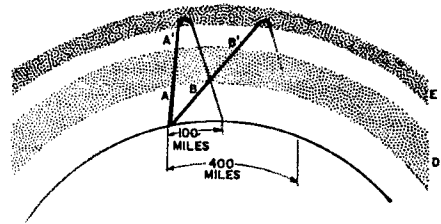


Fig. 2—During daylight hours, signals on 160, 80 and 40 meters are influenced by the D region. The higher-angle rays would be the only ones returned to earth. This is apparent from the distances the signals must travel through the D region. Note that with the high-angle signal the distance from A to A₁ is much less than B to B₁.

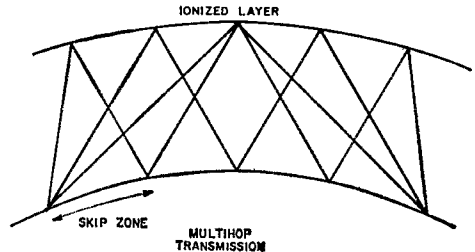


Fig. 3—The skip distance is the distance from the antenna to the first "bounce" back to earth. This drawing shows some of the multihops possible. In addition, there can be reflections from both the E and F₁ and F₂ layers to further complicate the picture.

to reach the same destination. Taking the overall signal, one ray may arrive by one hop while another ray takes two, and still others may even take several hops. Since each path is a different length, the signals may or may not add up together to be "in phase" at the receiving location. When the signals are exactly in phase at the receiving point, the received signal will be the strongest. Any other condition can cause the signal to be weaker. If the ionosphere conditions stayed perfectly fixed, the signal at the received end would be more or less constant. But this isn't the case, because the ionosphere is always changing and the various hops constantly change. This in turn changes the phase of the signals arriving at the final destination, causing the signal to rise and fall in amplitude — or, to put it another way, we have fading. In radio parlance, this effect is called "QSB."

The Higher Frequencies

As we go higher in frequency the *D* region has less and less effect on the signal. In fact, as far as amateur frequencies are concerned any frequencies above 14 Mc. are not affected by the *D* region.

On 80 meters the average daytime distance that can be covered is on the order of a few hundred miles, with much longer contacts possible after dark. However, on 40 meters, while there is some absorption of the signal by the *D* region, the loss of signal is not as pronounced as at 80 meters. Lower-angle signals can get through the *D* region to be reflected back, and daytime distances of up to 1000 miles are possible. At night, when the low absorption favors multihop transmission, distances on the order of 5000 miles or more are quite common.

On 20, 15 and 10 meters we encounter some entirely different effects as far as the ionosphere is concerned. As we said, the *D* region has little, if any, effect on these signals. Let's take another example and see how it works, say 21,100 kc. at noon, local time.

The high-angle rays — those that go directly upward — leave the antenna and first go through the *D* region, then through the *E* layer, and then on through the *F* layer and out into space, *without* being reflected back to earth! This is explained by the fact that the angles at which these rays travel through the *E* and *F* layers are such that the layers don't get a chance to bend or reflect them back to earth. The highest angle that gets returned to the earth is known as the *critical angle*. This means that there is an area around the antenna, extending out several hundred miles, where no signals are returned. This area is called the *skip zone*.

However, rays leaving the antenna at lower angles *will* be bent and returned to earth by either the *E* or *F* layer, if there is sufficient ionization. If neither layer is sufficiently ionized, the signals will pass on through and into space. When there is adequate ionization and the signals are returned, the band is said to be "open." Also, when these bands are open, the

signals at several thousand miles out will be much stronger than for the same distances with 80-meter signals. The reason for this is that the absorption in the ionosphere of the high-frequency signals is much less than with 80-meter signals. In fact, it is possible to work almost anywhere in the world on 15 and 10 meters using only a few watts input. One amateur we know of worked from the East Coast to Australia with a transmitter running 100 milliwatts input — one-tenth of a watt!

Sunspots

One point that bears mentioning in relation to the ionosphere is the *sunspot cycle*. Over a period of several years the number of sun spots increases to a peak and then gradually decreases to a minimum. This time period from one maximum to the next usually covers about 11 years. When the sunspot number is at the maximum, the ionization of the higher bands is at its best, and excellent DX or world-wide communications are possible. We are now approaching a sunspot maximum, so the next few years should be excellent on the 20-, 15- and 10-meter bands. At the sunspot minimum, conditions for world-wide contacts on 10 meters are very poor, with the band seldom open. However, distances up to 100 to 150 miles can be worked consistently on this band, depending on the terrain and on the antennas used.

Above 10 Meters

Something we haven't mentioned up to this point is the *maximum usable frequency*, or the highest frequency that can be reflected back to earth by the ionosphere. Let's assume for a minute that we have an antenna that sends a ray straight up from the antenna, and that we start at a very low frequency and increase it as much as we desire. At the lowest frequency the vertical signal will enter the ionosphere and be returned to earth, but as we raise the frequency, eventually a frequency will be reached where the ionosphere doesn't bend the signal back but lets it escape into space. The highest frequency that does come back is called the *critical frequency*.

Next, suppose we gradually lower the ray angle of our signal and repeat the frequency run. As we continue to lower the angle, we find that we can go progressively higher than the critical frequency and still have our signal return to earth. However, we eventually reach a frequency that isn't returned, even at the lowest possible ray angle. This frequency is referred to as the *maximum usable frequency*, or m.u.f., and usually is about 2.5 times the critical frequency.

The critical frequency and, in turn, the m.u.f., depend on many factors — time of day, time of year, condition of the sun, and others. During the last sunspot maximum the m.u.f. got as high as 60- to 70 Mc. It may drop below 7 Mc. during a sunspot minimum. One interesting point is that the closer your frequency to the

(Continued on page 144)

Digital Logic Devices

Symbols, Nomenclature, and Principles

BY NORMAN POS,* WA6KGP

"Digital logic" is the term used to describe an overall design procedure for electronic systems in which "on" and "off" are the important words, not "amplification", "detection", and other functions well known to all amateurs. It is "digital" because it deals with discrete events that can be characterized by digits or integers, in contrast with ordinary (*linear*) systems in which an infinite number of levels may be encountered. It is "logic" because it follows mathematical laws in which "effect" predictably follows "cause."

Digital logic is not new to QST. So far, however, explanations have been scattered through articles describing equipment. Here the fundamentals are assembled in one place.

DURING the past few years there has appeared an increasing number of articles in *QST* and elsewhere dealing with digital-circuit contrivances useful around a ham shack. Although most of these have been keyers of various sorts, it seems clear that the future promises increasing usage of these circuits in various phases of communications, their role in computer design being already quite firmly established. Accordingly, to aid the amateur in keeping up with these developments, and to accumulate in one article most of the current terminology and symbology, this article will describe with some generality how these devices work. The emphasis will be mainly on microcircuits, although the same principles apply to discrete-component circuits.

In years gone by, homebrew construction evolved away from the actual construction of components to construction of equipment using purchased components, with the possible exception of r.f. coils. The present-day development of digital devices is seeing a similar evolution away from the use of discrete components toward the use of microcircuits which perform quite complicated functions. Not the least reason is that one microcircuit costs far less, and is much more reliable, than the equivalent circuit built from discrete components. In addition, the logical functions are much more easily followed when the diagram is logical in nature, rather than a forest of resistors and tubes and what not. Recall that it was not necessary to understand space-charge physics, or cathode work functions, to use vacuum tubes intelligently. Likewise, one need not really be too concerned with the insides

of microcircuits to be able to use them. This article will speak mainly of the "input-output" characteristics of these devices.

Before proceeding, it should be realized that there is no broad agreement yet in matters such as logic symbols, equation symbols, and terminology.¹ However, matters are improving, and in this article the more common usages will be employed. Also, this article will be restricted to two broad categories of logic elements, "gates" and "flip-flops," because these represent nearly all of the more common applications.

Gates

There are three primary logic functions which gates perform. They are the AND, OR, and the NOT functions. These may be combined in fancy ways to form other types of gates, but essentially these three cover the field.

Logic elements deal with "ones" and "zeros". These refer to specific voltage levels, and vary between manufacturers and devices. Nearly always, a "0" means a voltage near ground, while a "1" means whatever the manufacturer says it means. Actually, the corresponding voltages in both cases are approximate because there

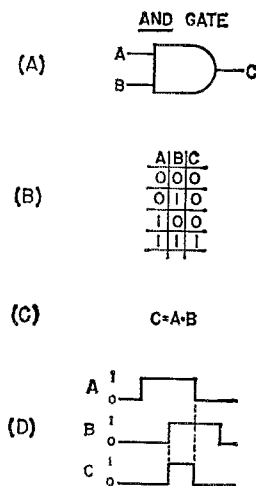


Fig. 1—The AND gate. (A) the symbol used in logic diagrams; (B) truth table, which shows the output state for every combination of inputs; (C) Boolean-algebra equation of the AND gate; (D) graphical representation of the possible states.

¹ The basic logic-circuit symbols are covered by a USA Standard, ASA Y32.14, "Graphic Symbols for Logic Diagrams", but there is as yet no standard covering nomenclature or letter symbols. — *Editor*.

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is a "noise margin" over which the devices will work. This is nice because it allows (within limits) uncritical wiring and noise pickup without ill effect. One must distinguish between "positive logic" and "negative logic." In positive logic, a 1 is more positive than a 0, though both may be negative voltages, and in negative logic, the reverse is true.

Fig. 1 shows an AND gate, drawn for positive logic. The four parts of Fig. 1 are entirely equivalent and are different ways of depicting the same thing. Fig. 1A is the symbol for a two-input AND gate. Gates may have many inputs, but using just two will make things clearer at first. Extension to more than two inputs is direct and straightforward. The inputs are labeled *A* and *B*, and the output is labeled *C*. These alphabetic names are called "variables". In plain English, the output is 1 only when both inputs are 1. Fig. 1B shows what is known as a "truth table" for the AND gate. All the possible combinations of inputs are listed, together with the resulting output. In Fig. 1C we have the logic equation which describes the same action analytically. These logic equations should not be confused with ordinary algebraic equations. They are known as "Boolean" equations, and are quite a bit simpler. The dot is used to mean AND, a little \vee (or sometimes a plus sign) means OR, and a bar over a variable means NOT. Variables are either 1 or 0 in value. So equation 1C means that *C* is 1 only if *A* and *B* are 1. Fig. 1D shows a time plot of the voltages at *A*, *B*, and *C*, and again exhibits exactly the same properties as the rest of Fig. 1. Different folks find one or the other of these various methods of depicting the logic action most appealing. The reader is free to choose his favorite, although all should be understood.

A little circle at either input or output is used to mean NOT on a circuit diagram. Fig. 2 shows a NOT gate, also called an "inverter." The interpretation of Fig. 2 is simply put: The output is *not* the input (no pun intended!).

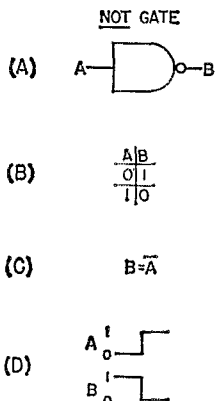


Fig. 2—Simple gate with inversion (NOT gate), the level reversal being indicated by the small circle attached to the gate symbol. (B), (C) and (D) give information corresponding to the same parts in Fig. 1.

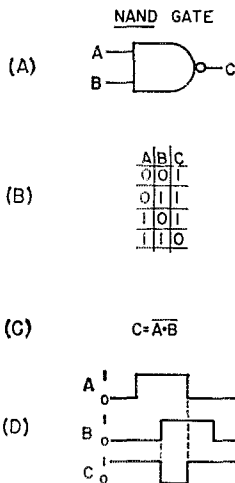


Fig. 3—The NOT-AND or NAND gate, an AND gate with inversion.

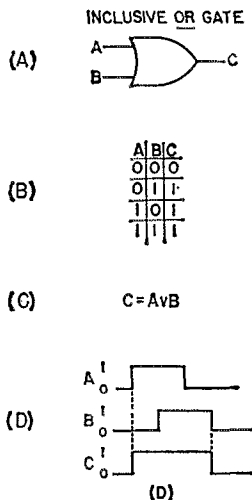


Fig. 4—Inclusive OR gate. The word "inclusive" indicates that the gate will be operated by any combination of logical 1 inputs as well as by any single 1 input.

If Figs. 1 and 2 are combined, we have the NOT-AND gate, usually contracted to NAND. This is shown in Fig. 3. Note that the result is just the opposite of Fig. 1. For internal reasons, the NAND gate is somewhat more common than the AND gate.

When we come to the OR function, we have to be careful. I may say, "either it will rain tomorrow, or it will not." This is called the "exclusive or" since the "or both" possibility is evident nonsense. On the other hand, if I say, "Harry will make DXCC if he receives a QSL from Saudi Arabia or Malawai," it is still true if the lucky fellow receives both cards. This is called the "inclusive or" function. There are no common contractions for these two OR functions

because until recently the inclusive OR dominated the market, again for internal reasons. Unless otherwise stated, an unspecified OR in the literature *probably* means an inclusive OR.

The inclusive OR is shown in Fig. 4. In a manner similar to the NAND gate, we may produce a NOR gate, which is shown in Fig. 5.

The exclusive OR is shown in Fig. 6. The equation 6C has to be written in this expanded form in order to specifically exclude the case when both A and B are 1. Equation 6C says that C is 1 if we have A and NOT B, or NOT A and B, but not both. In this case, the time plot of 6D may be somewhat clearer.

We are now in a position to observe something curious and interesting. If, in Fig. 1, we employ

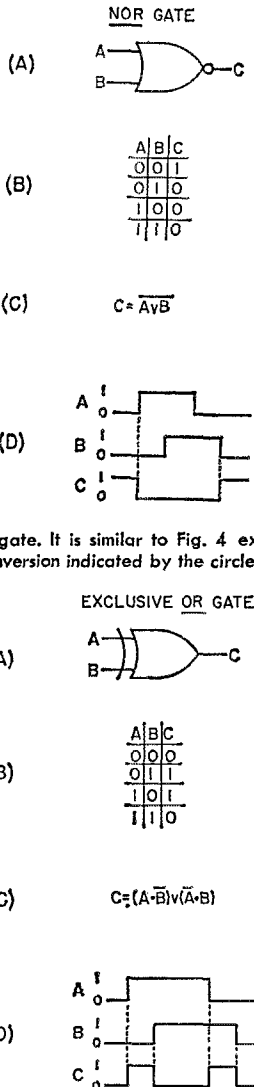


Fig. 5—NOR gate. It is similar to Fig. 4 except for the inversion indicated by the circle.

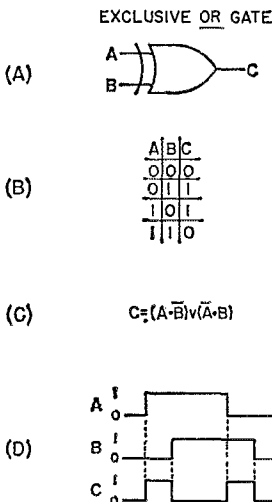


Fig. 6—Exclusive OR gate. In contrast to Fig. 4, the exclusive OR gate will operate only when only one input is a logical 1.

**CASCADING OF GATES
TO ACCOMPLISH HIGH FAN-IN**

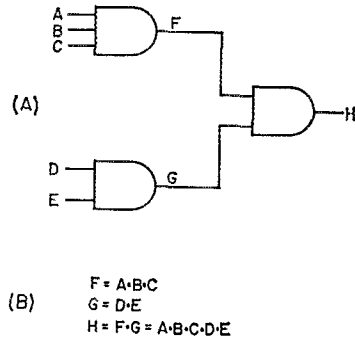


Fig. 7—Cascaded AND gates to reduce loading.

negative logic, *without doing anything to the actual circuit*, by calling a more negative voltage a 1 and vice versa, we see that C is down (is a 1) when A or B or both are down (are 1s). Thus, in a sort of magical hocus poeas which just involves name-calling, we have changed an AND gate into an inclusive OR gate! A mathematician by the name of DeMorgan realized this long ago before the advent of digital circuits, which goes to show once again how academic mathematics turns up applications in the most unexpected ways. What DeMorgan said in effect was, "if you NOT everything in a Boolean expression, then swap OR's and AND's, and then NOT the entire result, you haven't changed anything." That is, $A \vee B = \overline{\overline{A} \cdot \overline{B}}$.

What this means to the practical man is that it is always possible to construct a logical system (not always most economically) with just one flavor of gate. This shows the essential identity between the AND and OR functions, and also points up the essential way in which the exclusive OR of Fig. 6 differs. Recently, several manufacturers have bowed to these facts and have added exclusive OR gates to their lines.

One important specification for logic gates is the so called "fan-in" and "fan-out." Fan-in specifies how many sources may be applied to the input of a gate before performance is degraded, while fan-out specifies how many loads may be connected to an output. Along this line, there is defined by the manufacturer something called a "unit-load" in terms of which fan-in and fan-out are specified. The manufacturer will scale the required drive currents into the various inputs of a product line according to some rule of thumb, and give the results generally as a small integer or possibly a simple fraction. When designing a digital system, one adds up the total unit loads which a gate (or flip-flop) is to drive, and ensures that the sum does not exceed the fan-out rating of the driving device. Actually, the usual result of overloading a gate is a degradation of rise and fall times before the logic voltage levels are too seriously affected.

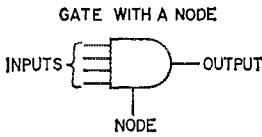


Fig. 8—AND gate with a node connection.

Similarly, if one finds that more sources are to be connected to an input than it can take by its fan-in rating, then one must cascade down through intermediate gates. The price one pays for this is delay time, since it takes a finite time for a gate to respond. Most of the time this is no severe restriction since gate response times are generally quite fast. As an example, if I desire to apply five inputs to an AND gate which is rated for four, I might solve the problem by the means shown in Fig. 7. With some gates there is a so-called "node" provided through which one can introduce more inputs than are provided for at the gate input. (Fan-in usually exceeds the number of actual input wires provided.) These nodes usually have to be "buffered" through diode clusters which are part of the same manufacturer's line. The symbol for a node is shown in Fig. 8.

As a closing comment on gates it might be pointed out that aside from putting excessive operating voltage on them, or actual mechanical damage, in most cases anything might be connected to anything without damage. They are rather forgiving of wiring errors. Some of the more recent microcircuits which have an FET type of construction are a little more fussy, however.

Flip-Flops

A flip-flop is a device which has two outputs that can be placed in various 1 and 0 combinations by various input schemes. Basically, one output is a 1 when the other is a 0, although situations do occur (sometimes on purpose) where both outputs are alike. Since the flip-flop is essentially a symmetrical device it really doesn't matter which side is which, but from an application viewpoint the manufacturer labels them and for reasons of consistency, it is wise to stick with his labels. Naming the leads and defining some terminology go hand in hand. One output is called the " Q " or "set" output, and the other is the " \bar{Q} " (read not Q) or "reset" output. If Q is 1 and \bar{Q} is 0, the flip-flop is said to be "set", or in the "one state", while for the reverse, the flip-flop is "reset" or "cleared" or in the "zero state". If both outputs are alike, the state of the flip-flop is indeterminate. Similarly, there are at least two inputs, the "set" and the "reset" inputs. It is the intention that the appropriate status of the outputs result from a specified status of the inputs. This is done in a variety of ways.

There are essentially two types of inputs, the so called "d.c." or "level-sensitive" type, and the "a.c." or "transition-sensitive" type. As the

names imply, a d.c. input does its work according to the voltage levels applied, and is also called sometimes a "static" or "nonsynchronous" input. An a.c. input does its work with a transition in voltage, and is also known as a "dynamic" or "synchronous" input. A given flip-flop may have some or all of these types of inputs, depending on the intended application, and the interaction of the inputs results in some very flexible operations.

It should not be concluded that an a.c. input is capacitively-coupled in. This was true for discrete component flip-flops, but reasonable capacitors just don't fit in microcircuit dimensions. The construction of an a.c. input uses a cute trick known as the "master-slave" principle, about which more later.

For an example of a quite generalized flip-flop, refer to Fig. 9. A device such as this is typified perhaps by the Motorola types MC664 or MCS45. S_d and C_d are d.c. inputs and unconditionally override all of the other inputs, as shown by the truth table of Fig. 9B. Note the small circles at the inputs. As mentioned under the description of gates, these indicate that the inputs are negated. This agrees with Table 9B, where a NOT input effects the corresponding output. Since S_d and C_d override, they can alter the state of the flip-flop at any time, hence the term nonsynchronous. When both S_d and C_d are 1, the "front end" inputs are effective. These are synchronous in the sense that changes of state of the flip-flop occur synchronously, if at all, with a transition of the "clock pulse" (CP) input. Specifically, since the CP input is notted by the little circle, transitions take place only at *negative going* (1 to 0) transitions of CP . Whether or not, and in which direction, the flip-flop changes state is controlled by the two pairs of S and C

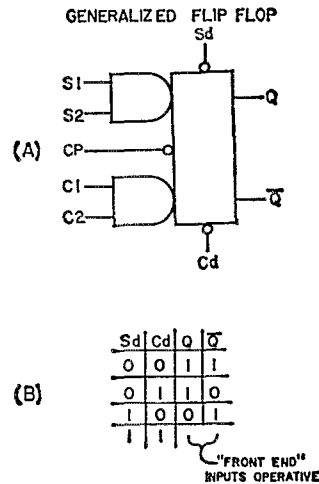


Fig. 9—(A) Logic symbol for a generalized flip-flop. If there is only one S and one C input terminal on the actual device, the AND-gate symbols are not needed and the symbol is a simple rectangle. (B) is the flip-flop truth table.

inputs. These are sometimes called "steering" inputs since they serve to steer the *CP* to either set or reset the flip-flop. Since the pairs of *S* and *C* inputs enter through two AND gates, the action at a negative-going *CP* is as follows: If both *S*'s are 1 and at least one *C* is 0, the flip-flop sets. If it is already set, nothing happens. If both *C*'s are 1 and at least one *S* is 0, the flip-flop resets.

The way in which master-slave operation results in an apparent a.c. input for *CP* can now be described. Inside the microcircuit there are really two flip-flops connected as a shift register (about which more later) with some assortment of gating between them. The first is the master, and the second is the slave. When the *CP* is 1, the status of the *S* and *C* gates is transferred directly to the master. When *CP* transits to 0, the status of the master transfers to the slave, and appears at the output. Note that both of these actions are really level-sensitive, but the combined effect is to produce an apparent shift in output synchronized with the transition of *CP*. The *S_d* and *C_d* inputs are tied to the slave directly, which explains why they override the other inputs.

At this point it is well to point out that generally, but not always, an unconnected input results in an automatic 1 at that input. Some manufacturers require that unused inputs be tied to ground or to a logical 1 voltage for proper operation.

A flip-flop such as this may be externally wired in a variety of ways to produce a shift register, counter, or any other of the many uses possible. In many instances the flip-flop comes internally wired by itself or to others in the same microcircuit to provide specific functions. Two common uses for flip-flop follow:

The Shift Register

A shift register is a series of flip-flops connected serially as shown in Fig. 10. When the *CP* makes its transition, the status of each flip-flop transfers to the right down the chain by one step. Shift register, counter, or any other of the many and in typewriter code machines. Often, but not always, all of the *C_i* inputs are tied together as in Fig. 10 and called a "common reset" or "clear" input. The *S_d* inputs may or may not be provided.

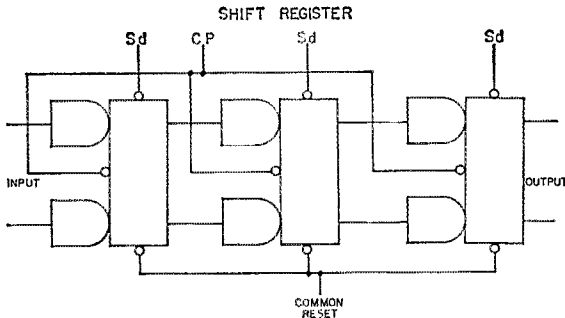


Fig. 10—Flip-flops combined to form a shift register.

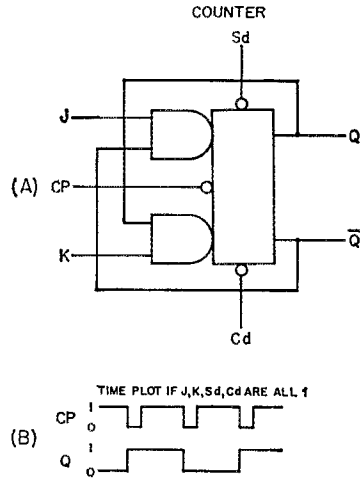


Fig. 11—Flip-flop connected for counting, or giving one output pulse for each two clock pulses. A series of these "divide-by-two" circuits in cascade will sum up the number of negative-going clock pulses for a period, determined by the circuit design, before "clearing" and repeating the count during the next interval.

When only one each of the *S* and *C* inputs is provided in a specific flip-flop, the AND symbol is generally not drawn in, since a single-input gate clearly performs no AND function whatever. If the shift register of Fig. 10 is constructed from individual flip-flops like that of Fig. 9, then one each of the *S* and *C* inputs would not be used. As mentioned earlier, these unused inputs are usually automatically in the 1 state.

Flip-flops used in shift registers are sometimes referred to as "Type D" flip-flops. The name refers to the application rather than to the nature of the flip-flop circuit itself.

The Counter

If the outputs are cross-connected to the inputs as shown in Fig. 11, the result is a counter. Since the 1,0 pattern at the output is reversed at the input, application of the *CP* will cause the flip-flop to "count" or "toggle" or "divide by two" (the terms are synonymous). For microcircuits which are internally wired in this manner, a special terminology has arisen wherein the inputs are named "*J*" and "*K*" and the flip-flop is called a "JK flip-flop," in contrast to that of Fig. 9 which is sometimes called an "RS flip-flop." The same comments about the *S_d* and *C_d* inputs for the shift register also apply here when several stages are provided in one microcircuit. To construct an "up counter,"² one connects each *Q* output to the *CP* input of the following stage. To construct a "down counter," one connects each *Q* to the *CP* of the following

(Continued on page 148)

² "Up" and "down" counting refers to the internal arrangement of the counter; the "up" counter starts with 0, 1, 2, 3, etc. and continues until the desired number of digits has accumulated, while the "down" counter starts with the final number and counts back to zero. The end result is the same in either case.

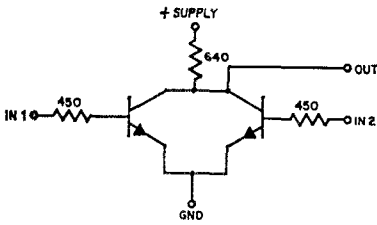


Fig. 1. Two-input NAND/NOR gate. The resistances are nominal values. Two gates occupy one package.

A	B	A AND B	A OR B
0	0	0	0
1	0	0	1
0	1	0	1
1	1	1	1

Fig. 2. Truth table for AND and OR functions. 1 and 0 do not refer to specific voltages, but to two states that may be variously defined.

In order to get one circuit to function either as an AND or an OR, we must define the 1s and 0s differently for each function. Take the OR function first. If both inputs are at ground potential, neither transistor conducts, and the collector voltage is equal to the supply voltage. But if either (or both) of the inputs are biased positively, the collectors (connected in parallel) will be pulled down near ground potential. If we call 0 in the truth table ground potential, and 1 in the table positive potential, we see that the output of the circuit corresponds to the OR column in Fig. 1, except that the 0s and 1s have been interchanged. This interchange of 0s and 1s is called a NOT function (NOT 0 = 1, and vice versa), so the circuit is called a NOT OR or NOR circuit.

On the other hand, if we define 0 as a positive voltage and 1 as zero voltage, it is not too hard to see that the circuit provides a NOT AND or NAND function. Thus a single circuit can provide two different logical functions, depending upon the so-called "positive" logic or "negative logic" definitions of the 0s and 1s.

The Flip-Flop

Another type of logic circuit is the flip-flop or bistable multivibrator, which can be set to one of two allowed states. A pulse on the toggling input changes the flip-flop from one state to another, and a pulse on the preset input places the flip-flop in a known and predefined state. Two other inputs are provided, but not used in the circuits described here.²

We can represent various ICs by symbols rather than drawing their entire schematics. This "systems approach" is always used, as the IC provides a certain specific function, in just the way the squares in a block diagram do. Gates and flip-flops are shown in Fig. 3, together with

² Further information is given in another article in this issue (Pos, "Digital Logic Devices"). — Editor.

actual basing diagrams. These units are standardized, with pin 4 going to ground and pin 8 (the flat side) going to the supply voltage, $+3.0 \pm 10\%$ volts. The μL (standing for micrologic) 914 contains two NAND/NOR gates, and the $\mu L923$ contains one JK flip-flop, consisting of 12 transistors and 16 resistors. These particular ICs are made by Fairchild Semiconductor, and are available at low cost.³

Hooking Them Up

An IC block diagram is essentially the actual wiring diagram. Once a function is decided on, a block diagram is drawn, the power connections are added, and the schematic is complete. Occasionally, discrete components are also used, to modify the action of a particular circuit or to build a circuit that cannot be handled by an IC alone. Since these circuits have a reasonably low impedance, wiring is not critical. Certain rules have to be followed, however, when working with ICs.

One rule is not to load the output of a circuit too heavily. Certain "loading rules" exist which set an exact upper limit of how many inputs may be connected to any output without overloading the output capability of a circuit. A rule of thumb is that about four circuits can be driven by a single output with the IC's used in this article. Another thing to keep in mind is that

³ Fairchild transistors are not available through supply houses normally patronized by amateurs, but can be obtained from Fairchild distributors. For the name of the distributor nearest you write Fairchild Semiconductor, Marketing Services Department, P.O. Box 1058, Mountain View, California 94040. Delaware Electronics Supply Co. 220 West Fourth St., Wilmington, Delaware 19801, will also accept mail orders from amateurs for Fairchild semiconductor products. — Editor.

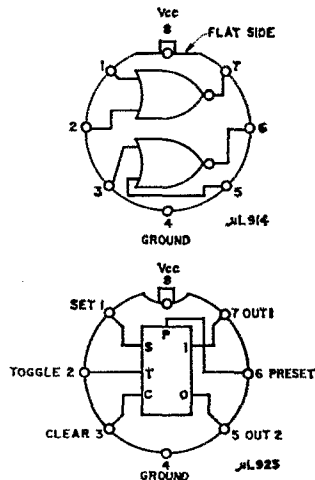


Fig. 3. (A) $\mu L914$ NAND/NOR gate, top view. Pin 8 is the supply voltage; pin 4 is grounded. Pins 6 and 7 are the outputs for the two units. (B) $\mu L923$ JK flip-flop, top view. The set and clear inputs work together with the toggle input to define the output state. A preset pulse causes Out1 to be zero, Out2 to be positive. A toggle pulse reverses the state of the flip-flop.

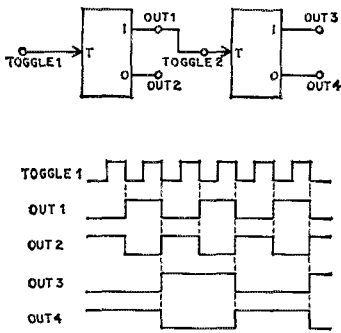


Fig. 4. Two flip-flops in a divide-by-four counter.

all these circuits are direct-coupled and can therefore be used down to zero frequency. The transition time (time taken to go from a 0 to a 1 state, or back) is fairly fast, about 20 nano-seconds (0.02 microsecond).

Fig. 4 shows a circuit using two flip-flops. This is a divide-by-four counter using the toggling inputs. Initially, both flip-flops were in the 0 state, because *Out1* and *Out3* were 0, implying that *Out2* and *Out4* were both 1, assuming positive logic. The flip-flop changes state when the toggle input goes from 1 to 0, so the first flip-flop divides the incoming pulse train by two. The second flip-flop does the same, and the total effect is a divide-by-four counter.

Fig. 5 shows a NAND gate wired to *Out2* and *Out4*. When both of these outputs are 0 the gate output is a 1, otherwise the output is a 0. By wiring together several flip-flops and gates, complex waveforms can be obtained.

Counter Circuits

We have seen that a single flip-flop can divide a frequency by two. Then n flip-flops can divide a frequency by 2^n , if the toggle input on a flip-flop is connected to the output on a previous flip-flop and this is done for n flip-flops. But suppose we don't want a division ratio of 2 or 4 or 8 or

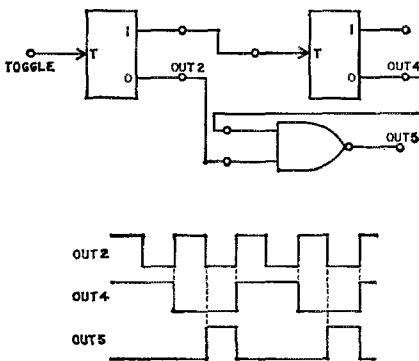


Fig. 5. Two flip-flops and a NAND gate. *Out5* is 1 when *Out2* and *Out4* are both 0.

so on. By using gates in conjunction with flip-flops we can get, in principle, *any division ratio we want*, given enough circuits to work with. Division ratios of five and ten are particularly convenient to have.

There is a general rule (which holds true for all division ratios) to follow when designing a counter. Assume we want a counter that will divide a frequency by some number p . Then for every p th input pulse the divider produces an output pulse and resets to its initial state. We could label the input pulses with numbers, 1, 2, 3, 4, . . . , $p - 1$, p ; 1, 2, 3, 4, . . . , but it is more convenient to label the input pulses starting with zero; viz., 0, 1, 2, 3, . . . , $p - 1$; 0, 1, 2, 3, . . . , etc. Starting with zero signifies that all flip-flops are set to the 0 state. Then $p - 1$ pulses arrive and set the flip-flops to various states. The next (p th) pulse resets all the flip-flops back to the 0 state. So p pulses applied to the input generate one complete cycle in the counter.

The basic idea in setting up a counter is to modify a binary counter of n stages (which divides by 2^n) to reset at some count p where p is less than n . To get a decade (divide-by-ten) counter we need $n = 4$ flip-flops to get a basic division ratio of 16, and then modify it to divide by ten. Fig. 6 shows a four-stage binary counter counting to 15 and then resetting on the 16th pulse (labeled 15 in our notation). The four flip-flops are given the designations 1, 2, 4, and 8 because the values of the "on" flip-flops, added together, correspond to the number counted within the pulse train. For example, on the 13th pulse the 1, 4, and 8 flip-flops are on.

To modify this divide-by-16 counter to count by 10, some method of resetting the flip-flops on the tenth input pulse must be found. Notice that upon receiving the tenth pulse the 2 and 8 flip-flops are on and the other two are off. Furthermore, the tenth pulse is the first pulse in the train which meets this condition. Therefore a gate circuit sensing the 2 and the 8 flip-flops together will be activated on the tenth input pulse, and can be used to reset all the flip-flops back to zero. But since only the 2 and the 8 flip-flops are on at this time, only these two must be set back to zero. This can be stated as a general rule: to divide an input pulse train by a number p , reset A and B and C and . . . and Z where $A + B + C + \dots + Z = p$. In the case of the decade, reset flip-flops 2 and 8 ($2 + 8 = 10$). If $p = 2^n$, no gates and no reset function are needed.

Notice that in order to obtain an AND function with the gate, negative logic must be used, as discussed earlier. The flip-flops provide two outputs, one the complement of the other; when one output is positive, the other is zero. We can consider one output to produce positive logic and the other output to produce negative logic. The negative-logic output is used to control the NAND gate, which in turn generates a positive-logic reset signal.

For certain division ratios, more than two

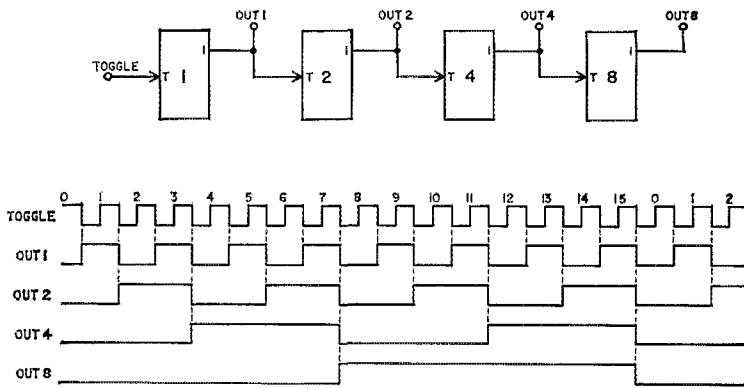


Fig. 6. States in a 4-stage binary counter dividing by 16.

signals must be ANDed together. The μL914 gate has only two inputs per gate. Two three-input gates available are the μL903 and the μL915 ; the μL907 is a four-input gate and the μL929 provides five inputs. Basing diagrams can be obtained from the manufacturer.

Suppose we want to divide an incoming pulse train by five. For this we need three flip-flops, numbered 1, 2, and 4. Since $1 + 4 = 5$, the 1 and 4 flip-flops are ANDed together to generate a reset pulse, which resets the 1 and 4 flip-flops. Referring to Fig. 7, the diagram of a decade (divide-by-ten) counter, we see that it actually consists of a divide-by-two counter followed by a divide-by-five counter. This principle can be extended indefinitely to produce any countdown ratio.

Since the counters are direct-coupled, there is no lower frequency limit that can be handled. The practical upper limit, however, is about 5 MHz. for odd division ratios, and about 8 MHz. for even ratios, for which the first flip-flop is not externally reset. In general, the more complex the division ratio — that is, the larger the number of gates required — the lower the maximum frequency of operation. This is a consequence of the fact that it takes a finite time for the signal to pass through a gate. More sophisticated IC's are capable of much faster operation, and the technology is advancing rapidly. In addition, it should be mentioned that there are other ways to achieve a fixed frequency-division ratio which have not been mentioned in this article. The method outlined above, however,

is a simple and versatile way of achieving good results with medium-speed ICs.

A Frequency Standard

Now that we have covered the fundamentals of frequency counters, let's put the counters together with the additional needed circuits to build a frequency standard. The standard that we want must generate several convenient frequencies from a single crystal oscillator. We would then expect our unit to consist of an oscillator, some frequency dividers, a low-impedance output circuit, and a power source. Fig. 8 shows a typical standard which includes two dividers. The crystal might generate a 1-MHz. signal, and the dividers could both be decades, generating 100-kHz. and 10-kHz. signals.

A great advantage offered by fixed-ratio dividers is that large division ratios can be obtained. Suppose you have an "odd" crystal in your junkbox, say 1700 kHz. A divide-by-17 divider can be built with five flip-flops and one gate to generate a 100-kHz. signal. "Nice" crystals usually are somewhat more expensive because of demand for them, but cheap "odd" crystals may be used instead, in conjunction with a divider to produce useful frequencies for calibration purposes. The reader is encouraged to use crystals on hand or ones he can obtain inexpensively, and to design a divider chain that suits his requirements best.

The circuit in the author's frequency standard

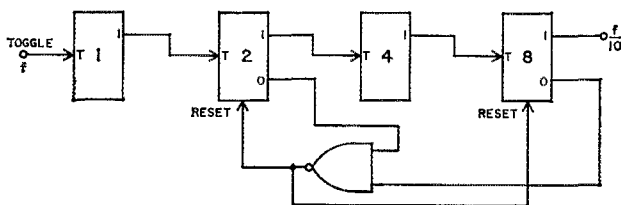


Fig. 7. A decade frequency divider.

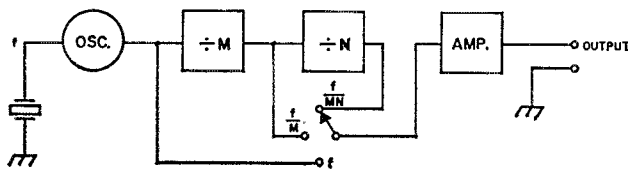


Fig. 8—A typical frequency standard providing three output frequencies.

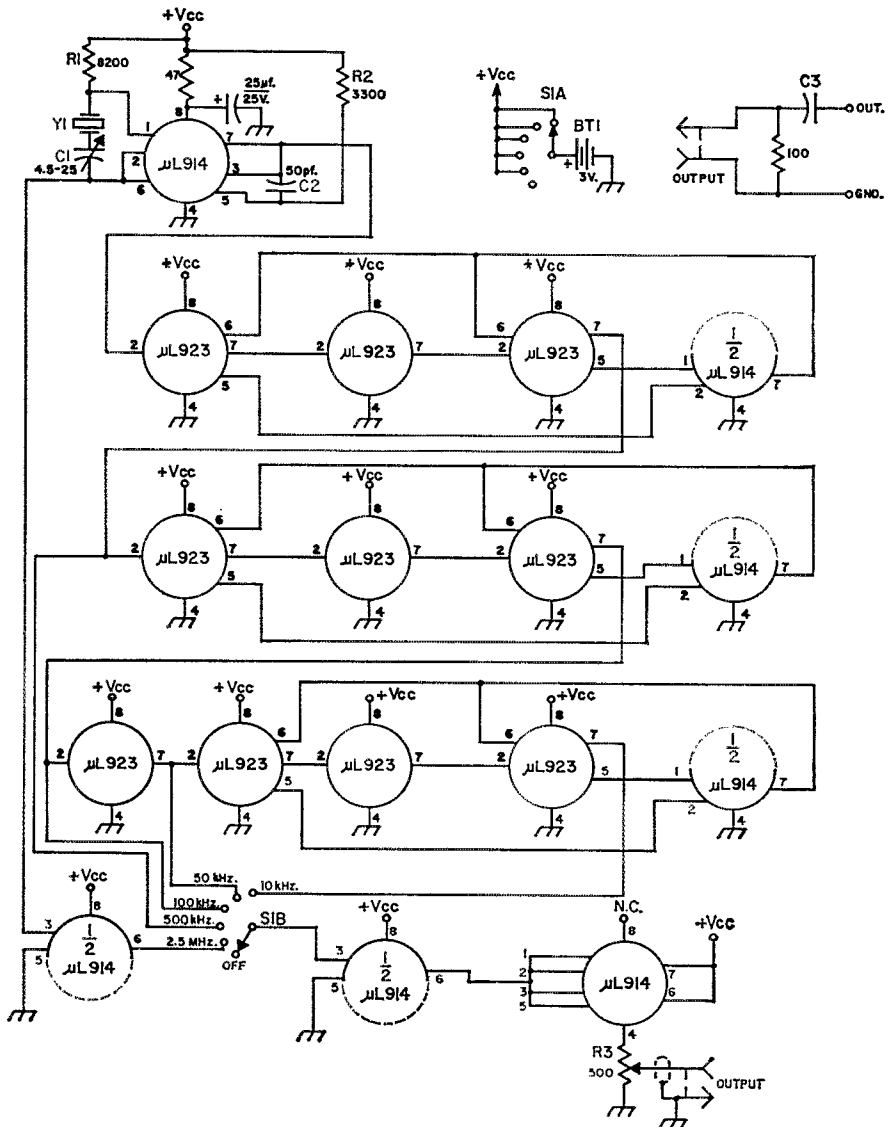
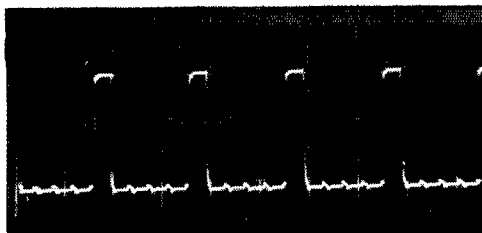


Fig. 9. Complete circuit of the author's frequency standard. Unless otherwise specified, resistances are in ohms; resistors are $\frac{1}{2}$ -watt composition. Capacitor with polarity marked is electrolytic; others are silver mica or ceramic. The integrated circuits used in this assembly are less-expensive epoxy-cased versions of the μ L914 and μ L923, respectively, and also are manufactured by Fairchild. Base connections are as shown in Fig. 3; pin 8 is indicated by a flat on the case, but the tab used in the metal-case version is absent. Motorola types MC715P (dual 3-input gate) and MC723P (JK flip-flop) may be substituted.

- S₁—Six-position two-pole rotary switch.
- BT1—Two size D flashlight cells in series.
- C₁—4.5-25-pf. ceramic trimmer.
- C₂—Value used in author's circuit; different crystals may require different values.
- C₃—50 pf. for 50-ohm antenna systems; 10 pf. for 300-ohm antenna systems.
- R₁, R₂—Values used in author's circuit; different crystals may require different values.
- R₃—500-ohm carbon potentiometer, linear taper.



The output waveform at 500 kHz. The scope sweep speed is 1 μ sec per cm., and the fast rise is clearly evident.

uses a 2.5-MHz. crystal oscillator, three dividers, and an output circuit. The first two dividers divide by five, to produce 500-kHz. and 100-kHz. signals, and the last divider is a decade, producing a 10-kHz. output. A 50-kHz. signal is taken out of the first flip-flop of the last divider chain. The output circuit generates about 2 volts peak-to-peak into 100 ohms. The output waveform is rectangular with very fast rise and fall times, producing harmonics to more than 100 MHz. Two flashlight batteries are used for power, and the entire unit is enclosed in a small aluminum box.

Fig. 9 is the complete circuit of the standard. The crystal oscillator is a cross-coupled multivibrator producing a nearly square wave at 2.5 MHz. Two outputs are taken, one to drive the first divider and the other, through a NOR gate used as a buffer, to the output selector switch. The values of the resistors and capacitors are chosen for reliable starting, and the ones shown in Fig. 9 represent only a starting point: different crystals will probably require different values. One interesting phenomenon was noted in the operation of this oscillator: if the supply voltage is applied too suddenly, the oscillator will not start. Evidently, the supply voltage must be turned on slowly so that the multivibrator goes through a "linear" region in order that oscillations may build up. Once started, however, the circuit operates in the saturated mode. The decoupling network in the supply lead to the oscillator IC provides a slow voltage build-up and therefore completely reliable starting. To trim the frequency of the crystal upward, a small trimmer is included in series with it. If the crystal frequency is still too high with the trimmer all the way in, reconnect the trimmer between ground and the junction of the crystal and the 8200-ohm resistor. If your crystal won't oscillate, it probably lacks in activity.

Three divider chains are included, constructed according to the rules given above. The output of the dividers is a rectangular wave with a duty factor of 20 per cent and a rise time of 20 nanoseconds. The desired output signal is selected by S_1 , passed through another buffer, and amplified by an emitter follower. The emitter follower is an unusual application for a dual-gate IC. The normal outputs, connected to the collectors of the transistors, are in this case connected to the supply voltage and pin 8,

normally the supply voltage terminal, is left unconnected. Pin 4, internally connected to the emitters and normally grounded, is the output connection in this application. This IC replaces a 2N709 used in an earlier circuit, works just as well, and costs about a quarter as much. A 500-ohm potentiometer connected to the emitters controls the amplitude of the output. The output cable, a length of 93-ohm coax, is terminated in a 100-ohm resistor, and the signal is coupled to the receiver through a small capacitor. The overall spectrum has a $1/f^2$ power dependence, and the capacitor helps to remove this dependence and produce a constant output from the fundamental to almost 20 MHz.

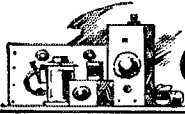
The unit is assembled on Vectorbord and enclosed in a $3 \times 5 \times 7$ inch aluminum box. The output level control and frequency selector switch are mounted at one end, and a UHF coaxial connector mounted at the other. The terminating network on the end of the coaxial cable is mounted at the receiver antenna terminals. The frequency-adjustment trimmer is located behind a hole in the top of the case. The unit draws 140 ma. from the batteries, which should last a year with normal use.

One caution in construction: The circuit should be grounded to the aluminum box at only one point. This ground is made by the shield braid on the coax which connects the output connector to the level control. All circuit grounds should be tied together and connected to the low end of the level control, as should the other end of the shield braid. If this is done, it will be possible to turn the output level control all the way down and have no signal leakage.

This frequency standard replaces a vacuum-tube unit built several years ago. The divider chain in the old standard used 6J6 multivibrators, which had to be carefully adjusted to obtain the proper division ratio. More often than not, they wandered off to some other frequency. They also had poor spectral purity in the form of hash and noise in the output. The spectral purity of the IC device is excellent, and since the division ratio is wired into the dividers, no adjustment whatever is needed in the counters. The entire unit costs about \$20, and uses 138 transistors in the $14\frac{1}{2}$ ICs that are wired into the circuit.

In conclusion, the author wishes to thank Mr. William Fears, without whose prodding this project would have never taken shape. QST

From August 5-10, GB3NEW will be operated from the Barry College of Further Education Radio Society at the National Eisteddfod of Wales. This event is a festival of Arts held annually at a different location in Wales. Operation will be in the 3.5, 7.0, 14.0, 21.0 and 28.0 MHz. bands using s.s.b. and c.w. A commemorative certificate will be available to each station contacted.



The Clipboard—

a Simple Experimental Circuit Breadboard

BY R. W. THORPE,* W6WYD

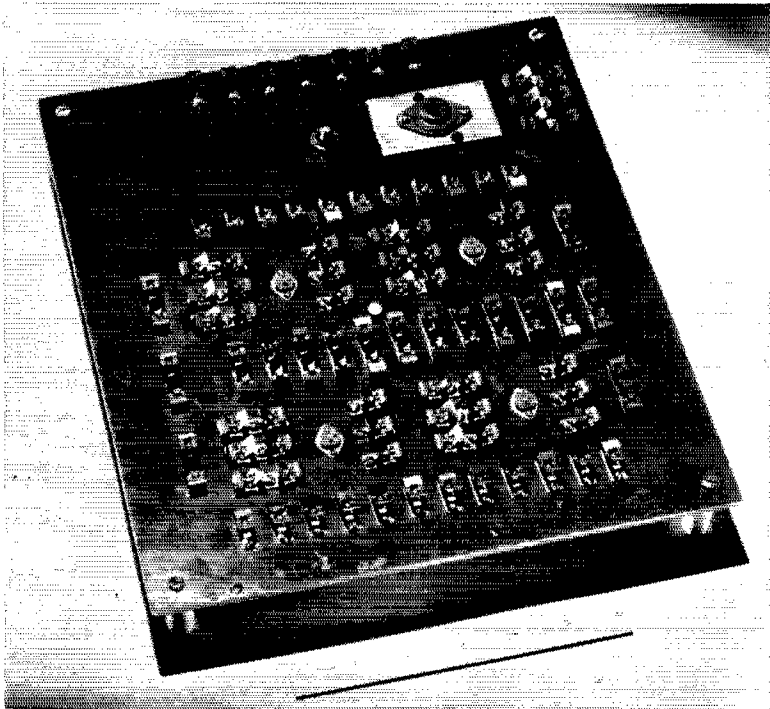
EXPERIMENTING with transistors can be lots of fun. Usually the circuits are simple, supply voltages are low, and the components, including the transistors, are relatively inexpensive. If you use printed or etched circuits or possibly integrated circuits, you soon find that you can package an amplifier that will fit in the corner of your eye without making you blink.

Before the final packaging, however, most of us want to build a breadboard to check the basic operation of the circuit — the validity of our bias calculations, the operating-point stability, or what have you. Conventional breadboarding techniques, which usually involve soldering, may make it inconvenient to substitute components. If resistor and capacitor leads are cut to fit the

breadboard, it may be economically hard on the fellow who buys his own materials and intends to reuse the items in the final package. The problem gets worse when other experimenters in the family start using the same facilities.

The solution at my house was the "Clipboard" experimental breadboard shown in the photographs. The transistors to be used are plugged into the sockets, and all the wiring is done by inserting component leads or short jumpers into the appropriate Fahnestock clips. As many as three power-supply voltages may be brought to the clips at the top of the board and be controlled simultaneously by the toggle switch shown. Tie-points and ground connections are located near the power connection terminals to permit the installation of special filtering circuits or

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Top view of W6WYD's transistor breadboard.

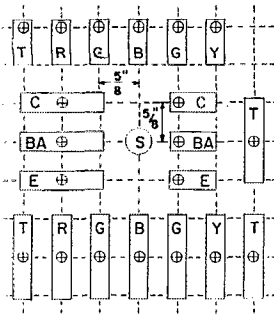


Fig. 1—Layout details of the Fahnstock clips adjacent to one of the four transistor sockets. Clips are positioned around the other three sockets in a similar fashion. Parts placement was determined by picking convenient points on a 3/4-inch grid. The clips labeled C in the drawing are connected to the collector contact of the adjacent transistor socket, those labeled BA to the base, and those labeled E to the emitter. Each clip or pair of clips marked T is independent and not connected to any other clips on the board. The remaining clips are color coded with a dab of paint to indicate their function. Clips labeled G (black) are ground connections, those labeled R (red) are connected to one power line, those labeled Y (Yellow) are connected to yet another power line. Circle S represents the transistor socket.

Zener diode regulation. Under-board wiring, shown in one of the photos, distributes the power to convenient locations across the board. Several floating clips are provided near each transistor

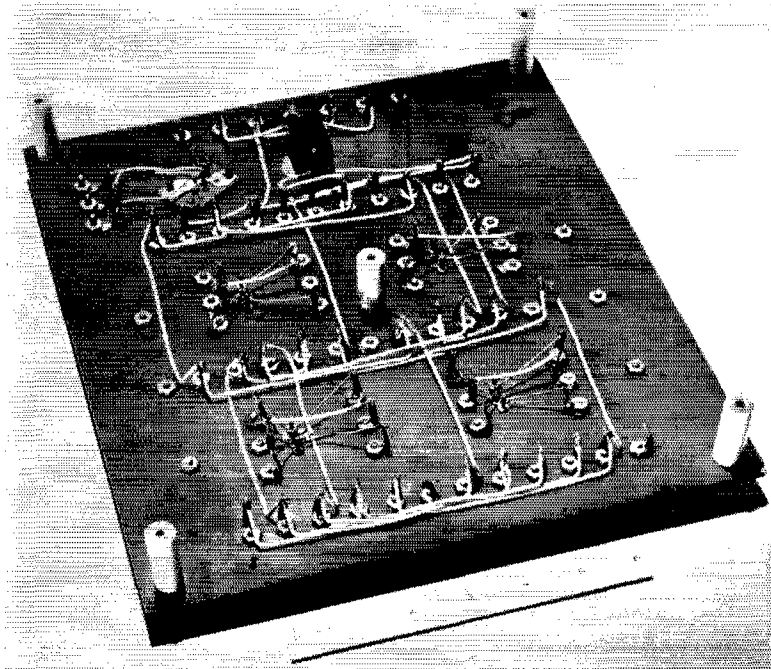
socket and serve as tie-points or input-output connectors. The power transistor and its associated clips were added for a special switching application and have since proven to be very useful.

Some features were found to be essential: plenty of ground terminals, floating input-output connectors, and the simultaneous switching of all power supply voltages (some circuits may be damaged if a voltage is applied to part of a circuit before another voltage is connected to a different part). The use of three clips for each transistor terminal proved its worth during experimentation with flip-flops having set, reset, and internal trigger-steering capabilities.

Construction of the Clipboard is simplicity itself. The basic board used here is a piece of 1/8 X 10 7/8 X 12 1/4-inch hard phenolic. Any insulating material with adequate strength and machinability could be used, and of course the dimensions are quite arbitrary.

Fig. 1 shows the location of the clips adjacent to one of the small transistor sockets. Clips are positioned around the other three sockets in like fashion. The exact location of the power-supply connectors, the switch, and the power transistor and its connectors is not given because of the wide variety of components available. The clips used for power distribution are color coded for ease of identification. All holes for mounting the clips, except those for the power supply and power transistor connectors, were drilled on a

(Continued on page 142)



Under-board wiring of the Clipboard.

Some Ground Rules For Sweep-Tube Linear-Amplifier Design

BY DOUG DeMAW*, WICER

Putting TV sweep tubes to work in linear amplifiers takes a bit of doing if maximum efficiency and reasonable life are to be realized. This article focuses on some techniques that can be applied to all TV sweep tubes suitable for use in linear amplifiers — the guidelines for smoother operation and fewer tube failures.

IT wasn't too many years ago that some of us who were s.s.b. experimenters learned that a buck could be saved by "operating" on certain brands of 1625-type tubes, thus making them suitable for use in grounded-grid amplifiers. It was necessary to saw a window in the tube base, locate and separate the cathode and beam-forming plate leads, and bring them out to individual base pins. At roughly 25 cents apiece, surplus prices, it was no strain on the pin-money fund to put four of them to work in parallel and run them at approximately 500 watts d.c. input. In fact, many a "pair of shoes" was built along such lines and driven by exciters capable of 20 to 50 watts peak output. Little thought, if any, was given to the matter of proper balancing of the tubes in order to assure equal load sharing.

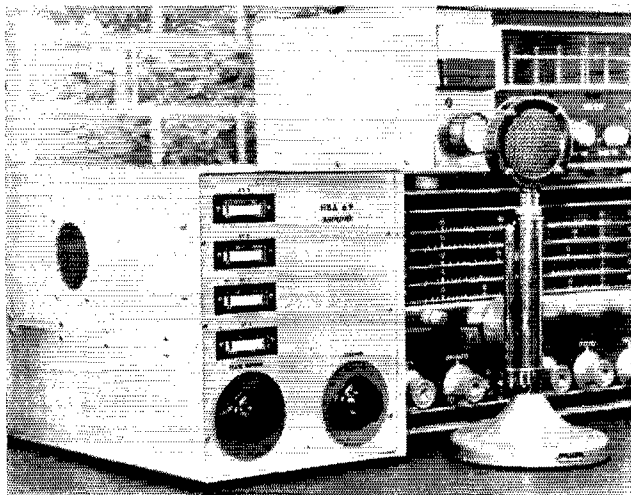
* Assistant Technical Editor, QST.

Similarly, little attention was given to tube cooling. After all, at 25 cents per copy, it didn't matter too much if one had to replace a set of tubes every three or four months.

Things have changed considerably since the early 1950s, at least where the matter of tubes for use in linears is concerned. The emphasis has been on the use of big, somewhat-expensive tubes of the 4-1000A, 3-400Z, and 4CX1000A species. These tubes can provide the legal maximum-power levels for amateur operation, while performing with minimum distortion, but require costly hardware and expensive power supplies to reach the 1000-watt d.c. input-power level. TV horizontal-sweep tubes, especially those intended for color receivers,¹ offer the builder a low-cost approach to linear-amplifier design while still permitting reasonable signal quality and power output.² This article is based on tests performed on an experimental 800-watt-d.c.-input linear amplifier. Four GE 6KD6 tubes are used in the grounded-grid, parallel-connected arrangement of Fig. 1.

¹ A number of TV sweep tubes are used in commercial s.s.b. ham equipment. Some of them are: 6DQ5, 6GB5, 6GE5, 6HF5, 6JS6, 6JE6, 6KG6, 6KD6, and 6LQ6. They have different maximum ratings and require different operating voltages, but they are all candidates for use in linear amplifiers.

² A rundown on intermodulation (IMD) distortion products, and power ratings for TV sweep tubes as linear amplifiers, was given by Bill Orr, W6SAI, and Bob Sutherland, W6UOV, in *Ham Radio*, April 1968, page 9.



This experimental sweep-tube linear amplifier uses four Shurite edgewise plate meters to allow each of the four 6KD6 tubes to be independently monitored as discussed in the text.

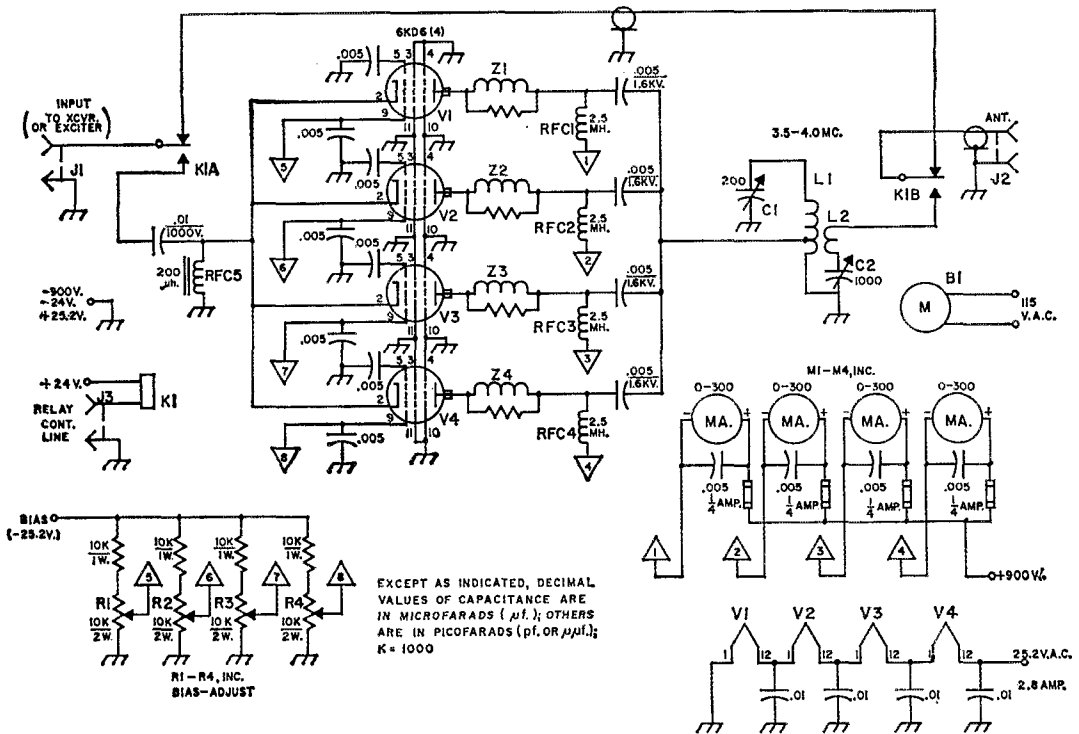


Fig. 1—Schematic diagram of the experimental 800-watt sweep-tube amplifier. Capacitors of decimal value are disk ceramic. Fixed-value resistors are composition. K_1 permits the exciter or transceiver to be switched through the amplifier for low-power operation, and so that the operator can receive through the amplifier.

- B_1 —High-speed cooling fan (see text).
- C_1 —Transmitting variable (from Command Set transmitter).
- C_2 —Three-section broadcast-type variable, all sections in parallel.
- J_1, J_3 —Phono jack.
- J_2 —Coax fitting, chassis-mounting (SO-239).
- K_1 —D.p.d.t. 24-volt d.c. relay, 10-ampere contacts.
- L_2 —18 turns No. 12 wire, 2½-inch dia., 3 inches long (made from B & W 3900-1 coil stack, or Polycoids 1774). Tap at approximate midpoint.
- L_1 —5 turns No. 14 wire, 3-inch diameter, approximately

- ¼ inch long (or 5 turns from Polycoids 1779 stock). Mount over ground end of L_1 .
- M_1 - M_4 , inc.—0-300 ma. d.c. meter (Shurite edgewise meters used in this model).
- R_1 - R_4 , inc.—10,000-ohm linear-taper control (Ohmite 2-watt carbon type, or equal).
- RFC_1 - RFC_4 , inc.—2.5 mh., 250 ma. (Millen 34102).
- RFC_5 —200 μh. (see text for particulars).
- Z_1 - Z_4 , inc.—Parasitic suppressor; 8 turns No. 22 enam. wire wound over the body of a 56-ohm 1-watt carbon resistor. Use pigtail of resistor as anchor points for the coil.

Sweep-Tube Ratings

Although there are many ways to rate a vacuum tube's performance capabilities, we will confine our discussion here to the manufacturers' design-maximum ratings. Under this heading we can find the limiting values of operating and environmental conditions which apply to what the manufacturers call a "bogey" tube—a tube of a given type, with average characteristics. These ratings are set to assure reasonable tube life in television receivers. Any departure from them is at the designer's risk, and will depend upon the life he expects from the tube in his particular circuit.

Table I lists the design-maximum ratings of the 6KD6 tube as given by General Electric Co. (A check of the tube manual showed that RCA rates their 6KD6s the same way.)

Since 990 volts is listed as the recommended maximum, a 900-volt d.c. supply was chosen to

power the amplifier. This voltage permits the maximum desired input power (800 watts) to be reached while operating at a lower plate current than would be needed if a 500- or 600-volt plate supply were used. The lower voltage would require that more tubes be employed to obtain the same d.c. input power without exceeding the 33-watt plate dissipation rating of each tube. Also, the higher plate voltage and lower total plate current result in a plate-load impedance (higher) that is less difficult to match. In this instance the impedance is of the order of 500 ohms, using 900 volts at 800 ma. to obtain the desired 800 watts c.w. input. If a 500-volt supply were used, with six tubes in parallel and 1.6 amperes of plate current, the load impedance would be roughly 150 ohms—a difficult value to deal with when using a conventional tank circuit.

The filament requirements are 6.3 volts at 2.8 amperes per tube. By operating the filaments

D.C. Plate-Supply Voltage.....	990 Volts
Peak Positive Pulse Plate Voltage.....	7000 Volts
Positive D.C. Beam Plate Voltage.....	70 Volts
Screen Voltage.....	200 Volts
Peak Negative Grid-Number 1 Voltage.....	250 Volts
Plate Dissipation (Absolute-Maximum Value).....	33 Watts
Screen Dissipation.....	5.0 Watts
D.C. Cathode Current.....	400 Ma.
Peak Cathode Current.....	1400 Ma.
Heater-Cathode Voltage	
Heater Positive with Respect to Cathode	
D.C. Component.....	100 Volts
Total D.C. and Peak.....	200 Volts
Heater Negative with Respect to Cathode	
Total D.C. and Peak.....	200 Volts
Grid-Number 1 Circuit Resistance.....	2.2 Megohms
Bulb Temperature.....	225 C.

TABLE I

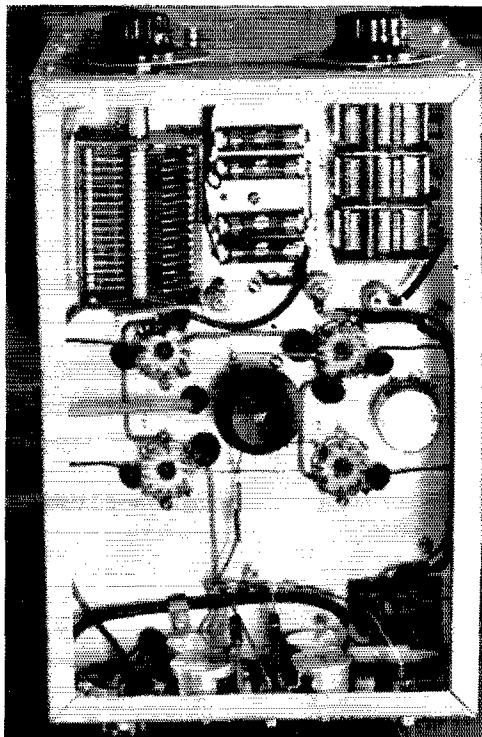
6KD6 Maximum Ratings

in parallel one can use a 6.3-volt transformer, but the current rating must be 11 amperes or better. To get around this high-current requirement the four 6KD6s were connected for series-filament operation. Happily, the transformer ratings called for 25.2 volts at 2.8 amperes — a standard transformer type available from Allied-Knight or Stancor. Of course a series-parallel arrangement could also be used with a 12-volt transformer, if desired. This would call for a current rating of at least 5.6 amperes.

Since the circuit of Fig. 1 uses the tubes in a grounded-grid hookup, the screen grids and beam-forming plates are grounded and do not have a d.c. operating voltage applied to them. The current they draw varies with the level of the driving signal voltages at a given instant. Tubes operated this way perform as high- μ triodes, and the drive required is below the level that would cause the grids and beam-forming plates to exceed their safe dissipation ratings. The tubes in this amplifier have been in service for several months with no noticeable change in their performance — a good indication that the grids have not been damaged by excessive current.

A negative bias voltage, approximately 7 volts, is applied to the control grids of the tubes to set their resting plate currents, for class AB operation, to 25 ma. per tube with the plate voltage specified here. With 500 volts on the plates it is possible to operate the tubes at zero bias, since the static plate current will be low enough to keep the plate dissipation at a safe level (roughly 28 watts) with no signal applied.

A safe bulb temperature must be maintained at all times if one does not want the tube's envelope to melt or crack. For maximum life the tubes should be operated at temperatures well below the 225 degrees C. that the manufacturer specifies. An example of the catastrophic results of improper cooling can be seen in an accompanying photo. Generally, some type of forced-air cooling should be employed to insure against damage from heat.



Individual fuses are used to protect each plate line of the amplifier. They can be seen between the two variable capacitors near the front of the chassis. A toroidal-wound cathode r.f. choke is mounted at the center of tube sockets. Four bias-adjust controls are located on the rear apron of the chassis, permitting the resting plate currents of the tubes to be equalized. Each tube is set for 25 ma. resting current. This requires approximately — 7 volts on the control grids. Tubes other than 6KD6s would require different bias values. The unused control at the right center of the chassis is for experimental purposes.

What About Matched Tubes?

Whenever power-handling tubes are operated in parallel some provision should be made to assure equal- or near-equal load sharing. The d.c. plate current should be closely matched during both the no-signal and applied-signal periods. Some manufacturers of s.s.b. equipment have solved this problem by careful grading of the tubes, using only those that have similar dynamic characteristics. Handpicked tubes do not come easy for the home experimenter, however, because it might be necessary to purchase as many as twenty in order to get six whose characteristics are closely matched. At \$3.85 per 6KD6 (\$3.47 each in ten lots or more) one might have to spend \$70 to obtain six matched tubes worth only \$23 — an impractical solution indeed!

By experimenting with the bias voltages of the four tubes in the amplifier of Fig. 1, it was learned that the no-signal plate currents could be matched when using any four tubes from a set of ten 6KD6s which were on hand. Separate bias-adjust controls permit each tube to be set for the class of operation desired. Fortunately, the plate-current readings tracked within 10 percent over the entire range from no signal to maximum signal when this method was used. (Initial tests were made with a single 300-ma. d.c. meter to avoid errors which could have resulted if four separate meters of unknown tolerance had been employed.)

If reasonable balance is not effected between paralleled tubes — especially if a single meter is used to monitor the total plate current, there is no way of knowing whether one tube is drawing *all* of the no-signal plate current while the remaining tubes are just loafing along. This could mean that the safe plate-dissipation ratings of one or two tubes in a group of several could be exceeded while *idling!* For this reason it is prudent to monitor the plate current of each tube in the amplifier, either by using a single meter and a suitable switching arrangement, Fig. 2, or by using four separate meters as was done here. The latter permits simultaneous monitoring of plate currents, permitting instant comparison of operating conditions. Four low-cost meters run approximately the same as one top-quality meter, so it's pretty much an even-Stephen proposition where cost is concerned. The less-costly meters (Shurite in this instance) have a 5-percent accuracy rating as opposed to the usual 2-percent accuracy of the more expensive instruments. This could mean a difference of as much as 30 ma., at full scale between any two 300-ma. meters, but since 30 ma. represents only a 10-percent error in operating currents it is well within the ball park according to the safe operating limits determined in these experiments.

Parallel Operation

With the circuit of Fig. 1, the total plate current is 890 ma. (800 watts c.w. input). The smaller r.f. chokes cannot handle such high current. (Chokes that can take high values of d.c. are ex-

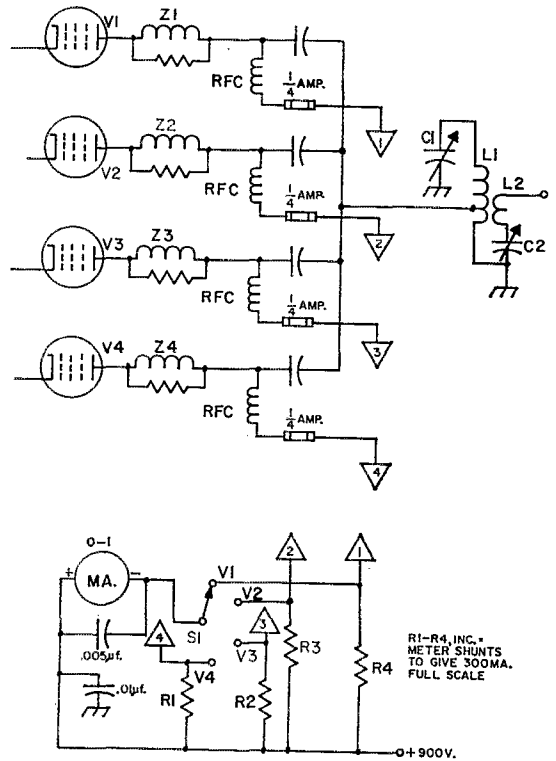


Fig. 2—Alternate method for metering the plate currents of the tubes. This system allows the use of a single 0-1 ma. meter. Meter shunts R_1 through R_4 should be calculated to provide a full-scale meter reading of 300 ma.

pensive. In this circuit four 250-ma r.f. chokes are used, each tube having separate d.c. feed. This keeps the cost down and makes possible the independent metering of each tube's plate circuit. Initially, four 1-mh. chokes were used and were promptly destroyed when the power output of the amplifier reached upwards of 200 watts. The four chokes in parallel had a series resonance in the 80-meter band — sure death to r.f. chokes in power circuits. Watch out for series resonances when selecting r.f. chokes for a given band of operating frequencies. A grid-dip meter can be used to locate the series-resonant frequencies of an r.f. choke by checking with the choke terminals shorted. This should be done with all operating voltages removed, but with the circuit connected for otherwise-normal operation.

To offer some protection to the plate meters, a 250-ma. fuse (don't use slo-blo fuses) is installed in each plate lead. Should one of the tubes short out during normal operation, the fuse will open the circuit and protect the meter. As a bonus feature, the defective tube will be turned off and the operator can continue his transmission by reducing the drive to a safe level. Repairs can be made later, when it's more convenient. Each meter is shunted by a 0.01- μ f. disk ceramic capacitor to prevent damage by r.f.

All four cathodes are returned to d.c. ground through a single homemade 200- μ h. choke. Its value is not especially critical provided its impedance is high compared with 50 ohms. An Indiana General CF-117-Q2 toroid core was wound with 90 turns of No. 24 enameled wire to provide the inductance used here.³ Alternatively, a cathode choke could be made by close-winding No. 24 enameled wire to a coil length of approximately 4 inches on a $\frac{3}{8}$ -inch-diameter, $4\frac{1}{2}$ -inch-long piece of ferrite rod.⁴

It is customary to keep the heaters of indirectly-heated tubes above r.f. ground in cathode-driven linear amplifiers, the usual procedure being to install a bifilar-wound inductor in series with the heater feed to the tubes. Since a peak driving power of only 40 to 50 watts is needed to fully excite this amplifier, and the exciter used in these tests was capable of producing up to 100 watts peak output, the filament chokes were omitted since some extra loss could be tolerated. This also worked well on 7 Mc. However, if the amplifier were to be used on 14, 21, and 28 Mc., it would be wise to include the heater chokes.

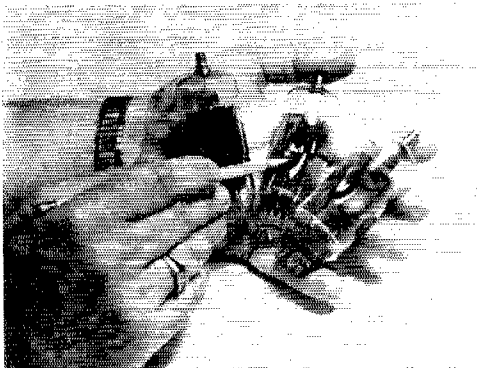
An eight-inch long, close-wound layer of No. 20 enameled or Formvar-insulated wire on a 10-inch length of $\frac{3}{8}$ -inch diameter ferrite rod would be suitable. Two such windings would be used, one in series with each the filament leads to the 6KD6s, as close to the tube sockets as practical. For even better coupling efficiency between the exciter and the amplifier, a tuned input circuit can be used.⁵ Such a circuit offers an improvement in the linearity of the output waveform of the amplifier.⁶

³ "Toroidal-Wound Inductors," *QST*, January 1968, page 11.

⁴ $\frac{3}{8}$ and $\frac{1}{2}$ -inch diameter ferrite rods, 12 inches long, are available from Lafayette Radio Electronics, 111 Jericho Tpk., Syosset, L.I., New York 11791.

⁵ "Gimmicks & Gadgets," *QST*, May 1968.

⁶ Orr, Rinaudo, and Sutherland, "The Grounded-Grid Linear Amplifier," *QST*, August 1961.



Here is an example of the damage that can be caused by excessive heat. The envelopes of these tubes softened and, then were sucked in toward the anodes until they cracked. These tubes were taken from a piece of equipment whose p.a. tank compartment was abnormally small. No forced-air cooling was used.

The Matter of Cooling

If we were to adopt an appropriate slang expression regarding the operating temperatures of sweep tubes, it would no doubt be "don't lose your cool." Heat is the worst enemy of sweep-tube r.f. amplifiers. It not only reduces tube life but is the primary factor that limits the safe input. For these reasons a great deal of emphasis was placed on the matter of tube operating temperature in this circuit.

Some earlier work was done on this subject by L. F. Jeffrey, WA4KFO, an applications and test engineer at the G. E. tube plant in Owensboro, Ky. "Jeff" wrote an interesting and informative paper, jointly with P. E. Hatfield, W9GFS, in which 6KD6 operating temperature versus life was discussed.⁷ They established some test conditions to simulate typical ham-style s.s.b. operation and measured the bulb and plate temperatures of the tubes with special laboratory equipment. During the tests an input power of 448 watts p.e.p. (two tubes) was used, without forced-air cooling. The bulb temperature varied between 135 and 160 degrees C., and the plate temperature varied between 290 and 460 degrees C. They indicated that plate temperatures in excess of 500 degrees C. will definitely shorten tube life. The temperature can easily rise above the safe 500-degree maximum if the tubes are confined in a small space and do not have forced-air cooling (such was the case with the three melted tubes in the lower left photo).

Jeffrey and Hatfield made additional tests with the same setup, but with forced-air cooling on the two tubes. The resultant bulb temperature fluctuated between 35 and 55 degrees C. while the actual plate temperature ranged between 265 and 450 degrees C. These reduced temperatures offer a worthwhile safety factor.

A high-speed cooling fan with a blade length of 1 $\frac{1}{2}$ inches — 3 inches overall diameter — is used in the amplifier shown in Fig. 3. The fan blades are located approximately two inches away from the tubes. Air is directed against the tubes even when the amplifier is in standby. Additional cooling effectiveness is assured because of the spacious cabinet in which the amplifier is housed (Fig. 4). Large-diameter air vents are located on the top and sides of the cabinet. The rear of the cabinet is enclosed (for TVI purposes) by a sheet of perforated aluminum to enhance the "breathing" capabilities of the assembly.

There is a trend these days toward compactness in transmitting equipment, and this can lead to unhappy results if proper attention is not given to adequate ventilation. To be on the safe side when designing a piece of power-handling equipment allow plenty of cabinet space so air can circulate freely. Locate the exhaust vents near the top of the enclosure; the intake vents should be near the bottom, just above chassis level.

⁷ "Sweep Tubes in SSB Service," L. F. Jeffrey, WA4KFO, and P. E. Hatfield, W9GFS. (An independent paper written and printed by these amateurs.)

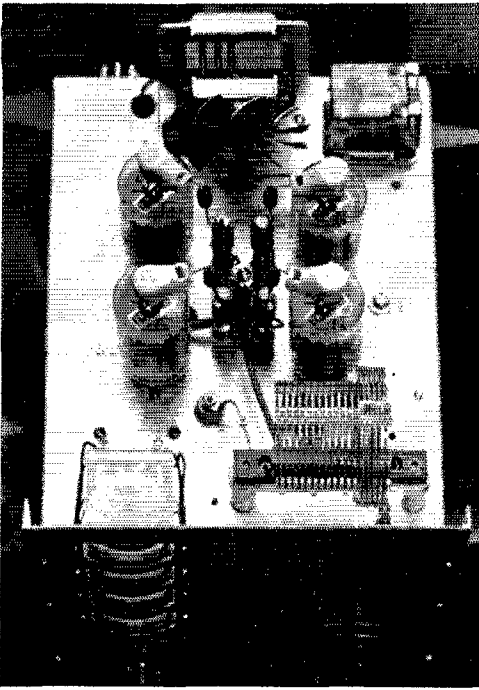


Fig. 3—A high-speed cooling fan is mounted on the chassis just behind the four 6KD6 tubes to provide plenty of air flow across the envelopes. The plate r.f. chokes and blocking capacitors are grouped between the tubes. Plate coil L_1 is mounted on a Millen jack-bar assembly, permitting greater flexibility when experimenting with L/C ratios.

Although heat-dissipating anode connectors were not used in this amplifier, they are worth considering in any permanent design. With air blowing across them, the plate temperature should drop even lower than with the present arrangement.

If a more compact amplifier is desired, the builder might consider using chimneys around each tube and a squirrel-cage blower to direct a heavy air stream up through the bottom of the chassis and around each tube socket. A ring of $\frac{1}{4}$ -diameter holes could be drilled in the chassis around each tube socket to allow the air to flow up through the chimneys. Of course the underside of the chassis would have to be airtight to insure against reduced air flow around the tubes. The chimneys could be fashioned from ordinary food containers such as canned vegetables come in. Each chimney should be painted inside and out with flat black paint to prevent the heat from being reflected back into the tubes. Heat-resistant dull black Bar-B-Q paint is available from most hardware stores in spray cans and is quite suitable for this.

Stability Considerations

Parasitic suppressors are used in the plate leads of all four tubes. They should be installed as a matter of course when building any power-type r.f. amplifier. Each screen-grid terminal on the

tube sockets (pins 3 and 11), and each beam-forming plate pin (4 and 10), is grounded directly to the chassis with heavy buss wire, using the shortest lead length possible. This minimizes stray inductance — an aid to stability. Pins 5 and 9 connect to the control grids and each pin on all four sockets is bypassed to the chassis with a 0.005- μ f. disk ceramic capacitor. Good r.f. bypassing is imperative here if the amplifier is to be "tame." Random oscillation can cause excessive currents to melt a sweep tube faster than a blow torch can dispatch an ice cube!

Performance Notes

We do not attempt to rate this experimental amplifier at more than 800 watts c.w. input. If the builder of such an amplifier wants to risk shortened tube life he can raise the power to 1000 watts. This amplifier has been tried on c.w. at 1000 plate volts with a loaded plate current of 1 ampere; no bad effects were observed after a few hours of such operation. The grids and beam-forming plates of the tubes no doubt would be operating near or at their critical dissipation ratings with this kind of power input. A 6-tube amplifier would be a more satisfactory approach to the higher-power level. During the foregoing tests a power output of 600 watts was measured into a 50-ohm dummy load on both 7 and 3.5 Mc. No evidence of harmonic TVI was observed on an RCA color TV set operating in the same room when the amplifier was connected to an 80-meter

(Continued on page 146)

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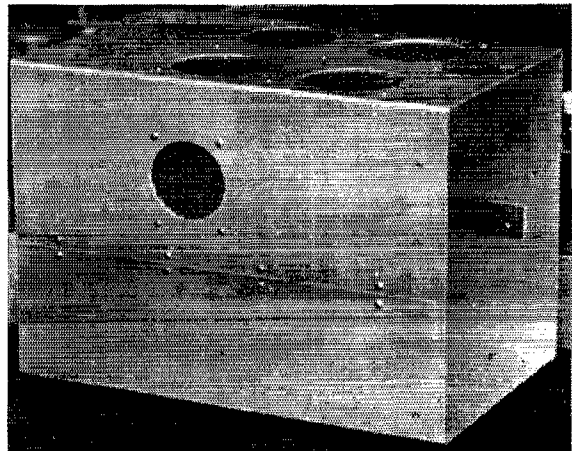


Fig. 4—Good ventilation is imperative if tube life is to be preserved. Large vent holes in the top of the amplifier cabinet serve as exhaust outlets for the heat. The holes on each side of the cabinet just above chassis level act as intakes. The rear of the cabinet is enclosed with perforated aluminum stock to permit the cooling fan to draw fresh air into the cabinet. Screening is used to help in TVI reduction.

Kill That Mobile Noise!

Some Hints and Kinks on a Common Problem

BY JOE CARR,* K4IPV/4

ONE of the headaches that invariably befalls the mobile operator is automotive noise. After several years of working in the auto radio field, I thought I was acquainted with every type of known noise, but automobile manufacturers continue to add to the symphony of possible noises. Even so, tracing down mobile noise can be less of a chore than most people believe; suppressing the noise is usually even easier.

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The first step in solving the problem is to gain an idea of what causes automotive noise. Of the many types of noise generators in a car, the ignition system, of course, is the main noise maker. Other sources include the generator or alternator, regulator, brake lights, gas gauge, air conditioner, heater or blower motor and horn. The battle is half won when you identify the source (see Table I).

If it can be ascertained how the noise is entering the set, your job is less of a hunt-and-peck

Table I

General Types of Mobile Noise

Sound Made	Cause	Cure	Comments
Popping static at regular rate, varies with engine speed	Ignition system	Use resistive wiring between coil, distributor and plugs or use special in-line 10,000-ohm resistors. Bypass plus terminal of coil to ground with 0.5 μ f.	Check antenna lead (see text).
High-pitched howl, varies with engine speed	Generator	Bypass generator armature terminal to ground with 0.5 μ f. Do not bypass field terminal.	If the unit is not marked, the armature wire is the heavy wire.
Whistle, varies with engine speed	Alternator	L-section filter at receiver (see text).	May indicate diode trouble in alternator.
Flutter when receiver is set at low volume level	Breaker points	Bypass plus terminal of coil to ground with 1000 μ f., 15-volt electrolytic.	Motorola AK-300 made especially for this purpose.
"Frying eggs"	Voltage regulator	Bypass the generator and battery terminals to ground with 0.5 μ f. Also see the <i>Handbook</i> and the <i>Mobile Manual</i> .	Mallory coaxial bypass capacitors have the same thread as most regulator terminals. A proper stud will connect the two.
Popping at regular rate, no change with engine speed	Gas gauge sending unit	Bypass lead-in wire to ground with 0.5 μ f. This wire is usually just under floor mat of trunk (above gas tank).	By rocking the car to slosh the gas in the tank, the rate can be varied.
Pop when brake is depressed	Brake light	Use 0.5 μ f. across brake light switch.	
Horn noise	Horn	Use 0.5 μ f. across horn.	
Electric motor noise	Blower, seat, or convertible top motor	Bypass motor power lead to ground with 0.5 μ f.	

procedure. This tidbit of knowledge can be gained simply by disconnecting the antenna at the receiver (not at the fender). If the noise disappears, it's a good bet that the noise is entering the set on the antenna lead. If, however, the noise is still present, the power lead should be suspect. The troubleshooting procedure is determined by the path by which the noise enters the set.

If you find that the noise enters via the antenna, check for an open or resistive joint between the coax shield and ground (car body). The coax should be grounded at both ends. Points to check are: (1) connector to coax, (2) coax to antenna base plate, (3) antenna base plate to car body, (4) receiver to car body, and (5) car body parts to car body parts. The time to think about points 3 and 4 is when you make the first installation. The receiver and antenna support are often left floating above ground if the installer fails to scrape paint from around mounting holes. The use of star washers between mounting brackets and mounting surfaces will improve the connection. In case of doubt, run a ground strap between the receiver case and the fire wall; squeak-reducing compounds used between dashboards and fire walls on modern cars often float the dash above ground, so make the installation of a ground wire a normal procedure. Point 5 is often overlooked by amateurs. Be sure that the hood, fenders (around engine compartment and where antenna is installed), and engine have good, strong ground connections. Special spring clamps for grounding the hood are available at car radio shops and car dealers. If your car has a fiberglass hood molded on a screen wire form it behooves you to pick up some of these clamps before the installation is even begun. One car radio manufacturer¹ recommends that a ferrite choke be placed in series with the antenna lead. A suitable choke can be made from a 1/4-inch o.d. toroid wound with three turns of No. 22 enameled wire. In order for the device to be effective, the lead between the antenna connector and choke must be as short as possible.

Noise entering the rig via the power lead can usually be filtered out by a simple L-section filter. I have made several of the coils for these filters by taking a ferrite slug from an old car radio tuner or from the antenna coil of a Japanese transistor radio and winding several layers of enameled or hookup wire over it (see Fig. 1). If you make a filter, be sure (1) the wire can handle the current drawn by your receiver, and (2) the wire isn't so long as to cause a large voltage drop.

A persistent case of mobile noise may indicate receiver trouble. Be sure that the input filter (Fig. 2) in your power supply isn't open, especially if your receiver is an all-transistor unit or a hybrid model using tubes such as 12BL6s or 12AD6s. These tubes operate with 12 volts on the plate, directly off the noisy power lead.

The procedures above will not be successful

¹ Philco, in a recent bulletin concerning Philco receivers made for the Ford Motor Company.

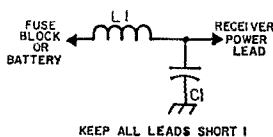


Fig. 1—L-section filter for receiver power lead.

C₁—0.5 μ f. (standard car radio bypass capacitor).
L₁—Three full, close-wound layers of No. 20 enameled wire on 3/8-inch diameter, 1 1/2- to 2-inch long ferrite slug. See text.

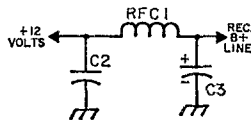


Fig. 2—Input filter commonly found in transistor and hybrid mobile receivers. C₂ is a spark plate capacitor. C₃ is usually a 400- to 500- μ f., 15-volt electrolytic. Although usually found where shown, C₃ is sometimes located on the other side of RFC₁; it is almost always part of a multisection capacitor. RFC₁, when present, is usually 15 or so turns of No. 12 wire on a 1/4-inch form. If C₃ is a multisection electrolytic and the negative lead opens, as it sometimes does, a symphony of oscillations, motor noise and motorboating will occur.

if the proper noise-suppression components are not installed in your car. For this, the procedures discussed in the *Radio Amateur's Handbook* and the *Mobile Manual* are your best bet. The majority of the car radio shops use these same techniques; there are few if any hush-hush trade secrets. In general, there are several steps that you should take:

- (1) Use resistive ignition wiring (standard on all new U.S. cars). This wire deteriorates after awhile, so check it before the old buggy starts missing.
- (2) Keep all leads as short as possible.
- (3) If there are regular bypass capacitors already in use, disconnect them before hooking up coaxial bypasses.
- (4) Be sure all metallic objects entering the passenger compartment via the fire wall are grounded. I nearly lost my mind once because of an emergency brake cable in a 1961 Ford. A bond strap restored my sanity.

With the aid of Table I, your next trip into the mobile noise field should be a little more pleasant than the last one. QST

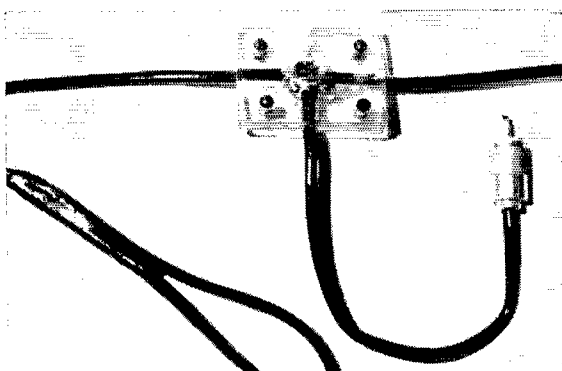
**SWITCH
TO SAFETY!**



The "Double-Bazooka" Antenna

Broad-Band Dipole Using Coaxial Construction

BY CHARLES C. WHYSALL,* W8TV



Center support for the antenna and feed line. It is made of two pieces of Lucite bolted together to form a mechanical support and protect the joint from the weather.

SOME years ago the staff at M.I.T. developed a coaxial dipole antenna for use in radar. This antenna used air- or gas-insulated coax with a velocity factor near unity, and therefore the diameters of the inner and outer conductors could be correctly proportioned for any desired surge impedance. As can be seen from Fig. 1, the antenna consists of a half-wavelength section of coaxial line with the outer conductor opened at the center and the feed applied to the open ends. The *outside* of the coax thus operates as a half-wave dipole. The inside sections, which do not radiate, are quarter-wave shorted stubs which present a very high resistive impedance to the feed point at resonance. At frequencies off resonance the stub reactances change in such a way as to tend to cancel the antenna reactance, thus increasing the bandwidth of the antenna.¹

The antenna can be adapted for amateur work using readily available cable, and while the de-

* No. 9 The Woods, Marion, Ohio 43302.

¹ The same reasoning applies to the ordinary parallel-conductor folded dipole, insofar as the effect of the folded sections on bandwidth is concerned. However, the folded dipole also steps up the impedance at the feed point by a 4 to 1 ratio. This does not occur with the coaxial system discussed here. — Editor.

This coax version of broad-banding by using reactance-compensating stubs is especially useful at the lower frequencies where an amateur band may be a considerable percentage of the center frequency. Although the principle is as old as the folded dipole, it has had comparatively little application in other antenna types.

sirable condition mentioned above cannot be exactly met, the losses involved are not significant. As can be determined by reference to many handbooks, the resonant length in feet of a length of coax is $492/F_{Mc}$, multiplied by the velocity factor of the cable. For solid polyethylene this works out to be $325/F_{Mc}$, and for nitrogen foam insulation the factor becomes $393/F_{Mc}$. These factors apply at any frequency. However, the cable velocity factor does not apply to the *outside* of the cable, which acts as a simple conductor. For example, a piece of RG-58A/U 83.3 feet long will be a half wavelength at 3.9 Mc. *inside*, but the *outside*, which does the radiating, would be resonant above 5 Mc. This is too short for the design frequency of 3.9 Mc., and therefore it is necessary to build out each end of the antenna to the necessary overall length. Ladder line is excellent for the built-out sections as it has a

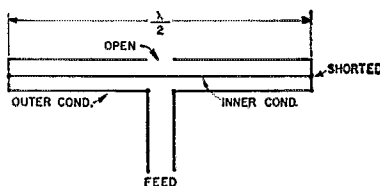


Fig. 1—The original coax dipole system, using air-insulated coaxial line. Velocity factor is essentially the same both inside and outside the line in such case.

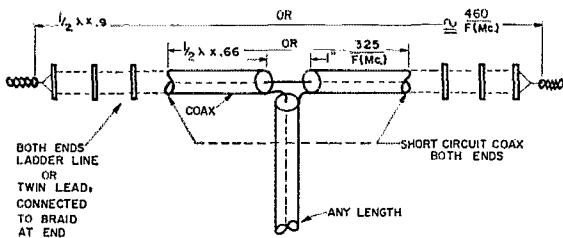


Fig. 2—Electrical construction of the antenna. In preparing the center opening, first cut off a 1-inch section of the vinyl covering, being careful not to nick the braid. Then cut the braid at the center, without cutting the polyethylene, and strip the braid both ways from the center to form pigtails to which the coax feed line can be connected.

greater effective diameter than an ordinary wire conductor, and the reduction in length-to-diameter ratio contributes to lowered radiator Q .

An antenna built in this way is shown in Fig. 2. Ideally, parallel-conductor line should be used to feed the antenna, since it is a balanced system, but many prefer to use coaxial feed. Little distortion of the field of the antenna will result if the feed line is carried away from the antenna at right angles for the maximum distance possible.²

The problem of strength at the center has been solved here by the use of two pieces of $\frac{3}{8}$ -inch Lucite, 3 inches square. As shown by the photograph, a $\frac{3}{16}$ -inch hole is drilled through the length, and another halfway through at 90 degrees to the first. A cavity nibbled out at the junction of the drilled holes accommodates the soldered connections at the feed line and two braids of the antenna sections.

Advantages and disadvantages can be listed for almost all antennas, and this is no exception. This is definitely not the antenna for the ham

² It is of course possible to use a balun at the antenna if the direct coupling to the outside of the feed line causes "antenna" currents to flow on the line. With most random lengths of line these currents should be fairly small in a 3.5-Mc. system. — Editor.

who wants one for all bands. It is a one-band job and will radiate practically nothing on the second harmonic since the stubs represent a short circuit at twice the design frequency. However, radiation will take place on the 20-meter band if the antenna is made for the 75-meter phone band, but the losses in the stubs will rise. Another disadvantage is that considerable care is required in construction. The advantage of the antenna is that an s.w.r. of between unity and 2 to 1 can be maintained over the 3.5–4 Mc. band if the antenna is cut for about the center frequency. Fig. 3 shows s.w.r. measurements made with two different lengths, the coaxial section (cut by formula for 3.9 Mc.) being the same in both cases.

Extensive experimenting by W8NSM and myself indicates that RG-58A/U coax has ample mechanical and electrical strength for this application. Hundreds of hours of legal-limit operation on RTTY, c.w. and s.s.b. have proved this.

Credit is due to Dave Walker, K5VFB, for the photo of the center construction, and to Burt Hayhurst, W5IZQ, for the s.w.r. curves. **QST**

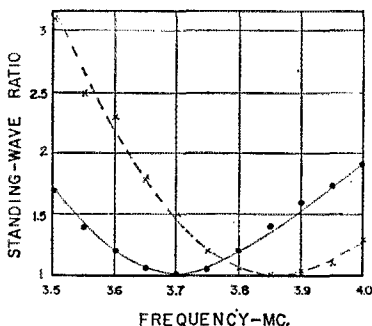


Fig. 3—Representative s.w.r. curves with the overall antenna length adjusted for resonance at 3700 kc. (solid line) and 3850 kc. (dashed line). In both cases the coaxial section of the antenna was the same, cut by formula for 3900 kc.

Strays

The wide spread of ages and interests among aspirants to ham radio is apparent in this code class conducted by Rich Reichenbach, W1SBK, on behalf of the Manchester Radio Club of Connecticut. Rich is in his 17th year of helping beginners in this way. At the left are Jeff and Greg Ennis, age 9, already taking 10 w.p.m. Opposite them is Frank Ennis, their father. Next comes Zygmunt Boresko, 74, another youngster, Paul Dumont, and, with back to the camera, Ernie Larson. Class meets each Tuesday in C.D. Headquarters of the Manchester Town Hall. It would be hard to estimate the number of hams in the Greater Hartford area who owe their competence with the code to the patient persuasion of W1SBK.



Technical Correspondence

MICRO-TO AGAIN

Technical Editor, *QST*:

I built the Micro-TO keyer from August 1967 *QST*, and it has been running for two months now with good results. I have a few comments on it that might help others:

Try to keep it away from heat-generating equipment, as the integrated circuits and transistors are sensitive to heat and cold. I had my keyer on top of my Ranger at first, but since the Ranger temperature goes up to about 135 degrees F. in my case, the keying became erratic after a time. The keyer was moved to a cooler spot and has worked satisfactorily ever since.

The transistors specified are made only by Fairchild, so far as I know. In my case, I used a 2N3638, a 3642, and a 2N699 (in place of the 3543) in the pulse generator. The output transistor was another 2N699, and the relay was a 36-ohm type, with a 1N34 across it. The 220-ohm resistor was left out, since it was not needed with grid-block keying. In the power supply, I used a bridge rectifier circuit since I did not have a center-tapped transformer. The rectifiers were of the top-hat variety. A little juggling of a dropping resistance is needed to come up with 3.6 volts. All transistors and IC's used the same voltage. About 450 μ f. was used for C_4 , while C_3 is 100 μ f. Anything above 450 μ f. may be used for C_4 , but below that there is too much ripple in the output of the power supply.

I would like to thank WA1HSN for all his assistance with this project. — Dan Shine, WA1GGN, 9 Colonial Blvd., West Haven, Conn. 06516.

10-METER "LAZY QUAD"

Technical Editor, *QST*:

Among your readers that like to tinker with antennas there may be some that would like to try the antenna shown in Fig. 1. The basic idea came from a station using a somewhat similar configuration on 15 meters, and I make no claim of originating the idea. However, I have never heard of anyone using the antenna on 10 meters. Since it is currently nameless, and has features similar to both a Lazy H and a quad, perhaps it should be known as a "Lazy Quad."

The major advantages of the antenna are: (1) extreme simplicity, (2) feasibility of installation on a light unguyed pole, (3) small horizontal space requirements (as compared to a horizontal dipole), (4) low QRN in receiving (as compared to a vertical dipole), (5) ability to withstand high wind loads and (6) broadband operation.

When looking at loop 1 we see a horizontally-polarized full-wave loop radiating broadside, with maximum currents along the top and bottom horizontal wires H_1 and H_2 . When looking at loop 2 we see a similar horizontally-polarized loop with maximum current on wires H_2 and H_3 . When looking at wires H_1 and H_3 we notice two in-phase horizontal wires spaced a half wave, both carrying maximum current. Minimum currents appear on the vertical

portions of the loops where the tuning stubs are inserted.

I operate mostly on 10-meter c.w. and have the antenna peaked at 28,050 MHz. In my specific case the length of each stub is 6 inches for this frequency. Loading is almost constant from 28 to 30 MHz.

The coax feed line is run straight down the pole (wood) to the ground, and there is little antenna effect on the feeder.

Results have been consistently better than had been obtained with vertical or horizontal dipoles previously installed at the same effective height at the same location. Indications are that it outperforms some beams of the same approximate height, perhaps because of the broad vertical pattern (which allows longer QSOs under critical skip conditions), as compared to the beams.

Perhaps some of your readers might be urged to try this basic idea with a reflector of the same basic configuration as the driven element. It would appear that the Double Lazy Quad would be anything but lazy in operation. — Dave Harlacker, W6PIZ, 1547 Wellesley Ave., Los Angeles, California 90025.

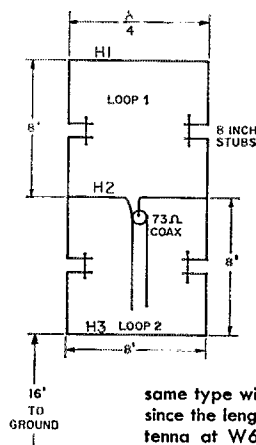


Fig. 1—W6PIZ's "Lazy Quad" for 10 meters. The loops are No. 14 wire, with the horizontal sections mounted on 8-foot lengths of 1 X 2 wood. The adjustable stubs are of the same type wire and are self-supporting since the length is only 6 inches. The antenna at W6PIZ is mounted on an unguyed wooden pole 32 feet high.

BASE INSULATORS

Technical Editor, *QST*:

I read with interest the article entitled "The Verti-Vee" by W1SNN (*QST*, July 1967, p. 20), with its reference to the "giant beehive deck insulator (from a battleship), designed to support a telescoping vertical radiator (from the same source). . . ." Actually, such insulators are in common use throughout the Navy, although we do not use telescoping radiators. From the photograph of the antenna included with the article, the insulator appears to be identical to the IL-18/U Insulator Assembly, while the antenna appears similar to the Navy Type NT-66047 Whip Antenna Assembly (35 feet long, aluminum, in five 7-foot sections, which fit together by means of screw-on joints). Being a Navy Chief Electronics Technician as well as a ham, I couldn't resist the opportunity to pass along a few maintenance hints which several years of experience with these antennas have brought to light.

First, the antenna section threads should be coated with anti-seize compound to allow disassembly at a later time. Likewise, all threaded surfaces on the insulator assembly should be similarly coated (grease will do the trick, or Dow-Corning

No. 4 silicon compound). Since the insulator cap on which the whip is mounted is cast phosphor bronze while the whip is aluminum, galvanic action will cause corrosion of the interface of the two surfaces. To insure good electrical connection and the least possibility of random radio-frequency interference, these two surfaces should be wire-brushed every six months. We do it every three months, but we have salt spray to contend with.

Second, manufacture some soft neoprene gaskets from $\frac{1}{8}$ -inch thick gasket material to install between metal surfaces and the ceramic insulator bowls. This will require four gaskets, and will prevent chipping the bowls when the whip flexes. If the bowl is chipped and the unglazed portion is not sealed in some manner, the bowl will absorb moisture like a sponge!

Third, file a couple of $\frac{1}{8}$ -inch deep notches across the bottom face of the whip to allow water to escape. The whips will accumulate water, and on occasion we have had as much as a quart pour out of the whip when it was removed. Needless to say, we wasted no time filing those notches.

Fourth, use as short a piece of wire or tubing as possible between the tuner and the whip — five feet at the most. Quarter-inch copper tubing is ideal, and polishing the tubing surface and spraying with Krylon will keep surface resistance to a minimum.

Fifth, mount the antenna assembly as close to the ground as possible, and use as many radials as possible for best results.

Sixth, keep the insulator bowls clean, especially if running a high-power rig. The whip will handle several kilowatts of r.f. if clean and in good shape.

Hope that these hints may prove useful to any hams who come across an old battleship (the same antenna is used on virtually every type of ship, including ocean-going tugs!). — *ETC Paul H. Bock, Jr., USN, K4MSG, RE Div. USS Belmont (AGTR-4), c/o FPO, New York, N. Y. 09501.*

REGULATED POWER SUPPLY

Technical Editor, *QST*:

In the March 1967 issue of *QST* (page 32) W1YDS described a very useful transistor power supply. However, he reported some difficulty in obtaining a precise output voltage. The following note is offered as a possible improvement.

In the original circuit, part of which is reproduced in Fig. 2A, the output voltage is equal to the Zener voltage minus the base-to-emitter voltage of the regulator transistor, as stated by W1YDS.

In the revised circuit of Fig. 2B, two components have been added: a forward-biased diode in series with the Zener diode and a resistor R (which will be discussed later).

From Fig. 2A, the output voltage is now equal to the sum of the Zener voltage and the voltage drop of the forward-biased diode minus the base-to-emitter voltage of the transistor. For a forward-biased diode, the voltage drop is usually between 0.4 and 0.7 volt, depending on the type of diode (either germanium or silicon) and on the current flowing through it. The ratings of this diode are not particularly critical, so long as the diode is capable of carrying the full Zener current.

For purposes of illustration, assume the Zener voltage to be 11.6 volts, the base-to-emitter voltage of the transistor to be 0.3 volt, and the diode voltage drop to be 0.6 volt. In the original circuit, the output voltage would be $11.6 - 0.3 = 11.3$ volts. In the revised circuit, the output voltage would be $11.6 + 0.3 = 11.9$ volts, under the same conditions. This is closer to the desired output of 12 volts.

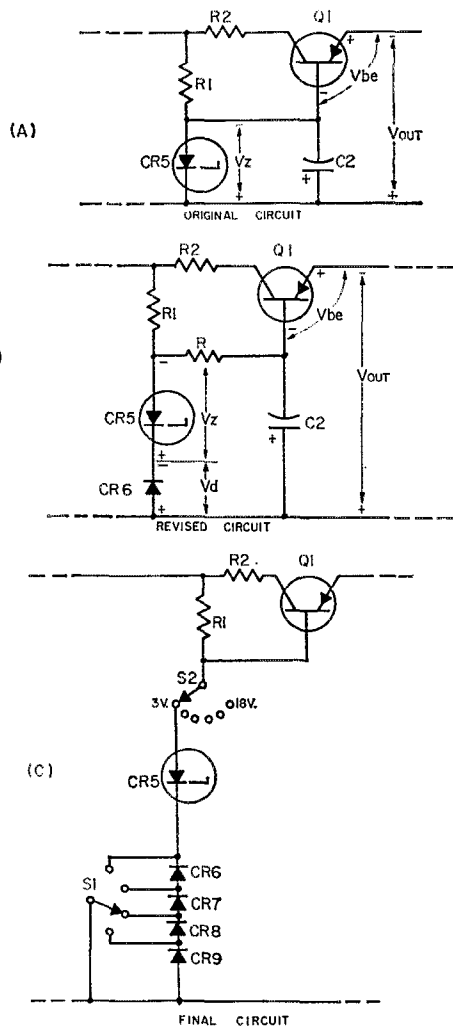


Fig. 2—(A) Series regulator used in March 1967 circuit (Gimmicks & Gadgets) with (B) addition of diode in series with Zener reference to effect a small change in reference voltage and thus in the output voltage. (C) Adding several diodes which can be switched in as required to adjust the output voltage. This switch can be used to compensate for voltage variations which result from load changes.

If more variation in output voltage is desired, more diodes of adequate rating may be added in series with the Zener diode. Fig. 2C illustrates a possible arrangement. Switch S_1 allows any or all of the diodes to be inserted for any output voltage. The range of S_1 will be from zero to about 2 volts in approximately 0.5-volt steps. These diodes also add some temperature compensation to the circuit.

Under certain combinations of load and current drain, the power supply may tend to oscillate at a high frequency. The 0.01- μ f. capacitor in the original circuit should take care of this. But, in any case, a 100-ohm resistor at R will serve as a "stopper" resistor.

It is sincerely hoped that these ideas will help in overcoming any problems. — *R. W. Mouritsen, VE3GIM, Algonquin Radio Observatory, Lake Traverse, Ontario, Canada.*



Hints and Kinks

For the Experimenters



DETERMINING THE LENGTH OF AN INVERTED V

A SEARCH through the literature on inverted V antennas doesn't reveal any hard and fast formula for determining antenna length. This is understandable because so many factors can get into the act from one installation to the next.

One simple way around the problem is to make the inverted V so that its length can be easily adjusted. Fig. 1 shows a simple way of changing the overall length at both ends of the V. The ends of the antenna are fed through the end insulators, and then the wires are clipped back on themselves. Once the correct or resonant length is found, the guys are made permanent.

The adjustment method consists of installing an s.w.r. bridge in the coaxial feed line, tuning up on the desired frequency, and then changing the length of the V until the s.w.r. is reduced to minimum. The point where the s.w.r. is lowest is the approximate resonant frequency of the V. As a starting point for the overall length use

$$\text{Length (feet)} = \frac{515}{\text{Freq. (Mc.)}}$$

For example, for 3.8 Mc. the overall length would be 136 feet and each leg, of course, would be half of this (68 feet). — *WICP*

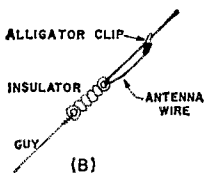
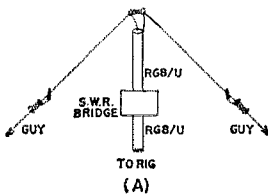


Fig. 1—Setup (A) for resonating an inverted V antenna, and a closeup (B) of one of the end insulators and shorting clips. The clips are used to progressively shorten each side of the antenna by an equal amount until the s.w.r. is reduced to a minimum.

EQUIPMENT LABELING

USE india ink for equipment labeling and get results at least comparable to press-on letters. Employed are a special lettering pen (\$2.50 three years ago) and special lettering guides (\$3

to \$5 each). They are made by WRICO (Wood-Regan Instrument Company), Nutley, New Jersey, and can be ordered through or obtained directly from most office supply or stationery stores. Lettering guides come in a wide variety of letter sizes and styles, with the recommended size of pen tip increasing with the size of the letter. I find the VCN 120 lettering guide and the No. 7 lettering pen excellent for normal panel labeling. A larger guide, the VCN 200, works fairly well with the No. 7 pen, although it was intended to be used with a pen having a thicker tip.

An almost unlimited variety of markings can be made with any one lettering guide. Added flexibility lies in the fact that india ink is available in a number of colors. If one makes a mistake, he can easily remove the ink from bare or painted metal surfaces by licking a finger and rubbing the mark away. After the lettering is completed it should be covered with a transparent coating. I have successfully used both Krylon crystal clear spray lacquer and finger nail polish, the latter being a little tricky to apply to some types of painted surfaces. To be sure the coating will cause no harmful effects, one should experiment first on a hidden corner of the surface to be covered.

A little practice with this lettering method can lead to some really good-looking results. A disadvantage is the initial cost. Once a pen and lettering guide are purchased, the expense is negligible since a bottle of india ink is both inexpensive and hard to use up. For best results I recommend that the pen be cleaned with a cloth and warm water after each use. — *Tim Wulling, K9APS*

T4X HINT

IF you have an early model of the Drake T4X transmitter and operate both s.s.b. and c.w., the following information should prove helpful. It came directly to me from the Drake Company in answer to an inquiry.

"Early models of the Drake T4X transmitter have an operational shortcoming which makes for inconvenience if you want to change from c.w. to s.s.b. or vice versa. To go from s.s.b. to c.w. you have to reach around and plug in the key, and the reverse when going from c.w. to s.s.b. There is a very simple remedy for this inconvenience, which allows the entire operation to be controlled by the function switch just as it is done in the later models of the T4X. With the T4X bottom turned up and the front panel facing you, observe the rearmost switch wafer of the function switch. There is a terminal on the

rear switch wafer close to the chassis that is unused. Connect a wire to this unused terminal, run it straight back to the injection jack at the chassis rear and route the wire through the notch in the corner of the injection shield to the terminal on the key jack to which the white wire is attached. Lead dress is important and the added wire should be installed just as described. This modification allows the function switch itself to control the changeover and will not alter the operation of the T4X in any other way." — *W1BTU*

GROUND ROD REMOVAL

I HAVE had good luck in removing ground rods by taking an 18- or 24-inch pipe wrench and rotating the rod several times before starting the pulling process. This seems to effectively break the adhesion between soil and rod and polishes the rod somewhat, with the result that the pulling process is made less difficult. — *N. E. Loofboro, W9IQB*

SIMPLIFIED METER SWITCHING

THE writer recently built a simple 6146 c.w. power amplifier to follow a small transistor transmitter. A 6AQ5 clamper tube was used to protect the amplifier, and a 0-1 milliammeter and suitable shunt and multiplier resistors were employed to indicate either grid or cathode current. However, as shown in Fig. 2, a s.p.s.t. toggle switch, S_1 , was used to do the meter switching, rather than the usual multiple pole switch. When S_1 is closed, M_1 and R_1 serve as a voltmeter to indicate the potential drop across the 5.1-ohm cathode resistor, R_2 . When S_2 is opened, the voltmeter indicates the potential drop across the 240-ohm grid resistor, R_3 . The full scale cathode and grid current readings are approximately 200 ma. and 5 ma., respectively. — *Wes Hayward, W7ZOI*



Fig. 3—A length of plastic-covered wire makes an inexpensive support for a mobile microphone.

CHEST MICROPHONE

AFTER operating mobile for a time, I found that VOX should be used. As a result I whipped up the chest microphone arrangement shown in Fig. 3. A length of No. 10 hard-drawn copper wire was covered with transparent plastic tubing and bent to the configuration pictured. Then a very inexpensive crystal mike was attached. The resulting arrangement is extremely light weight and has been most satisfactory. — *Russ Alexander, W6LEL*

REPAIRING SOLDERING PENCIL TIPS

THE ceramic around the tip of a soldering pencil will often crack after the iron has had extended use. Eventually the element will become unusable due to the looseness of the tip; however, the tip can be repaired with muffer cement, a substance usually found at auto supply houses. A tube of this cement is very inexpensive, and it can be used for other minor repairs involving heat because it will stand up to temperatures as high as 1200 degrees F. — *Mike Greenway, K4TBN*

VIBROPLEX KEY

BY placing a Vibroplex semiautomatic key inside a plastic bag (household Baggie), you can prevent dirt from getting on the contacts. The key can be operated easily through the plastic container. — *Fred Elser, W6FB*

CLEANING CRACKLE FINISHES

IN an April Hint & Kink it was suggested that gasoline be used to clean crackle finish panels. I suggest that solvent be used instead. Gasoline is dangerous and particularly so if used from an open can. — *Ralph Gibbons, W7KV*

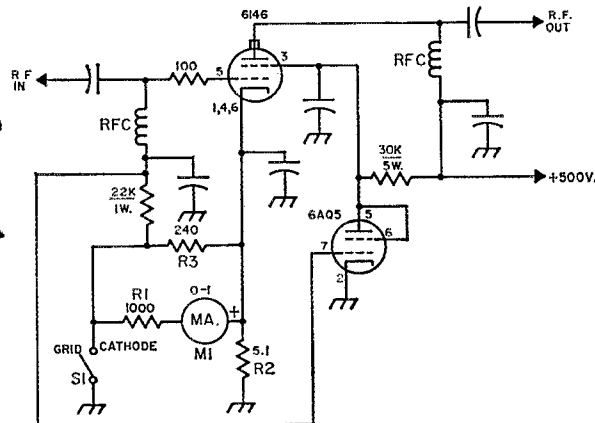
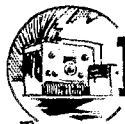


Fig. 2—Only a s.p.s.t. toggle switch is necessary to do the meter switching in this amplifier. Resistances are in ohms; K = 1000; resistors are 1/2 watt unless indicated otherwise. M_1 —0-1 milliammeter. R_1 , R_2 , R_3 —For text reference. S_1 —S.p.s.t. toggle switch.

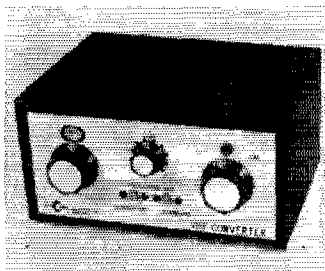


Recent Equipment



To acquaint you with the technical features of current amateur gear.

The Clegg Associates Classic-Series V.h.f. Converters



UNTIL recently if a manufacturer produced v.h.f. converters that offered low noise figure, guaranteeing optimum weak-signal reception, he felt that his obligations had been discharged. Factors like freedom from overloading, good rejection of out-of-band signals, accurate frequency calibration, and adaptation to the many kinds of communications receivers were routinely left to the purchaser. This situation may not be markedly changed today, as far as inexpensive converters are concerned, but we are seeing more attention being paid to refinements of the kinds mentioned above, in the higher price brackets.

The Clegg Classic-Series v.h.f. converters are fine examples of designing for maximum effectiveness, accuracy and convenience. The work of a long-time v.h.f. enthusiast, they reflect his concern for the "finer things" in communication above 50 Mc. They offer optional combinations for receiving the 50- and 144-Mc. bands with just about any communications receiver, and accessories to fill every operating need.

If you have a receiver that can tune 14 to 15 Mc., such as a 75A-4, the Clegg Model 614A has a "front end" that is essentially flat from 48 to 53

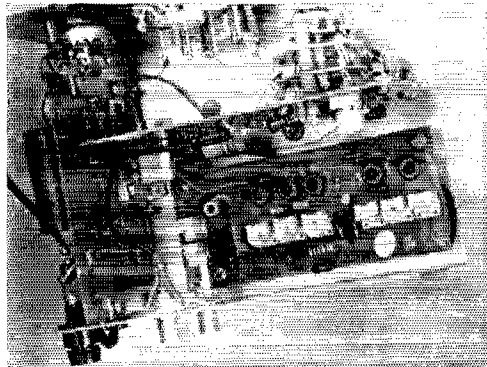
Mc., and it can be supplied with crystals that will enable you to cover this whole range in 1000-ke. segments. As supplied, it has two crystals, for 50 to 51 Mc. and 51 to 52 Mc., but the others can be furnished on order, and the switch has 10 positions. It also has a window and a dial that tells you what range you're on. The i.f. output circuit is flat from 14 to 15 Mc., which is easily accomplished. Switching injection crystals, as done here, is desirable, even if the receiver can tune a 4000-ke. spread, as broadbanding the i.f. over 14 to 18 Mc. is not so easy.

If your receiver tunes only 14 to 14.5 Mc., which is more common these days, the Model 614B switches crystals for each 500-ke. segment. It is supplied with those for 50.0 to 50.5 and 50.5 to 51 Mc., but the others are available.

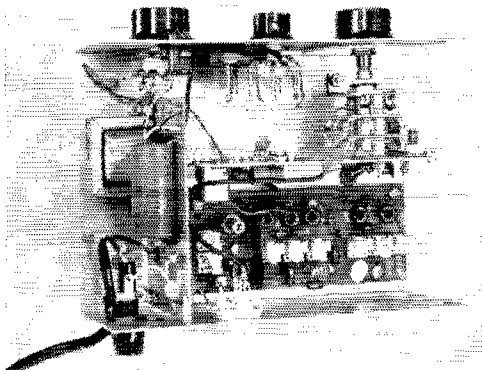
Even more choices are offered in 144-Mc. converters. Their front ends are aligned for 143 to 149 Mc., with i.f. bands 1000 or 500 kc. wide at 14 or 28 Mc. These also have provision for up to 10 crystals, with two supplied (three in the Model 228B, which has 500-ke. ranges starting at 28 Mc.). All models are also available with 200-ke. segments, for use with S-Line receivers. All have dials with frequency-indicating windows.

The Classic-Series converters have operating conveniences to match. Gain may be controlled from the front panel, over a range in excess of 20 db., without affecting the converter noise figure. This enables the owner to accommodate wide differences in receiver gain. The converter output level can be set to approximate the level of incoming signals on the tuning range used, thus permitting one setting of the S-meter to give realistic readings on both h.f. and v.h.f. reception. If the communications receiver should be overload-prone, the converter output level can be set with this in mind.

Two screwdriver-adjustment trimmers on the panel are for pulling the converter crystal oscillator frequency and the frequency of the built-in frequency standard oscillator slightly, so that the converter can be put "on the nose" in every in-



Closeup view of the Clegg 50-Mc. converter, showing the toroidal circuits used in the r.f. and mixer stages.



Interior of the Clegg 50-Mc. Classic-Series Converter, Model 614B. Range switch, upper right, has provision for up to 10 converter crystals. Power supply occupies left side of the assembly. Oscillator and multiplier stages, if used, are on the vertical circuit board. R.f. amplifier and mixer stages are on the horizontal board.

stallation. The frequency standard has a harmonic amplifier, to produce signals in the actual frequency range of the converter.

The r.f. amplifier and mixer stages use field-effect transistors, for freedom from front-end overload, and both long-term and short-term stability. Tuned circuits are toroidal, minimizing the possibility of radiation of unwanted frequencies from the oscillator and multiplier stages. Bandpass coupling circuits between the injection stages and the mixer help to keep the injection pure, an im-

portant consideration in keeping down unwanted responses to out-of-band signals. Power supply output is Zener-regulated for stability, and the line-cord connection is made through a filter, to prevent pickup or radiation via this source.

Each converter is given a thorough performance check, and detailed results are supplied with the unit as sold, for future reference. Such features and attention to detail do not come cheaply. The price range for the Classic-Series converters is higher than some hams pay for complete receivers, but if optimum v.h.f. reception is your objective, and you don't want to do the design and construction yourself, these converters should be of interest.

— W1HDQ

Clegg Associates Classic-Line V.h.f. Converters

Height: 4 inches.

Width: 7¾ inches.

Depth: 6 inches.

Weight: 2½ pounds.

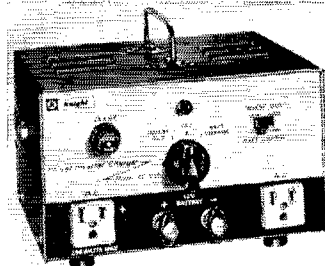
Power requirement: 115 volts, 60 cycles, a.c. (Built-in power supply.)

Price Class: \$115 to \$135, depending on model. Extra crystals \$5.95 each.

Manufacturer: E. T. Clegg Associates, Box 376, Morris Plains, N. J. 07950.

Knight-Kit KG-666

Power Inverter/Charger



THE amateur who decides to take the a.c.-powered transceiver out of his home and operate it in his car usually has to purchase a separate mobile supply for the rig. A look at power supply price tags — \$65 to \$200 for a mobile supply, depending on the transceiver — shows this to be expensive. However, a considerable sum can often be saved if one or two 115-volt inverters are purchased instead of the mobile supply.

If a car is equipped with a suitable inverter, it isn't necessary to buy a different mobile supply for each new rig. And, of course, an inverter can be used to provide a.c. power for devices other than transceivers. Within its power rating, an inverter will run TV sets, test equipment, solder-

ing irons, small portable electric tools, electric lights, shavers, small kitchen appliances, electric toys, hair dryers, and so forth.

The Knight-Kit KG-666 inverter shown in the photographs has a continuous power rating of 200 watts. If more power is required, two or more units may be connected in parallel. The a.c. output of the inverter is a 55- to 65-Hz. square wave, whose exact frequency depends on the battery input voltage and the load placed on the inverter. A slide switch in conjunction with the tapped secondary of the power transformer permits the selection of either 105 or 120 volts.

Two features, which this writer hasn't seen in other inverters, appear in the KG-666: an output socket that provides either 105 or 120

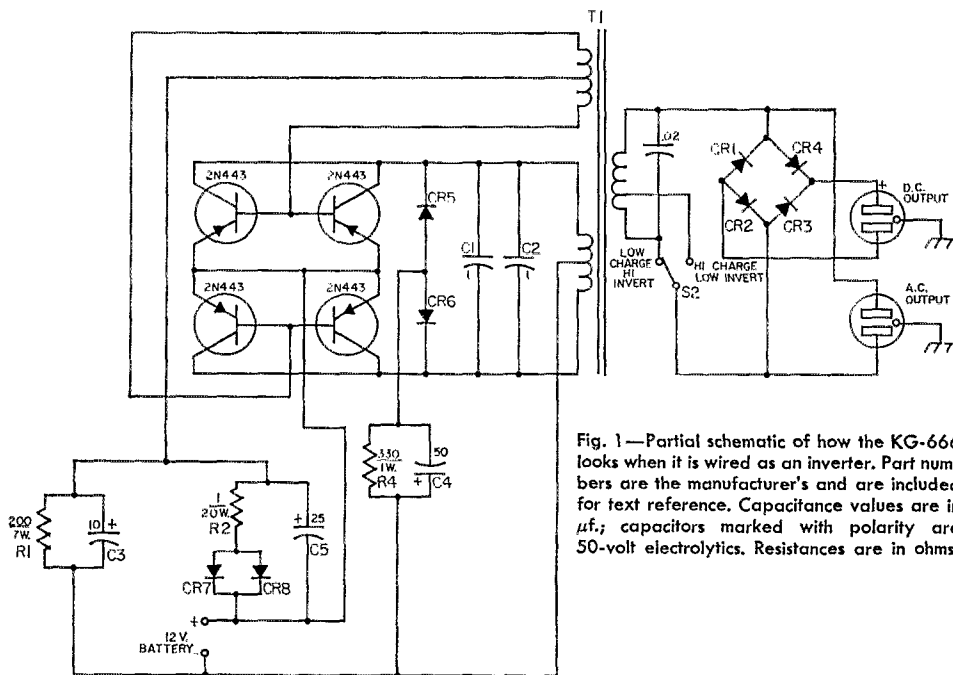


Fig. 1—Partial schematic of how the KG-666 looks when it is wired as an inverter. Part numbers are the manufacturer's and are included for text reference. Capacitance values are in $\mu\text{f.}$; capacitors marked with polarity are 50-volt electrolytics. Resistances are in ohms.

volts of unfiltered d.c., and a function switch that converts an inverter into a battery charger. The d.c. is used for operating small universal motors—such as those found in electric drills and shavers—that don't operate very well from square-wave a.c. Battery charging starts off at a 6-ampere rate and gradually tapers off as the battery becomes charged. If a lower charging rate is desired, the slide switch mentioned above can be used to reduce the effective turns ratio from transformer primary to secondary.

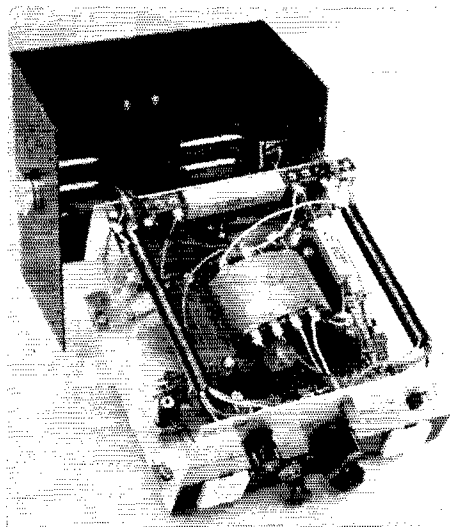
A fuse is included in the KG-666 to protect the unit from damage when it is being used as an inverter, and a circuit breaker is employed to safeguard the unit when it is functioning as a battery charger.

Fig. 1 is a partial schematic of the KG-666 operating as an inverter. Knight-Kit has added several components to the usual one-transformer, push-pull switching circuit to improve its performance and make it more versatile. Rather than the common resistive-divider starting network, a diode starting circuit consisting of C_3 , C_5 , CR_7 , CR_8 , R_1 and R_2 is employed. When the inverter is first turned on, the transistors receive a large forward bias voltage via R_1 and start oscillating readily. As soon as base current begins to flow, CR_7 and CR_8 conduct and reduce the bias supplied by the network to a lower level. This arrangement dissipates less power than a straight resistive network (there is no bleeder current), and it is less temperature sensitive.

The transistors are protected from switching transients by a capacitive despiking network, C_1C_2 , and a diode despiking circuit, $CR_5CR_6-C_4R_4$. In the latter circuit, C_4 is kept charged to the peak voltage across T_1 's primary through

CR_5 and CR_6 , which are therefore back-biased. Any transients that try to exceed the bias voltage stored in C_4 are short-circuited through CR_5 , CR_6 and C_4 .

CR_1 through CR_4 convert the a.c. output of the inverter to pulsating d.c., and S_2 selects the proper tap on the transformer for a.c. and d.c. outputs of 105 and 120 volts.



Interior view of the KG-666 shows an uncrowded layout. Two transistors are mounted on a heat sink at the rear of the unit, and one transistor is mounted on each of the cover's sidewalls.

When the KG-666 is employed as a battery charger, the circuit of Fig. 1 is used more or less in reverse. Instead of a.c. being taken out of the transformer secondary, a.c. is fed into it. T_1 acts as a step-down transformer rather than step-up. The function switch (not shown) disconnects the base circuit illustrated and connects the base of each transistor to its corresponding emitter. As a result, each transistor becomes a diode, with the former collectors becoming anodes and the former bases becoming cathodes. The charger rectifying circuit formed is a full-wave affair, with two diodes (partially shorted transistors) in each leg.

The KG-666 is a compact unit, measuring only $4\frac{3}{4} \times 8 \times 8\frac{1}{4}$ inches. Ventilation holes are provided in the top, bottom and back of the cabinet to help cool the transformer and other components inside the case. A handle on top makes it easy to carry the inverter/charger from place to place. For those interested in color schemes, the unit has an anodized green cabinet and a silver and green front panel.

On the front panel of the KG-666 are a fuse holder, a neon pilot lamp, a three-position (INVERT, OFF and BATT CHARGE) function switch, a slide switch that selects the output voltage level when the function switch is at INVERT OUT and the charging rate when the function switch is at BATT CHARGE, color-coded battery terminals, a polarized socket for a.c. output, and a polarized socket for d.c. output. On the back of the KG-666

Knight-Kit KG-666 Power Inverter/Charger

Height: $4\frac{3}{4}$ inches.

Width: 8 inches.

Depth: $8\frac{1}{4}$ inches.

Weight: 8 pounds.

Power Requirements: (Inverter) 12 volts d.c., 3 amp. no load, app. 20 amp. full load. (Battery charger) 115 volts a.c., app. 1 amp.

Price Class: \$45 (\$35 for the KG-662)

Manufacturer: Allied Radio, 100 North Western Ave., Chicago, Illinois 60680.

are a socket for attaching a line cord (furnished) for battery charging, a ground connector, and the reset button of the circuit breaker.

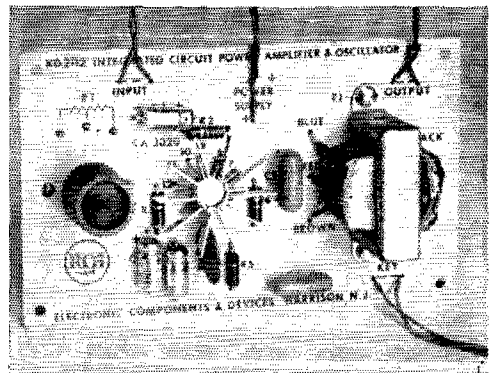
The kit was tested in the ARRL laboratory and performed satisfactorily. It only took a few hours to wire it, and no constructional difficulties whatsoever were encountered. The Knight-Kit practice of mounting resistors and diodes on labeled sheets of cardboard speeded up the assembly. Both the wiring and operator's manuals were clear and informative. Included in the manuals are details of a lower-powered inverter, the 125-watt KG-662. This unit is similar in appearance to the inverter described here, except that it uses only two transistors and has a different transformer. — W1YDS

• *New Apparatus*

IC Amplifier Kit

To introduce the integrated circuit to the hobbyist, RCA has brought out a kit containing all the parts needed for the construction of a high-gain audio amplifier and code practice oscillator, packaged along with an uncapped IC so you can see what the device actually looks like (you need a magnifying glass to inspect it!). The integrated circuit is the RCA CA-3020 linear amplifier. An etched circuit board is provided for mounting and connecting the parts, and there is a booklet telling about IC's in general and the CA-3020 in particular, along with information on assembly of the kit. The accompanying photograph shows the amplifier after assembly.

The amplifier has sufficient gain to be used with a crystal or ceramic phono cartridge, and enough power output (550 milliwatts with a 9-volt supply) to operate a speaker at moderate volume. Possibly of more interest to amateurs is the fact that all the necessary parts for the audio end of a receiver-construction project are included, which solves the problem of getting everything needed for an amplifier such as the one in Doug DeMaw's receiver in June *QST*. The amplifier is converted into a tone oscillator simply by adding a capacitor and resistor (furnished) to the circuit, and although the booklet doesn't say so specifically, this can be done without



affecting the amplifier's operation at all so long as the key is open. Thus the beginner can practice code at will, even if the amplifier is incorporated in his receiver.

The kit should be available soon through distributors of RCA products, and will be priced at about \$10.

— W1DF

JAN FEB MAR APR MAY JUN JULY AUG SEPT OCT NOV DEC

Hamfest Calendar

Alberta — Make your registrations now for the International Glacier-Waterton Hamfest to be held at Waterton Lakes National Park, July 20-21. Supper will be served at 6:00 p.m. Saturday and Breakfast Sunday morning at 7:30 a.m. Lots of program material for all. Make your own arrangements for accommodations. Pre-registrations \$3.00 per amateur and family. Send all money to Hamfest Committee, P.O. Box 54, Red Deer, Alberta, Canada.

Arizona — The Amateur Radio Council of Arizona will sponsor a hamfest in Flagstaff on July 26, 27, and 28, at Fort Tuthill in Coconino County Fairgrounds. Included in the events scheduled will be games of skill, contests, swap table, auction and a pot-luck dinner on Sunday. Free sites for camping . . . campers and trailers are okay. Rest room facilities are available. There are motel accommodations available in Flagstaff just north of the fairgrounds. Talk-in stations will be on 3.878 and 50.34 MHz. For more information write Amateur Radio Council of Arizona, P.O. Box 6602, Phoenix, Arizona 85005.

California — The Amateur Radio Club of Eleajon plans to hold a picnic July 14.

Illinois — The Jacksonville Area ARC will hold their hamfest on July 7 at the Morgan County Fairgrounds, 4-H Building, Jacksonville, Ill. Talk-in on 3.875 I.s.b., 50.2, and 145.58 MHz. Tickets are \$1.50 each or 4 for \$5.00.

Illinois — The De Witt County ARC will hold its annual Hamnic at Weldon Springs State Park, 4 miles south and east of Clinton, Ill., on Sunday August 4. Potluck dinner, no admission charge, everyone is invited. Monitoring 3.940 MHz.

Illinois — The Quad-Co. ARC, Inc., will sponsor the 11th Annual Hamfest of the "Breakfast Club" on July 20 and 21 at Terry Park, ¾ mile east of Palmyra, Ill. All other groups are invited to meet at the hamfest giving prior notice to the hamfest committee. There will be dancing and movies Saturday night. Bring your own basket lunch, sandwiches and soft drinks are available on the grounds. Talk-in on 3.873 MHz. from noon Saturday to 11:00 a.m. Sunday. Games, contests, golfing and fishing. Bring your swap gear. Camping facilities open from Friday afternoon until Monday morning. Pre-registration until July 7 is \$1.00, \$1.50 at the gate. For more information write Hamfest, % Quad-Co. ARC, Inc., Box 323, Chatham, Ill. 62629

Illinois — The Shawnee ARA, Inc., will hold their ham picnic at Herrin Illinois City Park Pavilion on August 4. All park facilities available for family outing including swimming. Registration at picnic or through club members.

Indiana — The Wabash Valley ARA will hold its 20th annual V.H.F. Picnic Sunday, July 28 at Turkey Run State Park (about 40 miles north of Terre Haute on U.S. 41 and Ind. 47). One dollar registration at the gate only. Full day of events scheduled. Contact E. Clehouse, K9EJU, 925 Barton Ave., Terre Haute, Ind. 47803.

Indiana — The IRCC picnic will be held at Brown County State Park on July 14.

Indiana — The Tri-State ARS's twenty first Annual Hamfest will be July 21 at the 4-H Center on North 41 Highway near Evansville, Indiana. Large air conditioned auditorium, ladies bingo, swapper's row, overnight camping, fun and games for all the family. Advance registration \$1.50, \$2.00 at the door. For details contact K9LAU, Jack Young, P.O. Box 492, Evansville, Ind. 47711.

Kentucky — The Paducah ARC will hold their annual Ham Picnic at the Noble Park Community Center, Paducah, Ky. It will be an all-day affair on July 14. Lunch will be served on the grounds. Bring along your swap material and equipment. Further information from Don Fuller, WA4LME, 247 Seminole Drive, Paducah, Ky. 42001.

Kentucky — The annual Hamfest of the Henderson ARC will be held on Sunday, July 28, rain or shine, at the Audubon Raceway. For more information contact WA4WTE, Box 83, Henderson, Kentucky 42420.

MANITOBA — The fifth annual International Hamfest will be held this year on July 20 and 21, on the American side of the Peace Gardens.

Massachusetts — The VARC is planning a July picnic at Look Park on the 14th of July.

Minnesota — The OGS 5th annual picnic will be held at Gunn Park near Grand Rapids on July 14.

Missouri — The Second Annual Central States V.h.f. Conference will be held Aug. 16-17-19 at the Howard Johnson Lodge, Route 54, on the Lake of the Ozarks.

The technical program features talks by (Gerome R. Reeve, W0KEI, *U.h.f. Cavity Design*; Pitt Arnold, W0IPE, *Antennas*; William D. McCaa, K0RZJ, *Transmission Lines and Matching*; Allen R. Burson, K5WXXZ, *Noise and Noise Blankers*; and Edward P. Tilton, W1HDQ, V.h.f. Editor, *QST*. A 432-Mc. Antenna Measuring Party will be conducted, and visitors are invited to bring arrays of any kind, matched for 50 ohms, and fitted with N or BNC connector.

A block of rooms is being held until July 15. Reservations should be made directly with Howard Johnson's Motor Lodge, Lake Ozark, Mo. 65019. No deposit required. Conference reservations (\$3.00 per person) should be made with Joe Hall, K0SGD, 315 W. College, Sparta, Ill. 62286. More information on the Conference may be picked up Sunday evenings at 9:30 CST, on or about 3815 kHz.

Missouri — The Zero Beaters ARC will hold their annual Hamfest August 4 at Washington, Missouri — City Park from 10:00 a.m. until 5:00 p.m. The St. Louis ARC's Amateur of the Year Award will be presented. Swap alley, food and drinks, entertainment for the children and the XYL. Write Zero Beaters ARC, WA0FYA, Box 24, Dutow, Mo. 63342.

Nebraska — The Central Nebraska ARC will hold its annual Steak-Fry at Victoria Springs State Park near Anselmo, Nebraska on Sunday, July 28. For those that come before Sunday there will be a Weiner roast and get-together Saturday evening July 27. Registration will be \$1.25 per person for ages 7 and up. For further details contact or write the Club Secretary, Paul Hartman, WA0LXD, Box 145, Arnold, Nebraska 69120.

New Jersey — The Knight Raiders VHF Club is holding their annual Hamfest (picnic style outdoors) on Saturday July 20, 10:00 a.m. till dusk, Weasel Drift Picnic Grove, Garret Mt. Reservation, West Paterson, New Jersey. Talk-in on 148.898 and 50.4 MHz. Rain date July 27. Coffee and refreshments are available. Swap and shop area, kids play area, picnic tables, barbecue pits and manufacturer's equipment displays. More information and directions from K2DEL.

North Dakota — The 5th annual International Hamfest will be held at the International Peace Gardens on the border between North Dakota and Manitoba on July 20 and 21. A nice program is being planned with activities for the YLs, XYLs, and children.

Ohio — The Van Wert ARC will hold their annual Hamfest and picnic on July 28 at Jubilee Park, Van Wert, Ohio.

Ohio — The Wood County ARC announces its 4th annual Ham-A-Rama on Sunday, July 7 at the Fairgrounds, Bowling Green, Ohio. Write W8PSK, 324 South Grove St., Bowling Green, Ohio 43402 for details.

Ohio — The first annual joint Ohio Section News picnic is July 27 at WRFD Picnic Park, north of Worthington. Details on any section net.

Pennsylvania — The 31st annual Hamfest of the South Hills Brass Pounders and Modulators, Inc. of Pittsburgh, will be held Sunday, August 4 from 1 to 6 p.m. at St. Clair Beach (Old Paris Lake) 5 miles South of Mt. Lebanon on Route 19. Plenty of picnic space for the family. Talk-in on W3PIQ on 10 and 6 meters. Registration \$2.00 at the door or \$1.50 in advance. For more information or pre-registration write L. R. Hendry, WA3GKL, 248 Skypport Drive, West Mifflin, Pa. 15122.

Pennsylvania — The two Rivers ARC, Inc. of McKeesport, Pa. will hold its fourth annual Hamfest on Sunday July 21 at the Balkan Hotel grounds near McKeesport. The event will start at noon, with refreshments, swap and shop, awards and registration. Registration will be \$2.00. For more information contact K3CHD, Don Myslewski, 45 McMahon Drive, Irwin, Pennsylvania 15642.

Tennessee — The Crossville Hamfest is scheduled for July 20 and 21.

Tennessee — The Oak Ridge Radio Operator's Club will sponsor the 18th Annual Crossville Picnic at Cumberland Mountain State Park July 20 and 21. For information, write The Oak Ridge Radio Operator's Club, Inc., P.O. Box 291, Oak Ridge, Tenn. 37830.

Texas — Ham and CB Swapfest, Sunday August 4 at City Park in Levelland, Texas. Sponsored by the Northwest Texas Emergency Net and Local CB Club. This is an event

for the entire family. Bring your own picnic basket. Registration begins at 9:00 A.M. Lunch at 1300. Mobile talk-in is the net frequency 3.950 MHz, and channel 11 for the CBers. For more information write John R. Nell, W5NGX, 208 Pat St., Levelland, Texas.

Washington — The Washington State Hamfest will be held July 13 and 14 at the Yakima County Fairgrounds. Registration starts at 10:00 A.M. Saturday. Events on this day include YL and children's program, softball and pre-school fun hour, 2:00 P.M. meeting of all ARRL appointees, 4:00 P.M. meeting of new State Council of ARC, 6:30 P.M. banquet followed by ARRL program with WINJAI as guest speaker. Sunday program includes pancake breakfast followed by 10:00 A.M. meeting of Wash. State AREC members, bingo, mobile judging, c.w. contest, and auction. Registration fee is \$4.00 which includes banquet and 5 drawing tickets. Children under 12, \$2.25. Breakfast is \$1.50. For presale tickets contact Yakima ARC, K7MGA, Secretary.

Washington — The Okanogan Valley International Hamfest will be held this year in Conconully State Park, Conconully, Washington on July 27 and 28. Registration

for hams is \$1.50 and a "piece of junk." XYLS \$1.00. There will be activities for hams, XYLS, and children. Potluck dinner Sunday noon. Everyone invited and bring the family. For further information contact Secretary, WA7DFP, Harlan R. Tverberg, P.O. Box 1420, Omak, Wash. 98841.

Wisconsin — The 1968 Wisconsin Nets Asso. Picnic will be held July 14 at Fond Du Lac, Wisconsin in Lakeside Park on the south shore of Lake Winnebago. Events will include a mobile contest, a code receiving contest and ladies events. For further information contact K9GSC, Kenneth A. Ebnetter, 822 Wauona Trail, Portage, Wisconsin 53901.

Wyoming — The 1968 Wyoming Hamfest will be of interest to the many amateurs vacationing in Yellowstone and Grand Teton National Parks this summer. The dates: July 27 and 28. The location: To-Gwo-Too Lodge, about 35 miles west of Dubois, Wyo. and only 50 miles from the South Gate of Yellowstone. It is 8500 feet in elevation, overlooks famous Jackson's Hole and commands a beautiful view of the Teton Range. Facilities for meals, lodging, camping and trailers are available. For information or reservations write to Ralph Schaefer, W7NKR, 505 E. Park, Riverton, Wyo. 82501. QST

COMING A.R.R.L. CONVENTIONS

August 3-4 — Central Division, Springfield, Ill.

August 17-18 — Florida State, Melbourne

August 30-31 — Kentucky State — "Louisville Ham Kenvention," Louisville.

August 30-September 1 — Southwestern Division, Phoenix, Arizona.

September 28-29 — Roanoke Division, Greensboro, N. C.

October 12-13 — Hudson Division, Tarrytown, N. Y.

June 20-22, 1969 — National, Des Moines, Iowa.

ARRL CENTRAL DIVISION CONVENTION

Springfield

August 3-4

Boasting an array of speakers, top-notch entertainment, social and business meetings and a gala program for the YLs and XYLS, the ARRL Central Division Convention will be held at the St. Nicholas Hotel, Springfield, Illinois, on Saturday and Sunday, August 3 and 4.

Saturday afternoon forums will include demonstrations of RTTY; s.s.b., with Doug Horner of Collins; traffic with RM Lloyd Hopkins, W9EVJ, and his traffic handlers; RACES; ARPSC; Red Cross with the SCMs and SECs from Illinois, Indiana and Wisconsin; antennas and Novice programs with Lewis G. McCoy, W1ICP, of ARRL headquarters. Other forums on Sunday include Navy and Army MARS; ARRL program; and, factory representatives explaining their new products. Question and answer panels will follow each program.

YLs and XYLS with registered amateurs will be treated to a grand and glorious two day event. Saturday noon, a pool side brunch and swim party at the Lake Shore Club on the shores of Lake Springfield (children will be guests of the Senate Theatre for a theatre party and treats), and Sunday morning, an hour program with coffee and rolls with Lewis G. McCoy entertaining with his famous comedy slide show. Reserva-

tions must be made in advance for this event.

Other highlights include the Hiram Percy Maxim Memorial, prizes for the best of mobile installation, QSL cards and hidden transmitter winners, Royal Order of the Wouff Hong initiation ceremony. Ray Birren, W9MSG, QSL Manager of the W9-K9 bureau and Phil Haller, W9HPG, Central Division Director of the League will be present to answer questions.

An exhibit hall featuring the equipment of some of the nation's finest manufacturers of amateur equipment will open both days to the registrants. The governor of the State of Illinois will present certificates to the high scores of the Illinois Sesquicentennial QSL Contest to the winners who are present. This will culminate the amateur's role in the state-wide celebration.

Edmond A. Metzger, W9PRN, is general chairman of the convention. Registration is \$5.50 per person; banquet tickets are \$5.50. A YL or an XYL of a registrant is free (banquet \$5.50). Wouff Hong fee is \$1.00. Further information may be obtained by writing to the "Land of Lincoln Convention Headquarters," 104 North 6th Street, Springfield, Ill. 62701. QST

Stays

The Panhandle ARC of Amarillo, Texas will sponsor a QSO party commemorating the discovery of helium on the sun in 1868, and a century of progress in the use of the element. This is in conjunction with the completion of the Helium Time Columns and Science Exhibit in Amarillo where artifacts and records were sealed in the stainless steel columns on May 17. Various sections are to be opened in 25, 50, 100 and 1000 years. Operation of the station, W5WX, will begin at 1700 GMT on July 13 and 14 in the center of the 20- and 40-meter phone bands and the center of the 40-meter Novice band. At 2300 GMT on each day, operation will commence in the approximate center of the 80-meter phone band and the center of the 80-meter Novice band. Operation in all instances will continue until midnight CDST. A total of 500 special QSL cards have been printed and will be sent to the first 500 stations worked. The cards bear serial numbers and only 500 will be issued. (From K5IB1)

1968 ARRL International DX Competition — High Claimed Scores

TIME once again for an early peek at how the big boys made out in our annual February/March global gallimaufry. C.w. scores (thanks mostly to whoever pulled the plug on ten meters the second weekend) appear to be down somewhat; phone tallies weigh in around the same tonnage as those of last year.

In the following compilation of high claimed scores (representing logs received by May 15), read, in order, total score, multiplier, number of contacts. Please don't submit DXCC-credit claims based on log confirmations till the final results are in print — Murphy willin', that should be October QST.

W/V/E — C.W.

Single Operator

W9WNV/2	1,843,965-405-1521
W1BPW	1,530,792-373-1368
K1DIR	1,482,624-351-1408
W4KFC	1,421,350-350-1357
W2VJN	1,414,793-389-1213
W1AX	1,402,596-351-1332
W3GM	1,356,736-344-1321
W3MVB	1,274,490-357-1190
K4BA1	1,161,270-345-1122
W9AQW	1,104,506-327-1126
W3MFW	1,050,396-323-1084
W8SH (K1ZND, opr.)	

Multioperator

W1BWD/2	1,045,992-328-1063
W1BCKS	1,027,620-330-1038
W5JAW	1,020,760-302-1134
W1BIH	1,007,424-318-1056
W4LCP	1,006,470-318-1056
W9KJ	964,896-304-1058
W2GGE	941,934-287-1094
W2PCJ	886,256-288-1040
W3NOH	802,452-287-944
W3MWC	762,072-281-901
W3WPG	737,880-286-860
W4BRB	722,250-260-963
W4RBB	704,439-261-907
K6NA	705,088-228-1037
W4HKU	683,377-301-759
W2WZ	677,820-260-869
W5BR	677,502-283-798
W3HHK	674,622-279-806
K2KNV	671,346-302-741
W5DWT	663,354-269-823
W4GRG	659,712-256-859
W3GN	655,920-240-911
W8LYF	654,360-266-820
W7EKE	612,300-260-785
W8EWN/3	600,349-294-682
W5LGG	598,635-265-753
W6HVN (WA6VAT, opr.)	

Multioperator

K9CUT	598,509-243-821
K3HTZ	586,920-268-750
W2SUC	586,332-267-732
W2SUC	584,640-240-812
W5OGS	583,263-283-687
W8DFY	582,684-236-823
W2HO	574,368-248-772
W8TZO	539,136-216-832
K2DJD	537,912-241-745
W3EYF	537,023-277-633
W8ZJM	531,202-266-667
K8RFJ	522,801-289-603
W5WZQ	520,212-308-563
W8ZCT	519,135-265-653
VE2YU	508,326-247-656

Multioperator

W3TMZ	4,791,960-493-3240
W4BVV	4,183,470-470-2971

W6RW	2,569,668-394-2174
W4ZXI	2,229,180-385-1956
W3YUW	1,873,044-369-1692
W2ABL	1,552,320-352-1470
K4ZA/4	1,522,605-357-1423
W1KXV	1,428,726-338-1409
W43EFT	1,119,010-362-1307
W9YT	1,388,166-338-1369
W3VKD	1,235,930-308-1338
K3JH	1,076,124-322-1114
W7SFA	1,072,197-279-1281
W6ANN	1,068,210-286-1245
W9EXE	928,184-314-986
W5EQT	762,685-283-946
W6WX	715,176-258-924
W4JK	670,454-271-828
W3GHS	664,734-266-833
K3JZY	645,402-263-818
W61TY	631,902-241-874
W6CQK	567,622-246-769
W61VN	544,419-251-723
K2AHQ	505,485-239-705

W/V/E — PHONE

Single Operator

W3BGN	1,873,272-356-1754
K1DIR	1,410,992-344-1406
W7BES	1,419,528-273-1672
W6RR	1,385,100-300-1539
W4QBK	1,136,220-348-1091
W1AX	1,130,940-305-1236
W8SH (K1ZND, opr.)	

Multioperator

K4YYL	1,079,154-334-1077
K8YBU	1,050,192-312-1122
K8YBU	1,038,883-282-1228
W9EWC	1,005,114-314-1067
W9AQW	985,188-298-1102
W5KTR	948,012-309-1023
W1OKG	841,776-284-988
K4YFQ	792,966-283-934
K4BA1	791,934-286-923
K9TZH	764,748-292-873
W4BEKL	742,530-265-934
W5JAW	722,982-299-806
W9RX	711,936-288-824
K9CUT	705,740-284-873
W3BUN	685,443-269-849
W1BIH	676,738-272-830
W2JSX	666,660-271-820
W3GM	663,138-277-798
W9DUB	646,352-243-888
W4BZQU	643,572-336-909
W4NBV	624,780-270-771
K3JH (K3JLI, opr.)	

Multioperator

W51OU	602,172-258-778
W5NMA	583,704-268-738
W5NMA	565,503-251-751
W9BZW	556,920-255-728
W6BRZH (W6NWK, opr.)	
550,077-211-869	
K7ADD/3	548,496-234-792

K8HZU	541,671-247-731
W0LBS	540,768-262-688
WA4LMD	537,840-240-747
W4SYL	532,656-274-662
WA4IKU	528,525-261-675
K9CVA	519,372-252-687
W4KFC	501,306-254-658

Multioperator

W3ZKH/3	4,882,410-507-3210
W4BVV	3,576,222-442-2697
W8UM	1,737,000-388-1500
WA4HTR	1,500,480-360-1390
W7SFA	1,185,030-266-1485
W3HHK	1,097,400-310-1180
K4CG	1,079,391-331-1087
W9BGX	1,050,600-340-1030
K6OHJ	1,029,216-284-1214
W9EXE	991,452-319-1036
W8NGO	960,813-303-1057
W2CCKS	836,694-282-1003
VE3FHO	836,635-295-951
W0LOL	724,152-286-844
W6CCP	698,328-243-954
W9YT	686,340-279-820
W46IVN	628,716-242-866
W5AC	627,720-256-815
K6DXM	610,878-266-801
W0IGH	578,088-214-888
W0BAA	530,145-231-765
W3KT	529,200-252-700

DX — C.W.

Single Operator

HK3RQ	3,310,907-263-4203
ZD8J	3,271,116-258-4560
VP2VL	3,081,300-298-3450
KH6LJ	3,001,270-270-3767
YP2SO	2,909,131-247-3956
HK3BAE	2,638,725-233-3775
YP2BGL	2,603,259-243-3598
PZ1AH	2,074,698-237-2921
VK2EO	1,962,900-225-2908
H3OQB	1,746,526-226-2576
HP1XHG	1,662,336-234-2368
XE2AAG	1,655,898-233-2370
K2SIL/KH6	1,402,512-244-1916
G2RO	1,362,561-213-2134
VK3APJ	1,269,819-199-2336
VP7DX	1,263,339-231-1828
G4CP	1,235,406-218-1966
OA4PF	1,163,076-206-1882
DJ5BV	1,160,352-204-2055
KL7IR	1,154,352-228-1688
KATAB	1,152,333-201-1911
CR6CK	1,137,780-180-2107
HB9UB	1,029,420-163-2167
PA6LOU	1,003,648-197-1750
J1C1WZ	1,037,304-188-1786
G3C1EW	957,972-194-1646
G3FXB	941,319-199-1624
HB9JG	900,900-182-1653
DL6WD	883,575-187-1565
DL4EG	861,300-174-1650
H18RV	853,142-163-1802
LA6AD	820,416-192-1426
GW3ITZ	805,680-180-1511
YV5AGD	779,259-169-1537
E19J	715,847-173-1387
PY1NO	638,608-167-1728
HAMO	626,652-156-1347
ON4XG	618,168-172-1198
YV1DP	608,130-145-1398
JA2JAA	544,872-146-1244
H18LC	542,359-174-1041
F8VJ	530,376-164-1079
SV0WP	518,190-115-1502
DJ3WU	515,319-158-1153
OZ5DX	501,837-161-1039

Multioperator

LU8DQ	2,219,681-233-3200
ET3FMA	1,513,920-190-2656
SM6CKV	1,351,560-210-2327

G6VC	1,103,436-201-1803
UA0KFG	1,088,256-192-1907
DL1VU	1,026,162-186-1839
HB9Z	819,156-178-1534
UA3KBO	684,520-157-1499
ET3USA	631,785-145-1411
PJ5MJ	560,205-177-1058

DX — PHONE

Single Operator

KH6JJ	3,799,063-246-5149
HK3RQ	3,735,000-250-5010
Y51XEE	3,721,888-208-4362
EA3JE	2,052,819-211-3243
8R1G	2,050,428-241-2835
XE1AE	2,039,688-252-2698
K16BZF	1,654,209-197-2799
PY7AKQ	1,640,520-217-2659
DJ5BV	1,613,040-208-2682
ZS6DW	1,439,670-185-2594
KV4AM	1,420,440-178-2661
F3KW	1,382,400-180-2560
OA4JR	1,371,192-194-2356
HP1JC	1,362,753-223-2037
OE2EGL	1,206,126-191-2262
KATAB	1,295,364-196-2303
H04TB	1,259,086-179-2345
LA6AD	1,151,280-180-2132
VK2APK	1,132,950-182-2075
DL4EG	1,129,089-169-2227
G4JZ	1,107,540-180-2051
VK3ATN	1,074,780-210-1708
VR3DY	1,054,116-188-1869
CT1BH	1,039,248-168-2062
KZ5NF	1,037,160-172-2010
5W1AT	1,029,299-191-1797
7P8AR	1,005,993-159-2109
G31AR	981,948-172-1903
H1C1D	972,650-175-1856
PA6XPQ	956,550-175-1832
CN8FV	913,275-165-1845
CT1MW	864,149-143-2017
ZD8HAL	836,703-171-1631
OA6BU	836,640-168-1660
DUIFH	807,884-154-1754
SV0WL	798,790-151-1767
PA6FE (PA6HBO, opr.)	
735,969-167-1469	
ZD7KH	728,502-138-1760
CT1CN	726,773-173-1401
H18LC	703,690-165-1422
EP3AM	700,560-140-1668
5W1AS	697,809-141-1653
SM5EAO	681,750-150-1515
VK9CN	655,860-170-1286
K04USM	642,390-133-1610
5H3KJ	639,020-149-1419
VP2AC	579,912-146-1324
VP7NA (K4IFE, opr.)	
577,809-171-1126	

Multioperator

H1CAQ	572,560-136-1405
KL7GAC	562,374-157-1194
SM6AEK	560,538-149-1254
K0LL/KG6	549,582-121-1514
ON4ZU	541,008-136-1326
O08RA	534,534-154-1157
OZ5JT	528,756-139-1268
SM4OMG	511,488-148-1152
OH2BH	504,444-127-1324
XE1AC	2,994,179-251-3977
DL0WR	2,577,220-201-4274
OH6SM	2,259,912-191-4042
G32SM	1,839,786-206-2977
B3WVO	1,585,700-180-3014
DL4RM	1,292,994-174-2477
G3SME	1,285,438-187-2292
K9MFM	1,190,700-180-2205
G3VZT/A	1,140,890-170-2139
UA3KBO	1,091,840-160-2337
YU1BCD	1,061,228-174-2035
ET3USA	913,836-161-1892
H1CZW	738,091-147-1651
F50J	581,048-151-1285

Instant DX QSL Service

BY RALPH A. DAGE,* W8PHZ

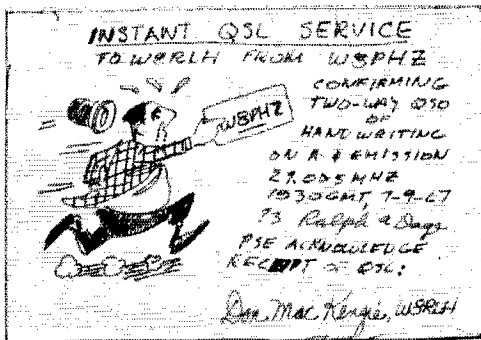


Fig. 1—The first "Instant QSL" as received by W8RLH.

PERHAPS the greatest problem encountered by avid DXCC members is that of obtaining rare QSL confirmations promptly for submission to the Awards Committee. All of the currently known methods employed in procuring DX cards, such as IRCs, SASE, bureaus, managers and "green" stamps, have their peculiar drawbacks and leave something to be desired.

It has recently been suggested that perhaps the DX operator could transmit his QSLs directly by facsimile reproduction or teletype to his supporters for immediate submission for DXCC credit. Others have suggested that tape recordings made of the contact might be used to verify the QSO. Since each of these suggested methods lacks the actual operator's signature they might not be acceptable by the ARRL.

It is my belief that the problem of instantaneously transmitting a QSL card complete with the operator's signature in ink has now been solved.

Don MacKenzie, W8RLH, and I came across the idea of transmitting actual signatures over the air by means of amateur radio while we were observing a new trouble-dispatching system in operation at the electric power utility where we are employed.

We immediately petitioned the Federal Communications Commission for permission to conduct certain experimental two-way transmissions of handwritten messages on 29 MHz, since we were not equipped with facilities for A4 operation on the frequencies authorized above 50.1 MHz. Subsequently, we were granted authorization by the FCC to conduct our A4 emission tests on 29.005 MHz, for a period not to exceed one week. One of the local representatives who leases and sells communication equipment of this nature kindly loaned two transceiver units for our tests.

*8078 Lochdale, Dearborn Heights, Michigan

We simply matched our transmitter microphone inputs and receiver audio outputs to the 600-ohm transceiver terminals and immediately began the thrilling experience of writing, drawing diagrams and even playing tic-tac-toe over the air.

A copy of what is believed to be the first "Instant QSL" ever received on an amateur radio frequency is reproduced in Fig. 1. This method of QSLing is unique in that not only did Don receive my signature in black ink on his QSL, but I also received his signature, in return, acknowledging receipt of my card. It should be pointed out that since the tests were conducted under rather hurried conditions, some of the transceiver adjustments had not been optimized. Some improvement in fidelity would have resulted if we had properly set up the vertical linearity adjustments.

While I cannot be certain that the Awards Committee would accept such a card for credit, I can be certain that this mode of transmission, at least in its present state, will not become popular on the amateur bands, because the cost of a transceiver unit is approximately \$1485!

For our tests we used two Electrowriter transceivers, products of the Victor Comptometer Corporation of Chicago. These transceivers instantly transmit handwritten communications over the air, as we have done, or in the conventional manner over private lines or ordinary telephone lines. There are three basic units available: a transmitter, a receiver and a transceiver which both sends and receives. There is no limit to the sending distance or the number of

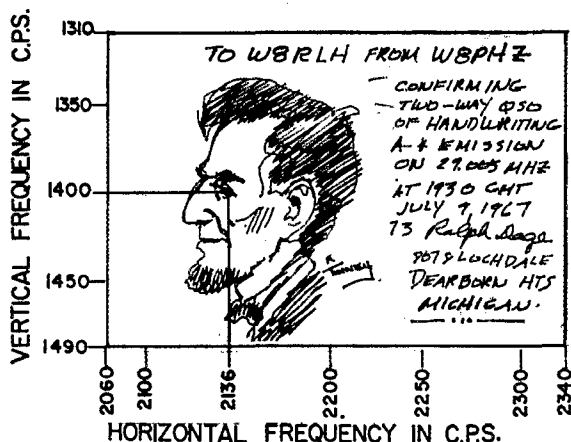


Fig. 2—Copy of an "Instant QSL" with coordinates, showing vertical and horizontal transmitting frequencies involved.

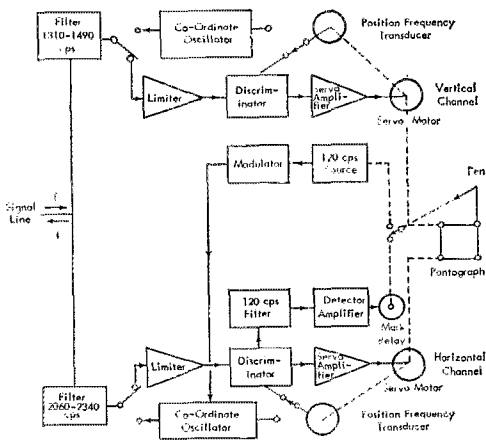


Fig. 3—Electrowriter Transceiver Block Diagram.

sending and receiving units. The units will receive messages whether or not there is someone in attendance.

The following brief description of the techniques involved may prove interesting to those technically inclined. The method used to send instantaneous handwriting over communication circuits consists basically of transmitting two simultaneous audio-tone frequencies — one frequency determining the ordinate and the other the abscissa of the $3\frac{1}{2} \times 5$ -inch writing area. As can be seen in Fig. 2, the pen can be moved to any point on the page simply by selecting any frequency between 1310 and 1490 Hz. for the vertical position and another frequency between 2060 and 2340 Hz. for the horizontal position. For example, the pupil in Lincoln's eye was reproduced by transmitting 1400 and 2136 Hz. A frequency shift of only one cycle will move the pen .025 inch vertically or .021 inch horizontally. Faithful reproduction by s.s.b. was much more difficult to achieve than by a.m. since precise

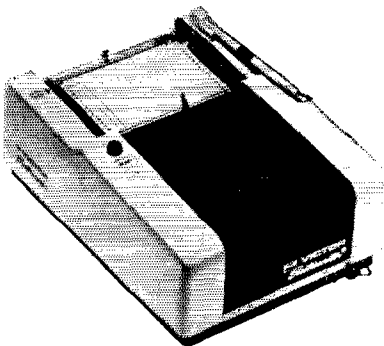


Fig. 4—Electrowriter Transceiver, product of Victor Comptometer Corporation, Business Machines group, 3900 North Rockwell St., Chicago, Illinois.

synchronization between the transmitter and receiver b.f.o. frequencies was required.

A block diagram of the Electrowriter transceiver used during our tests is shown in Fig. 3. This unit is a transistorized analog device capable of direct transmission of handwriting, sketches, or any other form of graphic data involving two coordinate positioning. Reproduction is instantaneous and faithful from one unit to another, or among several inter-connected units in a system. Information can be transmitted over any radio or telephone voice grade circuit regardless of distance. The transmission will also pass through dial telephone systems.

In the transmit mode the messages are also recorded locally on the transceiver's writing surface by means of a pen attached to the unit's pantograph. As the pen is moved parallel to the writing surface, the corresponding vertical and

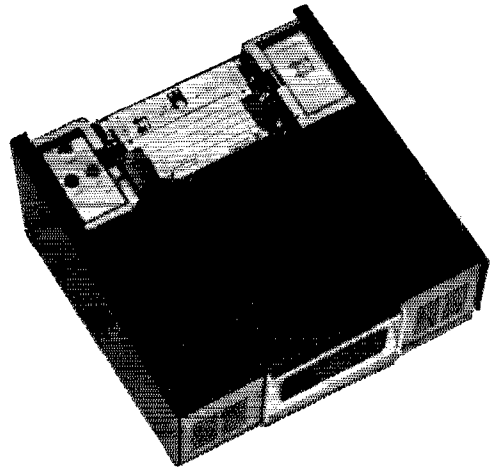


Fig. 5—Telautograph Transceiver, product of Telautograph Corporation, 8700 Bellanca Ave., Los Angeles 45, California

horizontal channel servo motors and position frequency transducers vary the frequencies of the coordinate oscillators. As described above, each point on the writing surface is thus specified by two discrete audio carrier frequencies. The relationship between position and frequency is curvi linear for each coordinate. When the pen is depressed down on the writing surface, the horizontal coordinate oscillator is frequency modulated with a 120 Hz. signal.

Since it is impractical to achieve the frequency stability required in this particular application by conventional variable inductors or capacitors, a position frequency transducer is employed. This transducer consists of a rotary transformer with a stator and rotary pickup coil. The ratio between the pickup coil voltage and stator voltage is a function of their angular position.

Each coordinate oscillator includes two emitter follower stages which couple a highly stable tank circuit resonant at the center frequency to the rotary position



Fig. 6—Ralph Dage, W8PHZ.

transformer is then used to adjust the value of the transmitted frequency above or below the center frequency. This arrangement is unique in that it permits independent range and center frequency adjustments. The sine wave output signal is taken from an isolated winding on the position transformer and coupled to the communication channel through the appropriate band pass filter. This particular unit was designed to produce a -3 db.m. output signal into a 600-ohm line.

In the receive mode, the transceiver responds to the pair of incoming variable frequency signals with input levels as low as -38 db.m. The signal components are initially separated by the horizontal and vertical band pass filters, then amplified by two successive class A amplifier stages. Limiters are utilized to eliminate any amplitude variations in the received signal level before it reaches the discriminator transistors, and also furnish a low level output voltage to a phase shift circuit. The 90° phase shifted component generated at resonance is applied through a gate transistors to the emitters of the discriminators. The incoming signals are then fed into a tuned tank circuit which acts as the frequency determining portion of the discriminator. The same position transformer used in the transmit mode and described above now serves as the discriminator tuned tank circuit in the receiver mode.

The rotor winding of the position transformer picks up an a.c. signal component in or out of phase with the phase shift voltage depending upon the direction of shaft rotation from its center position. When the position of the shaft corresponds accurately to that called for by the incoming signal frequency, the d.c. discriminator output is zero and the rotor remains stationary. The rotor is mechanically coupled to the pen and motor so that for each resonant discriminator frequency there is a corresponding pen position on the writing surface. As the incoming frequency signal varies during the transmission of intelligence, there is a corresponding d.c. error voltage generated in the discriminator output. This

unbalanced output voltage is then applied to the servo amplifier which in turn energizes the servo motor and drives the pen. When the pen has completed drawing the line and reaches the correct position, the discriminator output becomes balanced and the pen remains fixed in position. The pen is then lifted from the writing surface at the same instant the sender lifts his pen, since no 120 Hz. signal component is being recovered from the horizontal discriminator output.

Other features available for use with such transceivers include the following: squelch control, automatic paper feed, paper winder, signal lamp and buzzer and an acknowledgment lamp. Two commercial transceivers currently available for lease or purchase are illustrated in Figs. 4 and 5. Thousands of these units are in daily use throughout the world, providing a variety of business and industrial applications, such as maintenance dispatching, traffic and transportation control, production and quality control, time reporting, etc. Another unique and novel application is called the "Remote Blackboard" which permits the viewing of transmitted drawings or notations by large groups. The Remote Blackboard will project Electrowriter transmissions up to blackboard size or larger. It can be, and presently is being, used to teach college, extension classes in remote cities, courses from colleges to industry, or courses in several rooms of one building. Voice and visual transmission are simultaneous — two-way conversations, student to teacher and back, are as easy as phone calls.

My thanks are extended to Claude Clouthier for the loan of the equipment and to my artist-neighbor, Ray Tinney, who transmitted the sketches which appear on the QSL cards.

I am particularly interested in corresponding with any amateur or group now contemplating a DXpedition to the country of Albania. If permission is granted for entry and radio operation from this rare spot, I will do my utmost to see that one of these transceivers is made available. My ulterior motive is to attempt to obtain a rare ZA confirmation directly in the event that the log books covering the DXpedition's operation do not become readily available. QST



Fig. 7—Don MacKenzie, W8RLH.

Not for the experts, but for those who haven't attempted it,

TRY THE FMT!!!

BY CHARLES L. WOOD,* W2VMX

You can try the FMT, and it's fun! The letters FMT signify Frequency Measuring Test. Twice each year, in February and September, and two additional times for those serving the fraternity as Official Observers, ARRL headquarters station WIAW provides a service to the amateur world by transmitting signals for FMT purposes. On each test these signals go out on the 80, 40- and 20-meter bands, at two different times in the evening, spaced three hours apart. With this diversity of signals to copy, almost every amateur can make at least two measurements, and some can measure all six different frequencies.

What is the purpose of FMT? The object is to provide for you an index of your skill in measuring the frequency on which WIAW is transmitting for the special test period. The familiar bulletin and code practice frequencies are not used for this purpose. Instead, "unknown" frequencies are transmitted. *QST* carries a listing of the approximate frequencies to be transmitted during the two FMTs each year which are open to all interested persons.

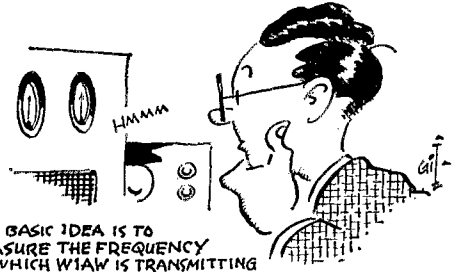
What do you do? You simply tune to WIAW, on or near the announced spot, and then make a measurement — as accurately as you can — of the transmitted frequency. Then, you mail your findings to ARRL. At headquarters, your data are compared with those supplied to ARRL by an independent laboratory. You will receive, by direct mail from ARRL headquarters, the results of your personal readings. The individual report on the ARRL Frequency Measuring Test tabulates the official reading, the submitted reading, the difference in cycles per second, the percentage error and the error in parts per million. At W2VMX there is a file of these FMT reports going back to 1955. Based on the many observations accumulated through the years, the following hints are offered to those who would like to take part in the sport.

The basic idea, as we have said, is to measure the frequency on which WIAW is transmitting. The best way to do this is to proceed from some *known* frequency or measuring point. There are a number of different ways of doing this, some much more accurate than others.

The Simplest Way

In the beginning, an FMT may be attempted with no more equipment than a simple crystal

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oscillator and a medium-grade receiver. Suppose WIAW is to transmit on or near 7090 kc. In your crystal box you find that you have two units, one labelled 7108 and the other stamped 7084. One of these is above the unknown frequency, the other below it. The evening of FMT, turn your gear on well ahead of time, to minimize errors due to warm-up. Tune in, and listen for WIAW, and suppose that you hear the signal somewhere around 7090. Looking at the seldom-used *logging* scale (most general-coverage receivers have something of this kind), you note that it reads 53. Now, you key the 7084 crystal in your oscillator and note the logging-scale point on your receiver. Let's say it is 49. The 7108 signal comes in at 61. The two crystals are 12 logging-scale units apart, and they are marked for frequencies 24 kc. apart. The logical conclusion is that for this portion of this particular band, each unit on your logging scale signifies a 2-kc. step in frequency. Since WIAW was heard 4 units above the lower crystal, then WIAW frequency must be 4×2 or 8 kc. above the 7084 point, or 7092 kc.

In actual practice, it would be rare for each division on a logging scale to represent exactly 2 kilocycles, or any other whole number of kilocycles. It would be very rare indeed for three signals to each be heard right on the scale division marks. The numbers in the illustration were set up simply to illustrate the basic process, called interpolation, by which an unknown signal between two known points can be mathematically computed. It also illustrates the point that FMT can be done with very simple equipment.

At W2VMX, we actually did three FMTs with nothing more complicated than an HQ129X and a boxful of crystals. Each of the three FMT's included 80- 40- and 20-meter readings. For the series of nine measurements the mean

error was 315.7 parts per million, within the requirements for Class II in the Official Observer program.

Stepping Up The Accuracy

If you find that you have been bitten by the measuring bug, be assured that there is no antidote: you will have the disease for a long time to come! One symptom is a strong urge to acquire the next logical piece of equipment, a secondary frequency standard. That's a fancy name for a device which will provide you with reliable and valid signals¹ at known intervals throughout your receiver range. You already know that if you key your rig with a 3525 crystal in it, you can readily hear signals in your receiver at such places as 7050, 14,100, and so on. Suppose you had a crystal of 1,000 kc. . . . you'd then be able to find a marker signal every megacycle along the dial. Useful, but not too much so. It would be better if the marker signals appeared every 100 kc., or even every 10 kc. A 100-kc. crystal oscillator is available commercially as an optional accessory with many receivers. A suitable unit, with a 10 kc. multivibrator, was described in a fairly recent issue of *QST*.² Every such device should be equipped with some provision for varying the frequency of the crystal. This is true because a 100-kc. crystal seldom just happens to vibrate at 100,000 kc. The frequency depends upon temperature, voltages, and other circuit constants. A typical solution to this problem is a small trimmer capacitor which permits you to zero-beat the signal with WWV. *Always* zero-beat with the *highest* available WWV signal; any error you may make in this process at, say, 2.5 Mc., is magnified about six times on the 20-meter band.

With a 10-kc. signal accurately zeroed in on WWV, you can read accurately any signal which happens to be an exact multiple of 10 kc. In the above example, it would be clear to you where 7090 and 7100 signals would appear on your dial. To compute the frequency of W1AW, you need only to note the logging scale readings for 7090, the unknown, and 7100. The arithmetic is the same as before. Here at W2VMX, using nothing more than a 1000/100/10 kc. marker, the logging scale, and a slide rule, we have made more than 75 observations over a period exceeding ten years, and we have never lost our Class I status in the Official Observer program.

An ideal addition to the station at this point would be an audio oscillator, calibrated in cycles per second and reading from the lower limit of hearing to 5000 cycles.³ There would be no need for an oscillator calibrated above 5000 cycles,

for it is not possible for any unknown frequency to be more than 5 kc. from a known point when the 10 kc. multivibrator is running. In using the audio generator, the amateur zero-beats either the marker signal or the W1AW signal, and then uses the tone oscillator to match the resulting beat note as heard on the receiver. You must use care so that you subtract and add when the particular process is appropriate! Returning to the above example, let us say that you zero-beat 7090 and hear a note of about 2000 cycles in your receiver. Using the calibrated audio oscillator you find a reading of 2535 cycles, and you *add* this to 7090, for an indicated reading of 7092.535 kc. because the unknown was *above* 7090 on the dial. W1AW frequencies which are more than 5000 cycles above the marker (e.g., 7096, 7098, etc.) would call for subtraction from the *next higher* marker, 7100 kc. in this case.⁴

Simple tone oscillators of the kind used for code practice can be built and calibrated for this purpose. If you have difficulty matching tones by ear, you can connect both the oscillator output and the receiver output to an oscilloscope (one to the horizontal, one to the vertical) and attempt to make a circle — which tells you that the frequencies are exactly matched. If the tone is high in pitch, and your oscillator calibrations are very close to one another at that point, try creating Lissajous patterns⁵ and making the necessary mathematical computations to find the unknown frequency.

Sometimes, you can use your imagination in obtaining readings on an unknown signal. One way to do this is to measure up from the lower 10-kc. marker, then down from above, averaging the readings. Sometimes you will uncover major interpolation errors in that way. An interesting, if inexact, interpolation device used at W2VMX for one FMT was a tape recording made at the parish hall piano. The tape consisted of a series of announcements like, "F-5", "F#-5", "G-5" followed by striking the appropriate note on the piano. These notes were compared with the received notes from W1AW, and frequencies were read from a table of musical tone frequencies. Did it work? Well, returns showed that our mean error was 247 cycles. Quite probably, not all of our error was in the audio department . . . but at any rate our mean error in p.p.m. was 43.2 parts per million, well within the required 71.43 p.p.m. for Class I OO. The lack of a continuously-variable tone source precluded any capital-P precision with this method, but it stands as one more in a long line of ex-

(Continued on page 146)

¹ The criterion of *reliability* refers to the fact that the marker signal will always be in the same place, and relatively constant with regard to its accuracy. The criterion of *validity* refers to the fact that a properly zero-beated 100 kc. marker will be heard every 100,000 kc. up the dial, not 100,004 or 99,996, or some other approximation of 100 kc.

² Hall, "The KH6EGL Frequency Standard," *QST*, May, 1965. This circuit also includes a 1-kc. multivibrator, which will provide still closer-spaced markers for trapping the unknown frequency. It may, however, be omitted if only 10-kc. markers are wanted.

³ A suitable oscillator was described by Lange, "25 to 25,000 Cycles," *QST*, July, 1967. It has three ranges, the first two covering 25-250 and 250-2500 cycles per second, respectively.

⁴ In this system, the absolute error tends to be rather constant. This means that the p.p.m. error is lowest on 14 Mc., roughly double at 7 Mc., and much greater at 3.5 Mc. This is in contrast to errors obtained through the use of tunable oscillators such as the BC-221, in which absolute error is proportional to the frequency being measured.

⁵ See chapter on measurements in the *Handbook*,

AMATEUR RADIO PUBLIC SERVICE CORPS

CONDUCTED BY GEORGE HART,* WINJM

We Learned Some Things

With destructive tornadoes racing through Arkansas and other midwestern areas as this is written, perhaps this is a good time for some reflections on emergencies and emergency preparedness in general. In researching this general subject, what comes to light is a piece written in the Rochester (Minn.) Amateur Radio Club's *Flyer* of about a year ago, in which there was a rundown of a tornado which occurred then. It seems that Minnesota's PICONET played an important role in this emergency, but this is just another chapter of the glorious past history of amateur radio public service. What is most intriguing about the piece is the information appearing under the heading "We learned some things."

Every emergency is an education in itself. No emergency net is so well drilled and prepared that the actual emergency operation is humdrum and routine. PICONET is reputed to be one of the best, but here are some of the things it learned, apparently through bitter experience, in the April, 1967, tornado:

1. An established net meets the need during an emergency better than a random group of unrelated stations.

2. Good band conditions, even with stormy weather, are a real help. (But not much we can do about this!)

3. Power counts! We should all have kws.

4. Proper message form is essential. Memorize the ARRL form; use "time filed."

5. Clarification of "precedences" for messages should be developed. "Health and welfare" traffic is important, but should not be placed ahead of "priority" traffic.

6. All messages should be signed by a responsible authority.

7. In a weather emergency, some knowledge of the best ways (the Weather Bureau way) to report weather conditions is very helpful.

8. C.w. can get through QRM and QRN when phone can't.

9. Use of different frequencies for "incoming" and "outgoing" traffic for an emergency area should be considered. Traffic coming *out* of an emergency area rates the higher precedence, other things being equal.

10. If two or three towns are "hard hit," maybe a separate frequency should be used for each, with a powerful control station to keep the frequency clear.



On May 9 at the Red Cross Chapter House in Cincinnati, Volunteer Services Chairman Bachrach (left) presented recognition pins for 25 years of assistance to W8SVU (right) and W8MXR (not shown). Seventeen other amateurs were similarly honored.

11. Local nets on 10, 6 and 2 meters are important.

12. When local newscasts and weather forecasts indicate the possibility of storms or other emergencies, the local emergency net frequency should be checked frequently.

Imagine, all these things learned in one little emergency! Trouble is, half of them will have been forgotten by the next time unless you keep harping on them, making them a part of your preparedness activities, putting them in your literature. The principles of emergency operation should be basic, their observance automatic, almost a reflex action. You don't acquire these sharp operating reflexes by reading about them. You have to practice them, frequently, regularly. This is why nets have regular drills and tests, and why the operator who says "I'll be there when you need me" and never prepares is often worse than useless. — W1NJM.

National Traffic System

The third formal meeting of the Eastern Area Staff of NTS took place in Syracuse, N. Y., on April 27-28, 1968, with all ten members in attendance.

* Communications Manager, ARRL.

The proceedings were completely tape-recorded, as were those of the two previous meetings. Also in attendance was W1NJM and, part of the time, NYS Manager W2MTA, as observers and advisors. The lineup of the EAS: Chairman and member-at-large, W2ZVW; 1RN, W1EFW; 2RN, W2FR; 3RN, K3MVO; 4RN, W4SHJ; 8RN, W8CHT, ECN, VE3BZB; EAN, K2KIR; TCC-Eastern, W3EML; Member-at-Large, W4UQ.

The first matter of business was the election of a new member-at-large (MAL) to fill the vacancy created when WA2GQZ resigned as 2RN manager and MAL W2FR was appointed in his place. It was pointed out that there was nothing mandatory about filling the vacancy, but the staff preferred that there be an odd number of members.

The following NTS adherents in the Eastern Area were nominated: W1BJG, W1EMG, W1EOB, W2GKZ, W2MTA, K2RYH, W3NEM, WA4EUL, WA4FJM, W4NLC, W4ZM, W8RYP, VE3AWE. What a choice to make! It was observed by many staffers that any one of them would make an ideal member, so each was discussed in detail before balloting. The first ballot found no candidate polling a majority, so a second ballot was ordered containing only the two highest (W1EOB and W8RYP), with W8RYP winning out by a close vote. Paul, who happened to be present as an intended observer (but not during the discussion or balloting) then was seated as a member of the staff.

Next, Chairman W2ZVW announced that he was relinquishing the chair at the conclusion of the meeting and called for an election of a new chairman. Again, the nominations and balloting were spirited. Those nominated were W1EFW, W2FR, K2KIR, W4UQ and VE3BZB. After the first ballot, two of the nominees were eliminated and the second ballot was among the three remaining. W4UQ polled a bare majority in a close vote.

So EAS has a new MAL in W8RYP, and a new chairman in W4UQ.

The next procedure was the preparation of some kind of an agenda. Each staff member was asked to mention those items which he would like to have discussed, and from this the chairman prepared a tentative agenda. The staff then settled down to detailed discussion of each agenda item. At the end of this go-around, each staff member was given another opportunity to bring up matters for discussion that had occurred to him since his original statement.

No model of parliamentary procedure, the Syracuse EAS meeting was nevertheless reasonably orderly, harmonious, and much was accomplished. Anyone who wants to take the trouble to listen to the tape recording will readily perceive that these NTSers know what they are talking about and are dedicated to the system's functioning in every respect, at every level. Here are some of the things the EAS recommended for further study:

1. "Daylight saving" time. At the upper NTS levels in particular there is considerable opposition to this, and the possibility of staying on the same GMT the year around should not be shelved.

2. Sequence of NTS net meetings. A vigorous discussion of the feasibility of the Public-Service-Manual-recommended sequence versus other possibilities resulted in a recommendation that "late" region and section nets (i.e., after the Area Net meeting) be pushed. Late section phone nets, in particular, can perform a very useful function.

3. An "unannounced" SET. After extended discussion, it was decided that an unannounced SET in the true sense is totally impractical, and that

consideration should be given to an "unplanned" SET instead. During the discussion the possibility of a simulated power blackout in NTS might give an idea of the system's versatility in a real emergency. Perhaps an "emergency power hour" during the SET?

4. NTS statistics. Their value and importance was discussed at length, with the general feeling that there can be some question regarding the significance of some of them.

5. It was decided that EAS meetings should be "open" to those invited by staff members to observe. It was also the sense of the meeting that the chairman would serve for not more than two years before a new vote is taken as to whether he should continue.

6. Status of NTS Area Staffs. Discussion of Board proposals for advisory committees and proposals for revising content of NTS Area Staffs. The EAS went on record as giving full support to the present setup.

7. Uniform application of standards to all NTS nets. It was noted that some nets indulge in radical departures from standard NTS procedures, particularly with respect to meeting times.

8. Rigidity of net procedure. How "tight" should the net be? Who should be allowed in? How much tolerance should be shown stations who do not properly zero beat, who do not follow regular net procedure, who do not represent an NTS entity?

9. The place of phone nets on NTS. Both the 4RN and 8RN managers had experiences to relate on use of phone for NTS in their regions, and new MAL W8RYP was able to make some contributions along this line. It was the feeling of the staff that phone might well succeed where c.w. has not come through in late (i.e., after EAN) sessions at region and section level.

10. Relation of NTS functions to SCM appointments. Specifically, is an NTS net manager necessarily an RM, or vice versa, and should some sort of relationship between NTS functions and SCM appointments be established?

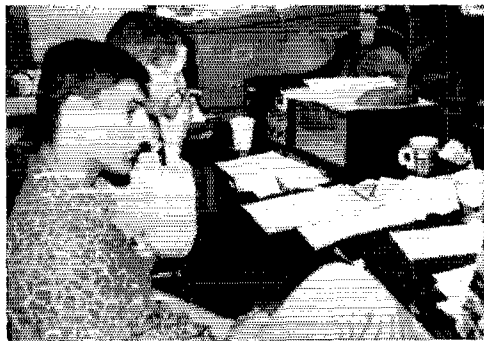
The Eastern Area Staff was in session approximately 8 hours over a two-day period. — W1NJM.

(April reports on next page.)

The Post Office Department promises faster mail service with the new Zip codes. Use yours when you write League Headquarters. Use ours, too. It'' 06111.



A strategy meeting before the Canoe Race at Crawfordsville, Ind., (see writeup) finds bossman K9BJL (1) conferring with WA9PAL (partially hidden), K9EJJ, WA9CYT, WA9IJF and WA9MNQ.



During the Greenwood tornado emergency (see writeup), contact was maintained by amateurs between Greenwood and Fort Smith. Shown at left is the Greenwood station, K5UAJ, operated by K5BOC (at mike) and WA5TJQ. At right is the Fort Smith station, W5ANR operated by (front to rear) K5YMU, W5ANOB and WA5LLX.

April reports:

Net	Ses- sions	Traffic	Rate	Aver- age	Represen- tation (%)
1RN	60	452	.303	7.5	91.2
2RN	61	592	.705	9.7	97.0
3RN	60	831	.565	13.9	99.2
4RN	52	614	.407	11.8	81.0
RN5	60	727	.325	12.1	96.3
RN6	60	1216	.821	20.2	99.9
RN7	59	517	.384	8.5	45.7
8RN	61	579	.358	9.5	92.3
9RN	60	551	.473	9.2	92.5
TEN	60	488	.504	8.1	71.0
ECN	57	186	.230	3.3	72.2
TWN	49	276	.244	5.6	57.4
EAN	30	1940	1.391	64.7	97.8
CAN	30	1244	1.079	41.4	97.8
PAN	30	1661	1.185	55.36	100.0
TCC Eastern	123	1021			
TCC Central	90	675			
TCC Pacific	123	1275			
Sections ²	1824	13581		7.4	
Summary	2613	28426	EAN	9.4	—
Record	2704	28169	1.391	19.1	—

¹ TCC functions, not counted as net sessions.

² Section and/or Local nets reporting (59): Falls City Area, Rebel, KTN (Ky.); ILN (Ill.); WBSN, Badger, WIN, WSSN (Wis.); NYS (N. Y.); BUN (Utah); RISP (R.I.); FMTN, VEN, QFN (Fla.); MDSD (Md.-D.C.); QIN (Ind.); PTN, EPA, PFN EPA 6 Meter (Pa.); PTN (Me.); GSN (Ga.); TTN, TEX (Tex.); Md.-D.C.; HNN (Colo.); NCNL, NCSSB (N.C.); Mich. 6-meter, QMN (Mich.); VSB, VN, VSN (Va.); Passaic Valley T & E, NJEPTN, NJN (N.J.); BN, Ohio SSB; AEPN (Md.); WSN (Wash.); OZK (Ark.); Vt.-NH; LAN (La.); CPN (Conn.); MSN, MJN (Minn.); W. Fla. Phone; ALNN, MTN (Mo.); AENM, AENR, AEND, AEMH, AENT (Ala.); WMN, EMNN, EMN (Mass.); RTQ (Que.); QKS (Kans.).

Fine 1RN Bulletin by Manager W1EFW points up need for a "late" session of 1RN, perhaps on phone, perhaps on 6 or 2 meters. Many changes in prospect on 2RN. sez W2FR; NYC-LI continues to be weak in representation. Easter traffic gave 3RN a boost; certificates to K3HKK, WA3JCA and W3PRC. W9QLW puts out a monthly 9RN news letter at report time, containing statistics for the month and brief "Disa and Data." South Dakota is making a comeback on TEN, but attendance now very light on early session; WA8HTN earns a certificate. ECN's early session on 7040 kc. is being met with mixed reaction; local signals are weak, but the VE1s come in better. K7NHL sez TWN traffic and representation are down, but QRN is up! Getting all reports is the big current problem. K2KIR niggers QRN will kill us this summer. W9DYG says all fine on CAN, then lists a string of troubles as long as your arm.

Transcontinental Corps. Every time we look over the three TCC reports we have to reflect admiringly on the job being done by this group of crack traffic operators and their three dedicated directors; working closely together

as they do in both good and bad conditions requires the utmost in cooperation, patience and compatibility. A spot on TCC is something sought after by NTS operators, a position of honor and respect. You can just assume that those functions listed as "unsuccessful" were given a good try before an alternate route was sought.

W3EML reports that simultaneous meetings of EAS and PAS were responsible for some of the month's unsuccessful functions. W0LCX's analysis of April activities indicates that troubles were caused by adverse conditions. W7DZX's monthly report shows all functions filled at the Pacific Area end and only eight unsuccessful functions.

April Reports:

Area	Func- tions	% Suc- cessful	Traffic	Out-of-Net Traffic
Eastern	123	87.8	2446	1021
Central	90	96.6	1368	675
Pacific	123	93.5	2630	1275
Summary	336	92.3	6444	2971

The TCC roster: Eastern Area (W3EML, Dir.)—W7s BJG EFW EOB NJM, W2s FR GKZ MTA, K2RYH, WA2s BLV UWA, WB2s OYE RKK, W3s EML NEM, K3MVO, WA3CTP, W4s NLC UQ ZM, K4KNP, WB4DXX, W5s CHT RYP SQO UM, K8KMQ, W4s OOG ZGC. Central Area (W0LCX, dir.)—W4OGG, K4DZM, W4s AVM WWT, WB4AIN/4, W5KRX, WA5SKI, W9s CXY DND DYG VAY, W0s INH LCX, K0s AEM YBD, W4s DOU MLE. Pacific Area (W7DZX dir.)—W6s BGF EOT HC IPW TYM VNQ VZT, K6s DYX LRN, WA6s LFA ROF W6s HVA RSY, W7s AAF/6 KZ HMA ZB ZIW, K7HLR, WA7CLF, VE7ZK.

Diary of the AREC and RACES

On Mar. 30 VE7BOQ, EC for Powell River, B.C., received a request for communications facilities for search for a missing 13-year-old boy. All available ARPSC operators were mobilized, along with 2-meter mobiles and an 80-meter base station. VE7ASR held down the fort in town on 3755 kc. VE7BIJ manned 80-meter and 2-meter base stations at the search marshalling point. VE7BOQ and VE7ALZ operated a 2-meter station in the former's car following logging roads, collecting reports and relaying to base. Seven frequencies were monitored, with 2-way communication on six of them. VE7CC assisted materially in keeping 3755 kc. clear and relaying, along with other B.C. stations.

The story has a happy ending. The lad was found unharmed after 30 hours lost in rugged, mountainous country.

—♦♦♦—

On April 7 at 0820 local, members of the Glens Falls (N.Y.) area AREC were asked to conduct

ommunications between Red Cross HQ and their disaster unit at a bad church fire in Hudson Falls. The request went to WB2ZTP to EC W2AYQ who contacted W2FEM and the latter immediately proceeded in his mobile unit to the scene of the fire. K2MUG went to Red Cross headquarters to assist WB2ZTP. WA2AQD heard the activity on 51 Mc., checked into the net and was dispatched to the fire to relieve W2FEM who was en route to meet K2AYQ to pick up the AREC's six-meter portable unit which was used at the fire scene relaying direct from the fire to the Red Cross disaster unit parked a short distance away and being manned by WA2AQS/mobile and WB2BZJ/mobile, W2BOR WB2UEX acted as relay stations from their homes. The net secured at 1025. — *K2AYQ, EC Glens Falls area, N. Y.*

A tornado struck Falmouth, Ky., on April 23, WA4YDO, K4DLG and K2VJE, traveling from the University of Kentucky at Lexington, established a portable station on 8960 kc. at a local schoolhouse. Operational traffic from the site to Louisville and the Cincinnati Red Cross, together with health and welfare traffic, were efficiently handled both into and out of the area. K4YZU and K4CSH took care of the Louisville end. The wisdom and efficiency of formal over informal traffic was again demonstrated — *W4OVI, SEC Ky.*

On April 19 a devastating tornado hit Greenwood, Miss. Fort Smith EC WA5DMT was among the first on the scene and started organizing the amateurs. A communications center was established at a local church, and mobiles were in operation a little over two hours after the tornado struck. Amateurs from the Fort Smith Amateur Radio Club set up their equipment in an office next to the Red Cross and made contact with the club station at Red Cross headquarters in Fort Smith.

For seven hours the only communication available out of Greenwood was amateur radio, and for three days the amateurs remained in operation handling health and welfare traffic to supplement overloaded wire lines. The amateurs were also useful in putting up antennas, and checking out trouble spots. WA5PRZ and K5BOC assisted the EC through their jobs as managers of the SSB Razorback Net, and over 500 messages were handled via the National Traffic System. WA5NOB served in both Greenwood and Fort Smith. WA5AER did considerable leg work checking out damage in Booneville and elsewhere. WA5LLX was outstanding at the Fort Smith station. WA5JOD served in an important position at Sparks Hospital. Three of the Fort Smith hams were doctors at the hospital. W5HOT, WA5TBN and K5VRC were outstanding from their home stations, along with many others. Communications were maintained with Little Rock and North Little Rock also. Other amateurs assisted in clearing the great quantity of traffic, such as requests for food, shelter, heavy moving equipment to assist in clean-up, closed vans and trucks to move and store materials and supplies, and coordination for the Red Cross, civil defense and other agencies. The Oklahoma Emergency Net and the Sooner Traffic Net were among those outstanding.

The Greenwood station used the call K5UAJ, and the Fort Smith station used the club call, W5ANR. The station in Greenwood was closed down Sunday evening, but a long period of clean up and "come back" followed in which EC WA5DMT participated. All concerned were effusive in their praise

of efforts of the amateurs to restore and maintain communications to stricken Greenwood.

On May 3 at 2255Z W8YHU/mobile was in QSO with W8TNF when the former came upon an auto accident. W8TNF called police via landline and they were immediately on the way. Another small service by amateur radio, possibly saving a life. — *K8DHJ, EC Stark County, Ohio.*

Orange County's (Calif.) Garden Grove High School has instituted during March a program through its amateur radio club station, WB6WPK, of sending messages over the National Traffic System on behalf of its faculty. The program is under the custodianship of W6RJX and W6IXN — *WA6ROF.*

On Mar. 31, Madison County (Wis.) Amateur Radio Club station W9EJH assisted the Red Cross in a communications demonstration at its Open House. K9SJR operated W9EJH and maintained contact with WA9QXM (K9ATV at the controls) at the chapter house. Some 15 other amateurs were contacted, some of them mobile in motion throughout the area.

The West Coast Amateur Radio Service on April 28 provided communications for a number of cycling events sanctioned by the Amateur Bicycle League of America. WA6AEH acted as control at the starting line while WB6YFT served as communications chairman. Stationed at strategic points along the course were WA6IGU, W6YOB, WB6OEZ and WB6LXP. — *W6MLZ.*

On April 20 and 21 the hams of Montgomery County, Ind., handled communications for the annual Sugar Creek Canoe Race at Crawfordsville. Working with the local b.c. station and the Sheriff's Department, units were set up at key points along the 15½ mile course keeping track of 125 canoes in the race. Amateurs have assisted in this event for six consecutive years, with K9BJL serving as chairman each year. Communications were handled on six meters. K9FUE and W9URS set up their amateur TV station at the finish line, enabling spectators to see the finish of the race. Eighteen amateurs took part. — *K9BYL, v.p. Montgomery County ARC.*

Forty-five SECs reported April activities, representing 16,108 AREC members, a gain of five reports over last year but a loss of some 800 members. Three sections reporting showed no membership figures, so the loss of membership is probably on paper only. Following are the March reporters: W.Pa., Alberta, So. Dak., La., SCV, N.C., Colo., Me., N.N.J., Conn., Sask., E.Fla., Tenn., Nebr., So. Texas, Wash., Ark., S.N.J., Mo., Sac.V., Mont., Orange, W.Va., E. Pa., Ala., San D., Mich., Ohio, Del., Nev., W.N.Y., San F., Kans., Utah, W.Fla., E.Mass., Que., Okla., Va., N.H., B.C., Ga., Maritime, NYC-LI, Ill.

Miscellaneous Net Reports

Net	Sessions	Check-ins	Traffic
Mike Farad	56	474	369
Coast Guard	22	575	40
QTC	22	373	657
HBN	30	393	509
Interstate SSB	30	1065	637
North American SSB	26	692	1033
20 Meter SSB	22	472	3405
7290 Traffic	45	996	1996
Clearing House	30	1450	287

QST

Amateur Radio Expo!



Unique Event Brings Together Radio Amateur and General Public

RECENTLY, a group of amateur radio clubs in the Hudson Division got together to launch a new kind of amateur radio event. The Garden State Amateur Radio Exposition, held May 2-4, 1968 featured 7000 sq. ft. of exhibit area, numerous operating amateur radio stations, programs for the general public, and meetings and symposiums for radio amateurs. The location was the Garden State Plaza in Paramus, New Jersey, one of the world's largest shopping centers!

While many of the component attractions of Expo are not unfamiliar to amateurs, the unique combination added up to something spectacular. Exhibits prepared by participating clubs depicted the many facets of amateur radio to the public, and also showed many long time amateurs some of the fascinating areas of the hobby they had not encountered. Exhibits included an antique wireless display, a station operated by blind amateurs, presentations from MARS, NASA, the International Mission Radio Association, and displays of f.m. communications, space techniques, home brew gear, QSLs, certificates, ham license plates, etc., and more. Throughout the event, automatic teletype machines printed greetings and other information to visitors on the exhibit floor.

Expo's location at a major shopping center proved excellent. It was easy to locate, had ample parking, included impressive exhibition and auditorium facilities and had a steady flow of public traffic.

The shopping center's staff were especially helpful in working with the Expo sponsoring clubs, and welcomed the opportunity to host the amateur radio event.

The following groups are responsible for Expo's success: Bergen Amateur Radio Association, East Coast VHF Society, Englewood Amateur Radio Association, International Mission Radio Association, Knight Raiders VHF Club, Land Rovers Amateur Radio Club, MARS, NASTAR (Nassau College Satellite Tracking Amateur Radio), New England F.M. Repeater Association, North Jersey DX Association, North Jersey Radio Association, Quarter Century Wireless Association, Stevens Institute of Technology Radio Club, Tri-County Radio Club, Watchung Hills High School Radio Club, and the Oakland 550 Club. As a result of Expo, most of the participating clubs have organized into the Garden State Amateur Radio Clubs, Inc.

The Paramus Expo is a dramatic example of a gala meeting between amateurs and the general public. Amateur radio gained much publicity from the event, area radio clubs' Novice classes swelled, amateurs had many purposeful meetings, and many amateurs had an opportunity to observe all facets of amateur radio in action. What say, will your group be the next to sponsor an amateur radio expo?

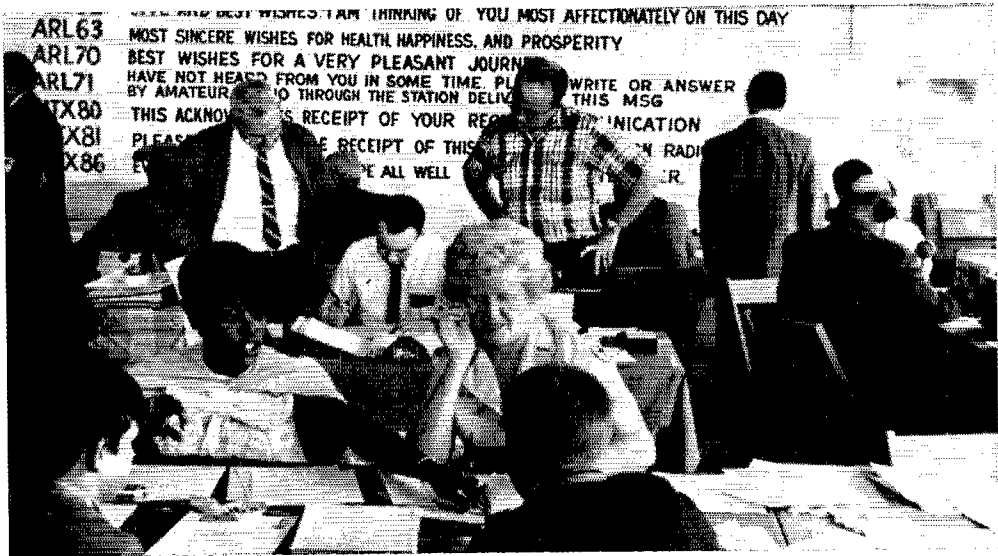
— WA2INB (Photos by WB2DLW).



Attention was given to attracting youth to amateur radio. Above, a group of scouts are shown observing one of the on-the-air stations. Left, Hq. staffer, W1ARR, relates a tale about amateur radio to a captive audience.



Above, visitors watch as an amateur station is constructed before their eyes. As shown right, many visitors of all ages made their first amateur radio transmissions and received "Certificates of Communication" as tokens thereof.



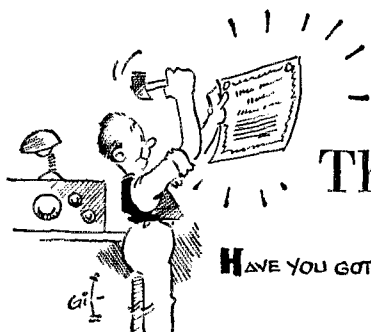
An extensive message center operation was one of the many highlights. Red Cross personnel accepted traffic from the public to be transmitted via amateur and MARS channels to distant servicemen, friends, and relatives.



Here amateurs and the public caught a glimpse of what the future has in store with the demonstration of a modulated laser associated with the space communications booth.



Interest of the prospective Novice and old timer alike was attracted by the demonstration of 2-way amateur television communication.



Those Higher-Class License Examinations

In Six Parts — Part V

Propagation, Antennas, and Transmission Lines

THIS section takes up those questions in the FCC sample list that have to do with the general subject of antennas and propagation. The questions are drawn from the Advanced and Extra Class study guide published by FCC. Although they are for the most part quite general in nature, calling for qualitative understanding of the subject rather than knowledge of the design details, there are some that do require numerical work.

The Radio Amateur's Handbook and *The ARRL Antenna Book* (1960 or 1964 edition) contain the information you'll need. The questions fall into three categories:

Radio Wave Propagation: Chapter 15 in the *Handbook*, both the 1968 and 1967 editions; Chapter 1 in the *Antenna Book*.

Antenna Systems: *Handbook*, pages 345-370 (1968) or 367-393 (1967); *Antenna Book*, pages 25-37, 137-166, and 170-185.

Transmission Lines: *Handbook*, pages 329-337 (1968) or 349-357 (1967); *Antenna Book*, pages 67-80, 100-106, 108-112.

Some of the material in the sample questions to follow will not be found in the *Handbook* because of the concise treatment necessitated by limited space. The *Antenna Book* therefore should be consulted in addition to the *Handbook*. In both, some details in the various sections

listed above need not be studied closely, although they contribute to the overall picture and should be read; the sample questions below will give you a good idea of how much of this "sidelight" information you will need to assimilate.

There are several formulas you should memorize before taking the examination. A check of the sample questions shows that numerical solutions may be asked for dipole length, length of a quarter-wave matching section, characteristic impedance of a quarter-wave section to match two resistive impedances, the relationship between load resistance, line characteristic impedance and standing-wave ratio, relationship of current maxima and minima (and similarly, voltage) to s.w.r., reflection coefficient, and power ratio expressed in decibels. The last probably will be confined to a few of the more common numbers, such as 3, 6 and 10 db., since you will not be expected to carry a table of logarithms with you to the examination room.

The FCC sample questions below have been grouped together in subject matter. Those from the Advanced examination are indicated by (A); those from the Extra are marked (E).

And once again, there are a few examination-type multiple-choice questions for you to practice on, at the end. Certain questions from earlier parts are discussed following the answers.

FCC Sample Questions

(A) What is meant by describing a radio wave as horizontally or vertically polarized? Which type is most suitable for sky and ground wave propagation?

A radio wave is made up of electric lines of force and magnetic lines of force, at right angles to each other. Polarization is determined by the position of the electric lines. A vertical antenna radiates vertically-polarized waves, and a horizontal antenna horizontally-polarized waves.

Either horizontal or vertical polarization is suitable for sky-wave communication. In ground-wave propagation (wave travelling in contact with the earth) any horizontally-polarized com-

ponent of the wave tends to be short-circuited at the earth's surface, so the useful energy is vertically polarized, or very close to being vertically polarized.

Note: A distinction must be made between the "ground" or "surface" wave (which, as the name implies, travels in contact with the earth) and the "space" wave. The space wave is frequently used for short-range communication at line-of-sight distances, particularly at v.h.f. It consists of two components, a direct ray which travels directly from the transmitting antenna to the receiving antenna, and a ray which is reflected from the earth before arrival at the receiving

antenna. The reflected ray in turn may consist of several components, depending on the number of objects, such as buildings, that may be between the transmitter and receiver, and that may be capable of reflecting a ray toward the receiver.

(A) Define maximum usable frequency.

The maximum usable frequency (m.u.f.) is the highest frequency which can be used to transmit over a specified distance via the ionosphere. Any higher frequency would not be reflected sufficiently by the ionosphere and thus would "skip" over the desired receiving point.

(E) What determines the skip distance of radio waves?

The frequency and the state of the ionosphere.

(A) What factors affect the state of ionization of the atmosphere?

Ultraviolet light from the sun is thought to be the primary cause of ionization of the upper atmosphere. Thus the extent of ionization depends on the time of day (or night) as well as the season of the year. Additionally, the extent of ionization changes over an eleven-year period, termed the "sunspot cycle," associated with cyclical changes in the number of spots visible on the sun's surface. Ionization of this nature is regular in occurrence and predictable. In addition, "sporadic" ionization occurs at heights of the order of 60 miles; this may happen at any time during the day or night, and the cause has not been determined. Isolated patches of ionization also occur in the auroral regions, and intermittent ionized "trails" are generated by meteors as a result of the intense heat generated when the meteor enters the atmosphere. At times, ionization may be greatly affected by the arrival of streams of particles thrown off the sun because of abnormal surface activity (solar flares). Such occurrences are known as "ionosphere storms." The usual effect is to disrupt the normal communication via the ionosphere.

Although there is no established correlation between ionization and surface weather conditions, propagation at v.h.f. in the troposphere is affected by weather (however, ionization is not involved in this type of propagation).

(A) How does the sunspot cycle affect wave propagation? What are the best frequencies to use for day and night, short and long distance communication during the cycle?

Ultra-violet light and possibly other forms of radiation from the sun produce ionization in layers of the upper atmosphere. These ionized layers bend radio signals back to earth at distances depending on the layer height and ionization intensity and the radio frequency in use. The sun's output of ionizing radiation varies over an 11-year period known as the sunspot cycle. Generally speaking, the greater the sunspot activity, the more intense the ionization and thus

the greater effectiveness of the ionized layers.

During periods of heavy sunspot activity, in the daytime suitable bands for short-distance communication would be 3.5 or 7 Mc., for long distances, 14, 21 or 28 Mc. At nighttime, 1.8 or 3.5 Mc. would serve for short distance contacts, and 7 and 14 Mc. for longer distances.

During periods of low sunspot activity, in the daytime suitable bands for short distance communications would be 3.5 or 7 Mc.; for long distances, 14 and 21 Mc. At nighttime, 3.5 or 7 Mc. would serve for short distance contacts, and 7 or 14 Mc. longer distances.

V.h.f., not normally affected by ionization, would be suitable at all times for short-distance communications—say up to 200 miles. At sunspot cycle peaks, F_2 layer skip may be observed in the 50-Mc. band. The incidence of auroral reflection at v.h.f. is also related to the sunspot cycle.

(E) What are aurora-reflected v.h.f. signals? If such a signal is heard, what does it sound like?

Aurora-reflected v.h.f. signals are those which reach a distant point by being reflected from the ionized region in the atmosphere that is responsible for visible aurora. Such signals sound rather rough and fluttery.

(A) Which amateur band is the most suitable for daytime communication over a distance of about 200 miles?

Considering ionospheric propagation during the daytime, the skip distance for sky-wave transmission on the 14-Mc. and higher-frequency amateur bands is normally greater than 200 miles, so these bands could not be relied upon for the desired distance. On the 3.5- and 1.8-Mc. bands the daytime absorption is high and the signals from stations at distances of this order are relatively weak or even inaudible. The 7-Mc. band offers the best possibility for reliable ionospheric communication under the specified conditions.

In the troposphere, weak but reliable signals can be propagated over the given distance in the u.h.f.-v.h.f. range. This type of propagation is relatively independent of frequency; the most important limitations are transmitting power and receiver sensitivity, tropospheric path attenuation, and terrain.

(E) Describe briefly some well known types of antennas and antenna systems used by amateurs which do, and do not, reduce harmonic radiation.

Practically any simple antenna, such as a dipole, will radiate harmonics equally as well as it radiates the fundamental signal; this is because the antenna is a linear circuit and inherently is resonant at multiples of the fundamental frequency. An ungrounded antenna will be resonant at all multiples; a system in which one end of the antenna is grounded will be resonant only at odd multiples of the fundamental. The grounded

antenna therefore discriminates against even harmonics. With dipole antennas, harmonics can be discriminated against by using a transmission-line system that is matched at the fundamental frequency but badly mismatched at the harmonics. For example, a dipole fed at the center can be matched by coaxial line at the fundamental, but is badly mismatched at even harmonics, so radiation at the even harmonics is poor. However, the mismatch on odd harmonics is only moderate, because of the way in which the center impedance of the dipole changes with frequency, so odd harmonics can be radiated. These statements apply to all dipoles, whether used alone or in directive arrays.

In cases where a matching network is used between the antenna (or driven element in a beam antenna) and transmission line, the discrimination against all harmonics is usually good because the line is matched to the antenna only at the frequency for which the matching section is adjusted. However, this is not true of all linear matching sections, particularly quarter-wave "Q" sections, because these have harmonic resonances similar to those of the antenna itself.

In systems in which no attempt is made to match the antenna to the line, such as a center-fed or end-fed dipole with an open-wire parallel conductor line ("tuned" line) there is no inherent discrimination against harmonics. However, in most cases it is necessary to provide a tuned LC matching circuit at the input end of the line in order to transfer power from the transmitter to the line. The selectivity of such a circuit, properly designed and adjusted, ordinarily gives better harmonic discrimination than any of the systems discussed above.

A multiband antenna which, by the use of traps or similar devices, attempts to match the antenna and transmission line at harmonic frequencies in order to be useful in harmonically-related amateur bands, will offer no discrimination against harmonics in those bands in which it is designed to operate, and little against odd harmonics of the operating frequency.

(A) How can the resonant frequency of an antenna be increased? Decreased?

The resonant frequency of an antenna is inversely proportional to its (electrical) length. Thus the resonant frequency may be increased by shortening the antenna; the frequency may be decreased by lengthening the antenna.

An effect equivalent to lengthening an antenna can be obtained by inserting a "loading" inductance which will tune the system to a lower frequency; similarly, an effect equivalent to shortening can be obtained by inserting a capacitance in the antenna to raise the frequency of the system. The frequency cannot be raised to more than twice the natural resonant frequency by the latter method, however.

Thickness of the antenna element is also a factor; increasing the diameter of the conductor decreases the resonant frequency. In practice this effect is not significant except at v.h.f. and higher.

An antenna, usually vertical, can be "top loaded" with radials or a similar structure to provide capacitance, which reduces the resonant frequency.

(E) List some different types of beam antennas.

Beam antennas may be classified broadly into three types: long-wire, driven arrays, and parasitic arrays. Examples of the long-wire type are the rhombic and V antennas. In driven arrays, the antenna elements — dipoles of the order of one-half wavelength long, usually — are all fed through transmission lines from the transmitter. The elements may be spaced and phased so that the maximum radiation is perpendicular to the line along which the elements are placed. Arrangements of this type are known as broadside arrays; examples are parallel elements fed in phase, or collinear elements fed in phase. Such antennas are bidirectional, but can be made unidirectional by the use of a second (and similar) array of elements properly spaced and phased with respect to the first. An end-fire array is one in which the elements are arranged in line in the desired direction of maximum radiation and phased properly to enhance the "forward" radiation; arrays of this type are substantially unidirectional.

Parasitic arrays differ from driven arrays in that a driven element is associated with others that have no direct connection with the source of power through a transmission line. The "parasitic" elements receive power by electromagnetic coupling to the driven element, and reradiate it in amplitude and phase dependent upon the spacing between elements and the tuning of the parasitic elements. These arrays (the Yagi antenna is an example) are essentially unidirectional.

Many combinations of both types of arrays are possible. Large loops also may be used as elements in directional antennas, the "quad" type being an example. A loop having sides a quarter wavelength long is approximately equivalent to a pair of short parallel dipoles, and may be treated as such in the construction of driven or parasitic arrays.

(E) What constitutes a parasitic antenna element?

A parasitic element is one receiving power from a driven element by coupling through the electromagnetic field, rather than receiving power directly from the transmitter through a transmission line. It is usually similar in construction to a driven element and is placed parallel to it at a distance which may be as much as one-half wavelength, but is generally less than one-quarter wavelength. It is usually tuned, by adjusting its length or by other convenient means, so that the phase relationship between the current induced in it and the current flowing in the driven element, in conjunction with the element spacing, will give a desired directive pattern for the system as a whole.

(E) How does the directivity of an unterminated "V" antenna and parasitic beam antenna compare?

An unterminated V antenna is bidirectional along a line bisecting the V, while a parasitic beam antenna has its main lobe extending in one direction only. Both types of course have a number of minor radiation lobes.

(A) What are the advantages and disadvantages of using the same antenna for receiving and transmitting?

Using the same antenna for receiving and transmitting takes advantage of any directional and other propagation characteristics of the antenna; thus an area from which a received signal is strong is also one to which the transmitting signal will be propagated at a high level.

The disadvantage of using the same antenna is that some method of switching between transmit and receive functions, or diplexing, is necessary. This can be a simple switch or relay control; it can also be accomplished electronically, as for example an electronic t.r. switch, which is the desirable method for fast break-in operation at h.f. In the v.h.f.-u.h.f. range, a diplexer can be employed to use the antenna for duplex operation.

(E) What are the current and voltage characteristics along a transmission line when it is matched and mismatched?

If the line loss is negligible, the current measured along a matched transmission line will everywhere be the same. This is also true of the voltage along the line. If the line has appreciable loss, the current and voltage will both decrease smoothly as the point of measurement is moved from the input end of the line toward the load. The greater the loss, the smaller the current and voltage at the load as compared with their values at the input end of the line.

In a mismatched line the current as measured along the line will vary continuously between maximum and minimum values with the maxima and minima separated by a distance equal to one quarter wavelength (the length measurement must take into account the velocity of propagation in the type of line used). The voltage varies similarly, but the voltage maxima occur at the points where the current is minimum, and vice versa. The positions of these maxima and minima of voltage and current depend on the relationship between the characteristic impedance of the line and the impedance of the load in which the line terminates. If the line loss is negligible, all current maxima have the same value; likewise all minima have the same value. This is also true of voltage. If the line loss is appreciable, the maxima will become smaller and the minima will become larger as the measurement point is moved from the load end of the line toward the input end (that is, the standing-wave ratio decreases going from the load toward the input end.) This behavior becomes more pronounced with an increase in line loss per unit length of line (that

is, the s.w.r. at the load is proportionately higher with increased line loss, than that at the input end of the line.)

(A) What happens to the voltage, current and impedance along a transmission line with an s.w.r. of 1?

When the standing-wave ratio on a transmission line is unity, the load is perfectly matched to the line. In such a case there is no variation in the amplitude of either the current or voltage along the line, and the voltage and current are in phase. The impedance looking into the line toward the load at any point is constant, and is purely resistive. (These statements are strictly true only if the line has no loss, but are accurate enough for most practical purposes if the line losses are reasonably low.)

(A) What is a good indication that a high standing wave ratio (s.w.r.) is present on a transmission line? Where is the best point on a long transmission line to measure the s.w.r.?

In the absence of equipment for checking the standing-wave ratio on a line, one indication of a high s.w.r. might be difficulty in making the final amplifier in the transmitter load properly when its output circuit is adjusted. Another would be extreme sensitivity of transmitter output-circuit tuning to small changes in operating frequency (i.e., a small shift in operating frequency necessitates readjustment of loading and tuning controls). When operating with high power and a line having relatively high loss, "hot spots" (spots where the line temperature is high) may be found along the line. If a parallel-conductor line is used, moving a neon bulb or indicating wavemeter along the line will show variations in current or voltage along the line (with a properly-matched line the indication will be constant everywhere along the line). The best check, however, is one made with a reflectometer or bridge designed to show relative forward and reflected power or voltage.

If the line is long and has appreciable loss, the standing-wave ratio will be highest at the load and will decrease with distance away from the load. It is therefore best to measure the s.w.r. at the load end of the line.

(A) A transmission line that feeds an antenna has a power loss of 10 db. If 10 watts are delivered to the transmission line input, how much power is delivered to the antenna? List possible causes of power loss. How can the s.w.r. of the line be made as low as possible?

A figure of 10 db. indicates a 10 to 1 power loss; thus only one watt would be delivered to the antenna. Power loss is caused by conductor resistance and dielectric loss in the line, and in some cases by radiation from the line. The loss is increased by a standing-wave ratio (s.w.r.) greater than 1:1. A low s.w.r. can be obtained by matching the impedance of the antenna to that of the line as closely as possible.

(E) Can a lossy transmission line be used to transmit signals? Explain.

A lossy transmission line can be used to transmit signals, but if the losses are high only a relatively small part of the signal power delivered to the line will reach the output end. That is, the line efficiency will be low. Line losses are usually given in decibels per 100 feet, as a function of frequency, for the condition where the impedance of the load is matched to the characteristic impedance of the line. The actual loss of power under a given set of circumstances can be calculated from this information, provided the standing-wave ratio is known.

(E) Explain the properties of a quarter-wave section of r.f. transmission line.

A quarter-wave section of r.f. transmission line shorted at the far end acts like a parallel-resonant *LC* circuit; open-circuited at the far end it acts like a series-resonant *LC* circuit. That is, the input impedance of a quarter-wave line with the far end shorted is a high resistance (some thousands of ohms) and the input impedance with the far end open is so low as to be practically a short-circuit. These statements are true when the applied frequency is that for which the line is resonant—that is, the frequency at which the line actually is a quarter wavelength long, electrically. (At frequencies somewhat removed from resonance the line becomes reactive.)

The quarter-wave line also can be used as an impedance transformer or inverter; for example, a resistive load at the far end that is higher than the characteristic impedance of the line itself will be transformed into a resistance that is lower than the characteristic impedance as viewed looking into the input end. The converse also is true. The relationship is

$$Z_1 = \frac{Z_0^2}{Z_2},$$

where Z_0 is the characteristic impedance of the quarter-wave line, Z_1 is the resistance presented by the line at its input end, and Z_2 is the load resistance at the far end.

(A) A 70-ohm half-wave antenna operating on a frequency of 7300 kc. is to be matched to a 50-ohm transmission line. Calculate the characteristic impedance of a quarter-wave matching section and the physical length of the antenna at the frequency given. What is the s.w.r. between the antenna and transmission line without a matching section?

A transmission line can be matched to an antenna of different impedance by a quarter-wave line section having a characteristic impedance equal to the square root of the product of the two impedances being matched. Thus the desired matching section should have an impedance of approximately 59.2 ohms (the square root of 3500, from 70×50 ohms).

Antenna length in feet can be found from the approximate formula $468/f_{Mc.}$, and in this case (7.3 Mc.) is approximately 64 feet. The matching section length would be $246V/f_{Mc.}$, where V is the velocity factor of the particular type of line used in the matching section. In practice, cut-and-try adjustment of both antenna length and matching-section length would be necessary for obtaining maximum performance.

Standing-wave ratio is the ratio between the impedance of the load (antenna) and the characteristic impedance of the line, without the matching section. In this case it would be 70:50, or 1.4 to 1.

(E) A 70-ohm transmission line is connected to a 35-ohm antenna. Calculate the standing wave ratio (s.w.r.), the reflection coefficient, and the percent reflected power. If 10 amperes are flowing in the antenna terminals, what is the current in a transmission line node?

The standing-wave ratio is found by dividing the characteristic impedance of the line by or into the impedance of the load terminating the line (the smaller number of the two is used as the divisor). In this case, the line impedance is higher, so the s.w.r. is $70/35$, or 2 to 1.

The reflection coefficient is the percentage of voltage (or current) reaching the load that is reflected back toward the input end. The formula

$$k = \frac{S.W.R. - 1}{S.W.R. + 1}$$

The reflection coefficient in the question therefore is

$$k = \frac{2 - 1}{2 + 1} = \frac{1}{3} = 0.333$$

The reflection coefficient is in terms of current or voltage ratios, so the reflected power is proportional to the square of the reflection coefficient. The reflected power is therefore $(\frac{1}{3})^2$ or $\frac{1}{9}$ of the power reaching the load, or 11.1%.

If the load on the line is resistive, as in this case, current nodes or loops occur at the load. If the load resistance is larger than the characteristic impedance of the line there will be a current node at the load; if smaller, there will be a current loop. The loops (or nodes) repeat at half-wave intervals along the line toward the input end. In the question, the load resistance is smaller than the line impedance and the current is maximum (current loop) at this point. Since the s.w.r. is the ratio of the current at a loop to the current at a node, the current at a node will be 10/2, or 5 amperes.

(A) When can a low-pass filter be installed in a coaxial cable without causing a large power loss?

Filter constants must be selected for a specific load resistance, so as a matter of design the filter impedance must match the nominal characteristic impedance of the line in which the

filter is to be used. However, the filter will not "see" this impedance unless the line itself is terminated in its characteristic impedance at the load end; therefore, for minimum loss the line must be properly terminated. It is taken for granted, of course, that the frequency to be transmitted is below the cutoff frequency of the filter.

(E) What effect does a transmission line which is not properly terminated have on the plate tank circuit of a transmitter?

If a line is not properly terminated, the impedance that the input end of the line presents to the transmitter's output circuit is not equal to the characteristic impedance of the line (as it is when the line is properly terminated). Thus both the tuning and loading adjustments of the tank circuit will be affected. In some cases this may mean that the desired amplifier loading cannot be obtained, if the tank circuit is one that has been designed to match a particular line characteristic impedance and has little or no range of adjustment. Also, since the input impedance of a mismatched line usually is reactive as well as resistive, it may be impossible to resonate such a tank circuit when the standing-wave ratio is large.

Examination-Form Questions

Q1. A half-wave dipole cut for 7150 kc. is center-fed through a 55-foot length of 300-ohm solid-dielectric parallel-conductor line ("twin line"). The impedance of the antenna is 68 ohms, purely resistive. What is the impedance at the input end of the transmission line?

- A — 68 ohms.
- B — 300 ohms.
- C — 143 ohms.
- D — 75 ohms.
- E — 138 ohms.

Q2. In the antenna system of Question 1, what is the standing-wave ratio on the line?

- A — 1 to 1.
- B — 4 to 1.
- C — 4.4 to 1.
- D — 5 to 1.
- E — 0.

Q3. A Yagi antenna is classified as what type of directive array?

- A — Long-wire.
- B — Collinear.
- C — In-phase.
- D — End-fire.
- E — None of the above.

Q4. At what part of the sunspot cycle would the nighttime maximum usable frequency be closest to the 7-Mc. amateur band?

- A — At the sunspot maximum.
- B — At the sunspot minimum.
- C — Midway between the maximum and minimum.
- D — The m.u.f. never goes below the 14-Mc. band.
- E — The sunspot cycle does not affect the 7-Mc. band.

Q5. A solid-dielectric coaxial line is operating with a standing-wave ratio of 2 to 1 at a frequency of 14,250 kc. What is the distance in feet between a current loop and the nearest voltage node?

- A — 34.5 feet.
- B — 32.8 feet.
- C — 22.8 feet.
- D — 11.4 feet.
- E — 0 feet.

Q6. Measurement with a reflectometer shows that the forward power in a transmission line is 225 watts while the reflected power is 25 watts. What is the voltage standing-wave ratio?

- A — Close to 1 to 1.
- B — 9 to 1.
- C — 8 to 1.
- D — 3 to 1.
- E — 2 to 1.

(Answers on page 128)

Strays

Feedback

Because of a typographical error the call in the Stray on page 56 of *QST* for May 1968 (the first item under "I would like to get in touch with . . .") should have been WØHQG.

Some of the antenna dimensions given in Fig. 101 of W4MKM's article on his weather satellite receiving setup, April 1968 *QST*, were incorrect. The diameter of the helix turns should have been 26 $\frac{3}{4}$ inches, the distance between turns 21 $\frac{1}{2}$ inches, and the length of the matching transformer should have been 20 $\frac{5}{8}$ inches.

Referring to the summary of the 1968 V.H.F. Sweepstakes appearing in June *QST*: (1) W3KWH (Western Pennsylvania) should have been listed in the multioperator category, and WA3ISY as the single-operator winner for that section. (2) The operator of KØTLM (Mo.) was WA2BXE. (3) The Eastern Mass. multioperator entry listed as WA1DGH should have appeared as W1AF, with K1PAM and WA1DGH as operators. (4) Certificate winner for the Ranconas Valley ARA was WB2LWZ, whose call appeared as WB2LZW. Apologies to all our victims!

In the Novice Roundup summary in June *QST*, the call of WN1DP, who placed third in the Eastern Massachusetts section, appeared as WN1DP. Sri, OM.

1968 Board Meeting Minutes

Mail Exams For Shut-Ins

Canadian Changes in 160 Meters

Some Techs Eligible For Novice

WA4 QSL BUREAU CHANGES

The QSL Bureau for WA4, WB4 and WN4 amateurs has been transferred from Richard Tesar, WA4WIP, to J. R. Baker, W4LR

1402 Orange Street

Melbourne Beach, Florida 32951

Mr. Baker formerly operated the W1 QSL Bureau, when he held the call W1JOJ.

Hearty thanks to WA4WIP for a job very well done! (Other info on the Bureau: page 82 this issue.)

TECHNICIANS ELIGIBLE FOR NOVICE

A new interpretation of its rules by FCC permits Technicians who have never had any other license to take the Novice test. The new privilege came in a letter answering the question of an individual. Pertinent portions are:

"The Commission's Rules permit a current holder of a Technician Class amateur license who has never been issued a Novice Class amateur license or never has been a former holder of an amateur license of any class to apply for the Novice Class license. . . ." — James E. Barr, Chief, Safety and Special Radio Services Bureau.

Applicants for Novice locate a volunteer examiner themselves. This person must be a citizen over 21, who holds a General, Advanced or Extra Class license; or who holds a commercial radiotelegraph license issued by FCC; or is currently the operator of a manually-operated radiotelegraph station in the service of the U.S.

The applicant secures an FCC form 610 from any office of the Commission. He gets together with his volunteer examiner and takes the code test. He then sends the Form 610 and a letter by the examiner certifying to the results of the code test to the FCC, Gettysburg, Pa. 17325. (ARRL form S-45 may be used in place of the letter; send a stamped, self-addressed envelope to Hq. with your request.)

The test papers will be sent in two or three weeks to the examiner, not the applicant. The material must be returned in twenty days.

CANADA REVISES 160 METERS

To accommodate the expansion of the Loran-A radio navigation service, reported here last month, the Canadian Department of Transport has drafted a new list of frequency assignments for 1.8 to 2.0 MHz. (See chart on p.69). The probable effective date of the rules change is July 1.

John G. Doyle, W9GPI

QST regrets to report the death, on May 13, 1968, of Jack Doyle, W9GPI — ARRL director from the Central Division for more than eight years, and a member of the ARRL Executive Committee for nearly half that time. He had to resign both posts in January 1963, when the illness of a son required him to put more time into the family automobile agency in Milwaukee, Wis. Jack was a past president of the Wisconsin Council of Radio Clubs, a Life Member of the Milwaukee Radio Amateur Club, served several hitches as vice president and director, and at the time of his death was editor of its paper, *Hamateur Chatter*. In 1948, W9GPI served as general chairman for the ARRL National Convention in Milwaukee. Jack will be keenly missed by the amateurs in the Central Division, and by the gang "behind the Codfish Curtain," as Jack referred to anything east of the Hudson.

MORE AMATEUR RADIO WEEKS

Amateur Radio Week has been proclaimed in Florida by its Governor for the past 12 years; this year it's June 16 through 23. In Cleveland, it was April 23-30, keeping step with the state of Ohio, whose date coincides with the Dayton Hamvention. Back east, the "whaling city," New Bedford, Mass., chose May 26 through June 2 for its observance.

VISITORS MAY USE VOX

Another in a series of FCC interpretations of its rules concerns the use of voice-operated break-in by unlicensed visitors. Again, this is not a new rule, but it is worth an occasional repeat.

"Section 97.79 of the Rules provides that when an amateur station is used for telephony, the station licensee may permit any person to transmit by voice, provided, that during such transmissions call signs are announced as prescribed by Section 97.87 of the rules and a duly licensed amateur operator maintains actual control over the emissions, including turning the carrier on and off for each transmission and signing the station off after communication with each station has been completed.

"It will be noted that while unlicensed persons may not *manipulate* the controls of an amateur transmitter, they may transmit by voice and announce call signs, except for signing the station off after communication with each station has been completed. The same limitations apply in

the case where a telephone station uses voice controlled operation (VOX)."

The Commission obviously equates "turning the carrier off and on" with action of a switch; thus, the fact that the transmitter comes on when the visitor talks does not make his use of the transmitter illegal in itself. Note, however, that the licensed operator must be in a position to flip the switch in case of improper comments.

Elsewhere, the rules require the name of every person who speaks over the mike directly or otherwise to be entered in the log.

SHUT-INS WIN MAIL EXAMS

The Federal Communications Commission has adopted new rules proposed in Docket 17989 which allow shut-ins to take Advanced and Extra Class examinations under the supervision of a volunteer. The League and one individual filed in support of the Docket; there were no opposition comments. The new regulations, which became effective June 17, are outlined below.

§97.28 Mail examinations for disabled applicants for Amateur Extra and Advanced Class licenses.

(a) The Commission may permit the examination for an Amateur Extra or Advanced Class license to be administered by a volunteer examiner selected by the applicant when it is shown by a Commission supervised examination because of protracted disability.

(b) The volunteer examiner for an Amateur Extra or Advanced Class license examination shall be at least 21 years of age and shall be the holder of a

class of amateur operator license equal to or higher than the class of license for which the applicant is being examined. The written portion of the examination shall be obtained, supervised, and submitted in accordance with the procedures set forth in §97.29(b).

§97.29 Manner of conducting examinations.

(a) Except as provided by §97.28, the examination for Amateur Extra, Advanced and General Classes of amateur operator licenses will be conducted by an authorized Commission employee or representative at locations and at times specified by the Commission. Note: When the applicant is entitled to examination credit for the code test under one of the provisions of §97.25, an application may be submitted without regard to the 10 day limitation. The examiner's request should then state that a code test was not administered for that reason. The applicant should furnish details as to the class, number, and expiration date of any Commercial radiotelegraph license involved.

§97.35 Additional examination for holders of operator licenses obtained by mail.

(a) A licensee who holds an amateur license which was obtained by a mail examination under the supervision of a volunteer examiner may be required to appear for a Commission supervised license examination at a location designated by the Commission. If the licensee fails to appear for this examination when directed to do so or fails to pass such examination, the operator license involved shall be subject to cancellation. When a Novice, Technician, or Conditional Class license is cancelled under this provision, a new license will not be issued for the same class operator license as that cancelled.

Draft Canadian Amateur Frequency/Power Level Plan in 1800-2000 kHz. Band

	A	B	C	D	E	F	G	H
British Columbia								
North of 54° N. Lat.	1	0	0	1	0	0	0	0
British Columbia								
South of 54° N. Lat.	0	0	0	0	1	0	0	1
Alberta	1	0	0	1	1	0	0	1
Saskatchewan	2	0	0	2	2	1	1	3
Manitoba	3	1	1	2	2	1	1	3
Ontario								
North of 50° N. Lat.	3	1	1	0	0	0	0	2
Ontario								
South of 50° N. Lat.	3	2	1	0	0	0	0	1
Province of Quebec								
North of 52° N. Lat.	1	0	0	1	1	0	0	1
Province of Quebec								
South of 52° N. Lat.	3	1	1	0	0	0	0	0
New Brunswick	3	2	1	0	0	0	0	0
Nova Scotia	3	2	1	0	0	0	0	0
Prince Edward Island	3	2	1	0	0	0	0	0
Newfoundland Is.	3	1	1	0	0	0	0	0
Labrador	2	0	0	0	0	0	0	0
Yukon Territory	2	0	0	1	0	0	0	0
District of MacKenzie	2	0	0	2	1	0	0	1
District of Keewatin	1	0	0	1	2	1	1	3
District of Franklin	0	0	0	0	1	0	0	1

Frequency Band

Power Level — Watts

A 1800 — 1825 kHz.	E 1900 — 1925 "	0 — Operation not permitted.
B 1825 — 1850 "	F 1925 — 1950 "	1 — 25 night 100 day
C 1850 — 1875 "	G 1950 — 1975 "	2 — 50 " 200 "
D 1875 — 1900 "	H 1975 — 2000 "	3 — 100 " 400 "

Behind the Diamond

Number 6 of a Series



After three months "on the road," *Behind the Diamond* returns to Newington to talk about L. A. Morrow — much better known as Pete, W1VG (but how Lorentz gets abbreviated to Pete is beyond me!). He came to League headquarters in 1947 as assistant advertising manager and became manager four years later.

Pete started in ham radio in 1913 with a spark coil and the call WI in Springfield, Ohio. By 1916 he had the more-official designator SAOF, and after the First

World War became 1VC at Cambridge, Mass. He moved to Hartford in 1920 as the first employee of the C.D. Tuska Company, formed by the ARRL's co-founder-secretary-QST editor, Clarence Tuska, to make radio receivers. Our photo shows the two during a recent visit (Pete at the left) examining the Tuska Type 225 ham receiver. After 1VC, our subject held the calls 8BZJ, 8BAB, W5NI, WSDKE and W9VKF before landing at 38 LaSalle Road. Along the way, Pete served as a Navy communications officer in the South Pacific during World War II, emerging as a lieutenant commander.

W1VG is now slipping out from behind the diamond; he retired from full-time service as advertising manager on May 3, but remains a consultant to the hq. staff. But he'll have lots to do — he remains an avid tennis player and DX chaser, and likes contest operating, too, mostly on c.w. He is also a contributor to the Hartford *Sunday Courant Magazine*, with a weekly cryptogram. In the latter vein, ZRXT RV ARRL ZHPY NR EUXU BRGGRJ VGRB DZZ ZUDAHU BUBNUGT DCL QST EDZT DX QF.

BOSTON EXAMS ONLY THURSDAY AND FRIDAY

The District FCC office at 1600 Custom House, Boston, Mass., 02109, will henceforth conduct exams for commercial and amateur licenses only on Thursdays and Fridays; no appointment is necessary. Applicants should appear for examination between 8:30 and 10:30 A.M., and should apply for the highest class of operator license for which they have prepared.

MINUTES OF THE 1968 ANNUAL MEETING OF THE BOARD OF DIRECTORS

The American Radio Relay League, Inc.
May 3-4, 1968

1) Pursuant to due notice, the Board of Directors of The American Radio Relay League, Inc., met in annual session at the Shoreham Motor Hotel, Hartford, Connecticut, on May 3, 1968. The meeting was called to order at 9:33 A.M., with President Robert W. Denniston, W9DX, in the Chair, and the following directors present:

Roemer O. Best, W5QKF, West Gulf Division
Charles J. Bolvin, W4LUVV, Southeastern Division
Robert York Chapman, W1QV, New England Division
Victor C. Clark, W4KFC, Roanoke Division
Charles G. Compton, W9BUO, Dakota Division
Gilbert L. Crossley, W3YA, Atlantic Division
Harry J. Dannals, W2TUK, Hudson Division
Noel B. Eaton, VE3CJ, Canadian Division
Sumner H. Foster, W9GQ, Midwest Division

J. A. Gmelin, W6ZRJ, Pacific Division
John R. Griggs, W6KW, Southwestern Division
Philip E. Haller, W9HPG, Central Division
Alban A. Michel, W8WC, Great Lakes Division
John H. Sampson, Jr., W7OCX, Rocky Mountain Division, (Vice Director, Acting)
Philip P. Spencer, W8LDH, Delta Division
Robert B. Thurston, W7PGY, Northwestern Division

Also in attendance, as members of the Board without vote, were Wayland M. Groves, W5NW, First Vice President; and John Huntoon, W1LVQ, General Manager. Also in attendance, at the invitation of the Board as non-participating observers, were Atlantic Division Vice Director Harry A. McConaghy, W3EPC; Central Division Vice Director Edmond A. Metzger, W9PRN; New England Division Vice Director Bigelow Green, W1EAE; and Roanoke Division Vice Director L. Phil Wicker, W4ACY. There were also present Treasurer David H. Houghton; Honorary Vice President Francis E. Handy, W1BDI; General Counsel Robert M. Booth, Jr., W3PS; Assistant General Manager Richard L. Baldwin, W1IKE; Communications Manager George Hart, W1NJM; Senior Assistant Secretary Perry F. Williams, W1UED; and Public Relations Consultant Don Waters.

2) On motion of Mr. Chapman, the assembly stood in a moment of silent tribute to the late Dana E. Cartwright, W8SUPB, former Great Lakes Division Director.

3) On motion of Mr. Best, unanimously VOTED that the Board adopts the agenda as distributed by the Secretary.

4) On motion of Mr. Compton, unanimously VOTED that the minutes of the 1967 Annual Meeting of the Board of Directors are approved in the form in which they were issued by the Secretary.

5) On motion of Mr. Chapman, unanimously VOTED that the Annual Reports of the Officers to the Board of Directors are accepted and the same placed on file.

6) Mr. Eaton, as Chairman, presented the report of the Finance Committee; Mr. Dannels, as Chairman, presented the report of the Planning Committee; Mr. Best, as Chairman, read the report of the Membership and Publications Committee; Mr. Haller, as Acting Chairman, presented the report of the Public Relations Committee; Mr. Groves, as Chairman, presented the report of the Merit and Awards Committee; Mr. Denniston reported on the Frequency Allocations Study Committee. During the course of the above, Associate Counsel Arthur K. Meen, VE3RX, and Technical Director George Grammer, W1DF, entered the meeting.

7) On motion of Mr. Thurston, unanimously VOTED that the Annual Reports of the Directors to the Board of Directors are accepted and the same placed on file.

8) At this point, supplementary oral reports were offered by the Officers of the League and the General Counsel.

9) The Board was in recess from 10:43 A.M. until 3:35 P.M. for the purpose of informally discussing the contents of the committee reports and other matters not requiring formal action by the Board, and for luncheon.

10) On motion of Mr. Chapman, unanimously VOTED that the Board commend President Robert W. Denniston, W0DX, General Manager John Huntoon, W1LVQ, and League Consultant Phil Rand, W1DBM, for their outstanding work with the various governmental agencies resulting in obtaining additional operating privileges in the 160-meter band.

11) On motion of Mr. Chapman, after discussion, unanimously VOTED that the Planning Committee study the feasibility of ARRL recommending limited segments in amateur bands for select contest operations.

12) On motion of Mr. Chapman, after extensive discussion, unanimously VOTED that the League sponsor achievement awards for five-band DXCC confirmed contacts, identified as 5B-DXCC; any authorized mode of communication would be recognized, and rules and regulations set forth for this achievement would be promulgated by the Communications Manager; only contacts made after date of promulgation will be considered.

13) On motion of Mr. Chapman, unanimously VOTED that the Board authorizes and encourages the General Manager to continue the employment of professional public relations consulting services.

14) Moved, by Mr. Chapman, that the offices of second and third vice presidents of the League be occupied by persons other than directors or vice directors presently holding office. But after discussion, with the consent of the second, the motion was withdrawn.

15) On motion of Mr. Chapman, after discussion, unanimously VOTED that each director, at his own discretion, is authorized to attend one Executive Committee meeting each year, with funding chargeable to authorized director division expenses.

16) On motion of Mr. Chapman, unanimously VOTED that a study under the direction of management be made that will provide the League with guidance for best serving our government in the event of total mobilization for war or national emergency purposes, this study to consider the utilization of ARRL employed personnel, building and laboratory facilities, as appears suitable and practical.

17) Moved by Mr. Thurston, that the General Counsel and General Manager contact the Post Office Department as soon as possible, but no later than December 31, 1968, concerning the feasibility of establishing procedures for the handling of overseas shipment of QSL cards; if feasible, that necessary steps be taken to establish the outgoing QSL Bureau as recommended in the Planning Committee's Report dated May 1, 1968. After extensive discussion, on motion of Mr. Bolvin, VOTED to amend the motion by striking all after the words, "if feasible," and replacing with, "the General Manager shall prepare a presentation on proposed methods and costs, for consideration by the Executive Committee." The question being on the motion as amended, the same was ADOPTED, 12 votes in favor to 4 opposed.

18) On motion of Mr. Gmelin, unanimously VOTED that the General Manager institute a study on the feasibility of establishing a dialogue with manufacturers of solid state hi-fi equipment with the view of establishing procedures for eliminating r.f. interference to home audio equipment and sound systems.

19) On motion of Mr. Gmelin, after discussion, unanimously VOTED that the Membership and Publications Committee study the possibility of instituting a new League publication in the area of f.m. and a.m. repeater equipment and techniques.

20) Moved by Mr. Gmelin, that the name of The American Radio Relay League be changed to the "American Amateur Radio League," to better reflect the actual composition of the organization. But, after discussion, with the consent of the second, the motion was withdrawn.

21) Moved, by Mr. Gmelin, that the General Manager and General Counsel contact the Federal Communications Commission with the suggestion that the FCC provide for all data for the Novice examination be placed in the form 610, thus eliminating the separate volunteer examiner's letter now required; but there was no second, so the motion was lost.

22) Moved, by Mr. Gmelin, that the Board of Directors instruct the Communications Manager to rewrite Article 4 of the Rules and Regulations of the Communications Department by adding the

OFFICERS' REPORTS AVAILABLE TO MEMBERS

Each year the officers of the League make comprehensive written reports to the directors. The Board has made these reports available to interested members, in a volume which also includes reports of the directors. The cost price is \$1.00 per copy, postpaid. A copy of the financial statement only is available without charge. Address the General Manager, ARRL, Newington, Conn. 06111.

following: "No person shall hold the office of Section Communications Manager while at the same time holding the office of Director of the League." After discussion, moved by Mr. Thurston, to amend the motion to exclude dual holding of National Traffic System positions as well; but there was no second, so the motion to amend was lost. After further discussion, on motion of Mr. Bolvin, VOTED, 14 votes in favor to 1 opposed, to strike the text and substitute therefor the following: "that the President appoint a committee to study the current field organization, both elective and administrative; the committee shall recommend to the Board such changes in structure and qualifications as it finds necessary." Mr. Chapman requested to be reported as voting opposed. The question then being on the motion as amended, the same was unanimously ADOPTED.

23) Moved, by Mr. Gmelin, that the General Manager is instructed to institute a study to find new ways of combatting malicious interference problems found on the amateur bands. After extensive discussion, moved by Mr. Bolvin, to amend the motion by striking the text and substituting therefor the following: "that the Board recognizes the serious developments relative to malicious interference and use of questionable language in our amateur bands by a relatively small number of amateurs. The Board favors a program to assist regulatory agencies and the courts in bringing such practices to a halt." After further discussion, on motion of Mr. Chapman, unanimously VOTED that the matter is laid on the table.

24) Moved, by Mr. Gmelin, that the office of Secretary/General Manager and Editor of *QST* be held by separate individuals, each responsible directly to the Board of Directors. After extensive discussion, the motion was rejected. Messrs. Gmelin, Griggs and Spencer requested to be recorded as voting in favor.

25) Moved, by Mr. Gmelin that the Board of Directors through the Communications Manager establish rules and regulations concerning affiliated radio networks as follows:

1. In addition to maintaining and encouraging a National Traffic System, the League shall invite other traffic and emergency networks to affiliate with the ARRL and be so publicized.
2. A network may affiliate with the League if it expresses the sympathy with and allegiance to the aims and policies of the League in accordance with the regulations determined by the Communications Manager, and which, upon investigation, is found to be worthy and qualified.
3. The network manager or president of an affiliated network may apply to the Communications Manager for a supply of ARRL ARPSC Affiliated Network certificates, which may be issued by the net manager or president to any qualified member of the network.
4. The affiliation of any such network may be terminated by the Communications Manager at any time for any cause deemed prejudicial to the best interests of the League, or by the net officers, if they so desire.
5. The Communications Manager shall be responsible for the general supervision of the ARPSC affiliated networks and their welfare, and for the relations existing between them and the League; he shall keep records and conduct the necessary correspondence with them to effect these relations.

After discussion, on motion of Mr. Dannals, unanimously VOTED to amend the motion to provide that the matter is referred to the committee making a study on the overall field organization. The question then being on the motion as amended, the same was unanimously ADOPTED.

26) The Board was in recess for dinner from 6:20 P.M. until 8:06 P.M.

27) On motion of Mr. Clark, after discussion, unanimously VOTED that the Board of Directors (1) establish trial Rules and Regulations Concerning Advisory Committees, (2) that these conform in principle to the guidelines set forth below, and (3) that a Working Group be authorized to accomplish any refinements deemed necessary to improve clarity and cogency of the proposed guidelines, and to develop, within the next ninety days, detailed supplementary procedures to facilitate implementation of such Advisory Committees, as these committees may be voted into existence by the Board of Directors, said Working Group to consist of three Board members appointed by the President, with the General Manager serving as a fourth and ex-officio member of the group, and, further, that not more than two such advisory committees be established for an experimental period of eighteen months.

RULES AND REGULATIONS CONCERNING ADVISORY COMMITTEES

The following rules and regulations provide for the establishment of national advisory committees, composed of qualified amateurs, to undertake studies, review proposals, and to communicate advice, recommendations and expertise from the League's membership to its management in various specialty areas of amateur radio:

1. The creation (or dissolution) of any Advisory Committee shall be the determination of the Board of Directors or Executive Committee at a regular meeting.
2. The petition for establishment of an Advisory Committee shall outline the purpose of the Committee, the proposed scope of its activities, and the means by which the Committee pro-



A double coup was pulled off by the Cleveland gang—they secured proclamation of amateur radio week in Cleveland by Mayor Carl B. Stokes, and got the mayor on the mike from City Hall, sending a message to Councilman Margaret McCaffery's son. Left to right seated, the councilman, the mayor, the operator WA8QFK, standing, WA8PQL, WBUDG, K8ONA, K8LMF, W8SZH.

(Photo by WA8PCT.)



Foothills ARC president WA6QIC and ARRL Pacific Division director W6ZRJ present the February QST Cover Plaque award to David M. Krupp for "Attache Case RTTY," and congratulate WA6NIL, right, for winning the "homebrew" equipment contest judged by W6ZRJ and Mr. Krupp.

poses to communicate among its membership for the purpose of discussion, debate, and to reach a consensus on matters under study. This petition is to be presented to the Board by the sponsoring Director.

3. The initial membership of the Advisory Committee shall be selected by the President of the League, employing such consulting assistance as he may deem desirable to secure the services of those best able to provide the expertise sought.
4. Committee membership, for practical reasons, should be limited to fewer than ten, and the exact number and any geographical or other proposed limitations on committee make-up shall be outlined in the original petition for creation of the Committee.
5. A method shall be proposed by the petition for selection of a Chairman, and his responsibilities shall be outlined in detail.
6. A specified term of office shall be established for Advisory Committee members, and a practical method of selection of replacements outlined. New members are to be recommended by the committee and appointed by the President prior to taking office.
7. Advisory Committee authority shall be limited to the preparation of recommendations within its specialty area, based upon consultation with segments of the membership and upon Committee studies; these are to be presented to the Staff and/or Board as appropriate to the situation.
8. One member of the Board of Directors shall be designated by the President as a consultant and ex-officio member of the Advisory Committee, acting as a point of contact between the Committee and the Board.
9. One member of the Headquarters Staff shall be designated by the President as a coordinator and ex-officio member of the Advisory Committee, to provide Staff assistance, where required to assure viability of the Committee through adequate communication of information pertinent to the

activities of the Committee, to initiate action to replace members who resign, to secure the resignation of those who become inactive, and to assist in any way possible to improve Committee effectiveness in providing a link to the membership and performing as a sounding board for management reference.

10. Headquarters Staff personnel, wherever appropriate, shall refer membership inquiries and proposals to the Chairman of the cognizant Advisory Committee for consideration and comment, routinely informing Advisory Committee members of substantive matters impinging upon the Committee's specialty area and soliciting the Committee's views, although these need not be binding.
11. The identity and addresses of the Advisory Committee members shall be routinely carried by QST, to facilitate direct member contact.

28) On motion of Mr. Clark, after discussion, unanimously VOTED (Mr. Eaton abstaining) that with reference to Docket 15928, Report and Order, dated August 24, 1967, the Board instructs the General Manager to petition the FCC to modify the amendment to Section 97.7 of the Commission's rules to hold in abeyance any action concerning the frequency segments 50.0-50.1 MHz. and 50.0 to 50.25 MHz., so that pending further study these frequencies will continue to be available to amateurs holding Technician Class and higher grade licenses.

29) On motion of Mr. Bolvin, after discussion, unanimously VOTED that the Membership and Publications Committee give early consideration to a publication directed at the potential amateur in the 12- to 16-year age group.

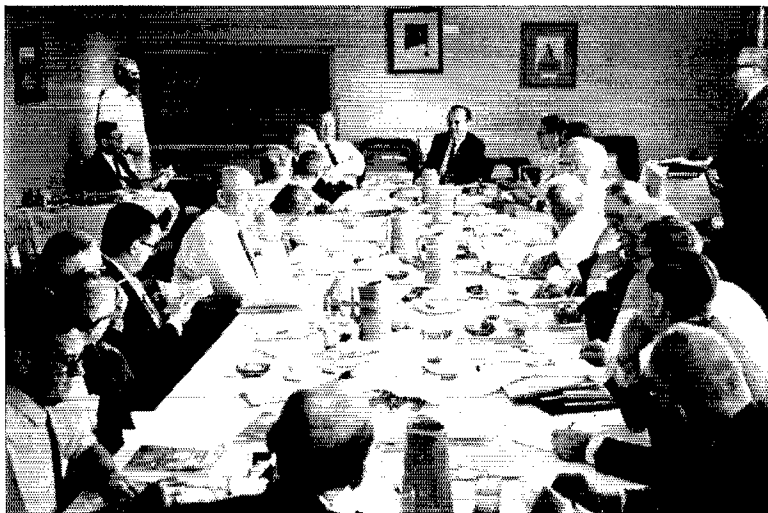
30) On motion of Mr. Bolvin, after discussion, unanimously VOTED that when more than one QSL Bureau is established in a single call area, each bureau is to be considered a separate entity for the purposes of expense allocations.

31) Moved, by Mr. Bolvin, that the President assign to the appropriate committee a study directed at eventual relocation of Novice licensees from 21 Mc. to 28 Mc.; subject to such relocation, the study would also consider expansion of the 21-Mc. phone sub-band. After discussion, on motion of Mr. Dannals, unanimously VOTED to amend the motion by striking the text and substituting therefor the following: "that the President assign a committee to study overall band utilization, particularly addressing itself to the various modes of operator preference in use; this study should continue over a two-year period, ending early in 1970, and should

(Continued on page 76)

BOARD THANKS VOLUNTEER A.R.R.L. OFFICIALS

In reviewing the work of the League for the past year the ARRL Board of Directors again found that much of our progress is due to the volunteer efforts of elected and appointed officials in the administrative and field organization of our association. By unanimous action the Board has again expressed its sincere thanks to the Vice-Directors, assistant directors, SCMs, SECs and QSL Managers — an action which we know all amateurs will heartily endorse.



Portrait of a working Board. Here New England Vice Director Green (standing—upper left) and Central Division Vice Director Metzger (standing—right) act as tellers for election of Executive Committee.

Candid Impressions:

A Pictorial Report on the 1968 ARRL Board Meeting

BY DON WATERS*

COME, sit here with me as a silent spectator at the 1968 Annual Meeting of the Board of Directors. Here, each year, the men who represent a great membership organization assemble to make its policies and direct its affairs. This is the culmination of weeks and months of correspondence, on the air communications and club visits by each Director and his field staff, of year-round meetings of the Executive Committee and other working committees of the Board, and of concentrated effort by the headquarters staff.

As spectators we can only listen and observe. But there are no silent spectators among the sixteen Board members present. Each of these men represents a lifetime of deep personal involvement in amateur radio. Each is here, not for personal gain—the positions of Directors and Officers of the League carry no pay—but

*Public Relations Consultant, ARRL.

because each has won his position of leadership by virtue of demonstrated ability, commitment and service.

From morning to late at night, for three days, the present and future of amateur radio are discussed, argued, explored; constituent views and regional problems are expounded; and months of field work and committee activity come into focus.

There is a feeling of common purpose here, but differences of opinion are frequent and sometimes sharp. Proposals reflecting much thought and effort are made; some get short shrift, but all are heard. Compromises are made; good ideas are explored, hammered into practical form, and become formal Board actions.

This is representation really at work, the democratic process at its most visible. This is an ARRL Board meeting.

QST



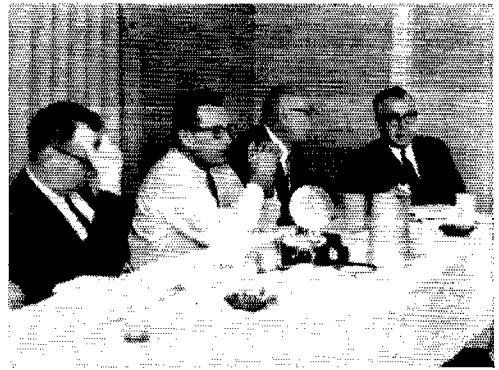
After dinner sessions are standard at Board Meeting often lasting into late hours. Here group listens to report on public relations program.



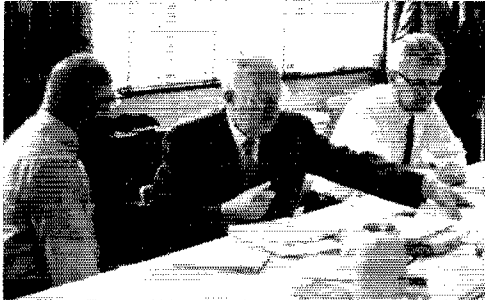
Concentration and attention are mirrored in faces of (from left) Pacific Division Director Gmelin, Southwestern Division Director Griggs, First Vice President Groves and Midwest Division Director Foster.



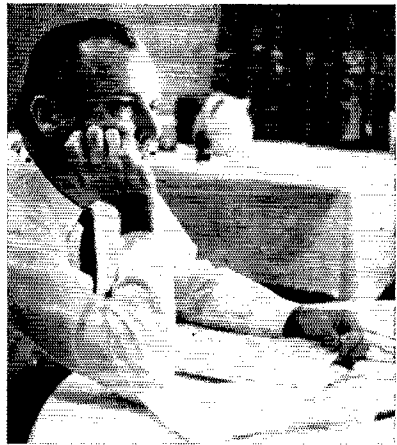
Ballots are collected following a vote, while Dakota Division Director Compton (standing—right rear) raises a new point.



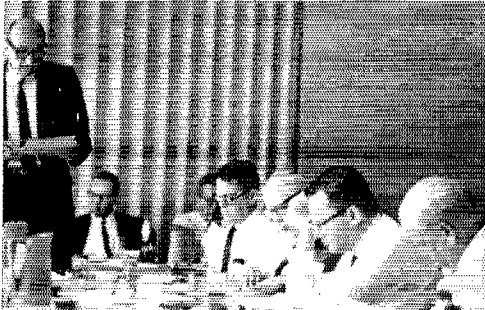
"Silent Spectators" at Board Meeting invited guest table include Communications Manager Hart, Public Relations Consultant Waters, Roanoke Division Vice Director Wicker and Central Division Vice Director Metzger.



Treasurer Houghton (center—arm outstretched) discusses League finances as Finance Committee members Compton (left) and Eaton listen attentively.



President Denniston, here in a thoughtful mood, is effective meeting chairman and occasional umpire.



Roanoke Division Director Clark presents a Planning Committee recommendation as Board colleagues follow the text.



Canadian Director Eaton (left) and New England Director Chapman give thoughtful consideration to a proposal.



After many hours of informal and formal sessions, Board members may have lost some of their energy but none of their concentration.

RULES FOR LIFE MEMBERSHIP

1. The Board of Directors has established a provision for Life Membership in The American Radio Relay League, Inc., effective August 1, 1967.
2. Life Membership is granted only by the Executive Committee, upon proper application from a Full (U. S. or Canadian licensed) Member.
3. The Life Membership fee is twenty times the annual dues rate, or currently \$130.
4. An applicant may choose an alternative time-payment plan of 8 quarterly instalments, \$16.25 each. In such instance he will be provided an interim two-year Full Membership certificate. Upon completion of the payments, Life Membership will be granted.
5. Life Memberships are non-transferable, and dues payments are non-refundable. In the event an applicant is unable to complete payments on the instalment plan, he will be given a term of membership, at the annual dues rate, commensurate with payments received.
6. Other licensed amateurs in the same family, and at the same address, of a Life Member may retain or obtain Family Membership upon payment of the annual dues of \$1, but without receipt of *QST*. The dues of the Family Member may be prepaid for any number of years in advance, but there is no special rate.
7. Application forms are available upon request from the Secretary, ARRL, Newington, Conn. 06111.

(Continued from page 73)

consider the effects of the new regulations as they become effective." The question then being on the motion as amended, the same was unanimously ADOPTED.

32) Moved, by Mr. Bolvin, that the Board authorize travel expenses for vice directors to attend one official Board meeting during his term of office; it is the intent of the Board that the vice director utilize the authorized expenses to attend the first official Board Meeting after his election but such authorization shall not be limited to a specific meeting. After discussion, on a roll-call vote, the motion was rejected, 6 votes in favor to 8 opposed. Those directors voting in favor were Messrs. Best, Bolvin, Dannels, Griggs, Haller and Sampson; those voting opposed were Messrs. Chapman, Compton, Crossley, Eaton, Gmelin, Michel, Spencer, and Thurston; Messrs. Clark and Foster abstained.

33) Moved, by Mr. Bolvin, that nets which are effectively clubs, with "on the air meetings," may affiliate with the League under the existing rules for affiliated societies. But, after discussion, the motion was rejected.

34) On motion of Mr. Griggs, after discussion, unanimously VOTED that the General Manager is instructed to authorize a change in DXCC require-

ments for additional country credits by permitting DXCC members having 300 countries or more to send in QSL cards in additional increments of 5.

35) On motion of Mr. Griggs, after discussion, unanimously VOTED (Mr. Eaton abstaining) that the General Manager and General Counsel are hereby instructed to confer with the Federal Communications Commission relative to its adoption of a policy in conducting amateur license examinations that will permit an applicant to receive credit for passing the code test for General Class or higher whether or not the applicant also passes the written test taken at the same time, and to permit the applicant to return within 100 days for reexamination on the written test.

36) Moved, by Mr. Griggs, that the General Manager is hereby instructed to authorize a change in the ARRL DXCC contest rules to allow scoring and separate listing of single operator, single band operation. But, after discussion, the motion was rejected, 6 votes in favor to 10 opposed. Messrs. Griggs and Thurston requested to be reported as voting in favor.

37) Moved, by Mr. Griggs, that the General Manager is hereby instructed to permit the sale of League publications at a discount to Section Communications Managers and to limit such sales to one copy each year of each publication desired. After discussion, on motion of Mr. Clark, unanimously VOTED to amend the motion by striking the text and providing that the General Manager shall forward a free copy of the latest edition of the ARRL Handbook to each Section Communications Manager upon election. The question then being on the motion as amended, the same was unanimously ADOPTED.

38) Moved, by Mr. Griggs, that creation of an advisory committee for DX be approved in accordance with the Rules and Regulations concerning Advisory Committees, with any additional data required for compliance with the rules, as published, to be furnished by the sponsor and approved by the Executive Committee prior to implementation of the committee. But, after extensive discussion, on motion of Mr. Chapman, the matter was laid on the table. Mr. Griggs requested to be recorded as opposed to tabling.

39) On motion of Mr. Griggs, after discussion, unanimously VOTED that creation of an advisory committee for VHF Repeater operation be approved in accordance with the Rules and Regulations concerning Advisory Committees, with any additional data required for compliance with the rules, as published, to be furnished by the sponsor and approved by the Executive Committee prior to implementation of the committee.

40) On motion of Mr. Best, unanimously VOTED that the Board expresses its sincere thanks and appreciation for the untiring work and devotion to the League and to amateur radio by the vice directors, assistant directors, SCMs, SECS, QSL Managers and all the members of the League, and it is the sense of the Board that their contribution to amateur radio has done much to enhance amateur radio in the field of public service, convenience and necessity.

41) On motion of Mr. Best, unanimously VOTED that the League expand its program of assistance to amateur organizations overseas, with particular emphasis on local "club-to-club" liaison, in order to continue the development of the growth and strength of amateur radio throughout the world.

WHO THE DEVIL IS WHO?

Fourth in a Series of Call Conversion Charts

Here are additional calls of amateurs taking advantage of new rules which allow Extra Class licensees licensed 25 years ago or longer to acquire two-letter calls. If you should be listed here, let us know by post card right away.

Now	Was	Now	Was	Now	Was	Now	Was
W1DB	W1CJO	K4AQ	WB4CJL	K6AO	W6VVR	W8CH	K8NA
W1ES	W1ASM	K4AT	W4DIY	K6BA	W6PHI	W8DZ	W8FGX
W1FE	W1ALJ	K4CR	W4DYX	K6BB	W6BBE	W8EC	W8WNV
W1FJ	W1IFR	K4DC	W4SZT	W6BL	W6SKJ	W8ED	W8BJD
W1HF	W1JJZ	K4FS	W4ORB	W6CB	W6UHM	W8EN	W8ZVC
W2AC	W2MSQ	W4HO	WA2MMN*	K6CW	W6LED	W8EX	W8LOF
W2BK	W2LNP	W4LR	W4LPW	K6DM	W6LHZ	W8FC	W8ORD
W2BU	W2SHZ	W4OQ	W4ROK	K6DR	W6EOU	W9AD	W9DPI
W2DD	W2VZV	W4OR	W4BYR	W6DO	K6PHI	W9BE	W9KTC
K2DX	W2VCZ	W4UB	W4ZYS	K6DY	W0ZWK	W9CF	W0EUT
W2HE	WB2GPE	W4WN	W2EDF	K6EL	W6AHC	W9CV	K9KND
W2OK	W2ALK	W4WS	W4CHA	W6FP	W6QWG**	W9DC	W9SGB
W2PK	W2ZHI	W4YF	W4HAV	W6JO	W6UJM	W9DE	W9MFW
W2QL	K2DTZ	W5EU	W5DQV	W6NM	W2NOJ	W9EN	W0QKC
W3EL	W3BCM	W5FA	W5RIH	W6RJ	W6BNK	W9GC	W5PHB
W3NL	K3VAB	W5GR	W5LGG	W6WH	W6EBT	W9GU	W0OZN
W3NK	W3RMI	W5HB	W5QPI	W7TR	W7PGX	W9GY	W0NLH
W3NW	W3RBE	W5HF	K5ILX	W7TV	K7HQN	W0HI	W0DHC
K4AC	W4YJJ	W5KX	W5LNK	W8BP	W8SBQ	W0HQ	W0PBU

* Correction from April list. ** From May list, where W6FD was listed in error as W6QWG.

42) The Board was in recess from 9:52 until 10:00 P.M.

43) On motion of Mr. Best, the following resolution was unanimously ADOPTED:

WHEREAS, one of the many objectives of the Federal Communications Commission and the American Radio Relay League is to attract young men and women to amateur radio and the technical studies which pursue therefrom, and, WHEREAS, the cost of administering the amateur radio service, including giving and conducting operator license examinations is borne by the applicants and the amateurs, and, WHEREAS, the young men and women whom the Commission and the League are desirous of attracting to amateur radio are usually attending school except on Saturdays, Sundays and holidays, and, WHEREAS, many others desirous of undertaking examinations for original or higher licenses in the amateur radio service are employed on week days except on Saturdays, Sundays and holidays, NOW, THEREFORE BE IT RESOLVED that the League request the Federal Communications Commission to hold examinations for application to the amateur radio service from time to time on Saturdays.

44) Moved, by Mr. Best, that with no criticism of the Executive Committee's negative report on Minute 63, 1967 Board meeting (Directors' Letter 1291), to allow Technicians to operate in the Novice bands, power limitations and rules as applied to Novices to be the same as contained in the Rules and regulations of the FCC, a survey be made as to the opinion of League members, especially Novices and Technicians, whether this would be helpful in their advancement to a higher class license as recommended in the League's advocacy of incentive license. After discussion, moved by Mr. Dannels, to amend the motion by striking the text and substituting therefor the following: "The League requests the Federal Communications Commission to amend Section 97.9(f) of the amateur regulations to permit an opportunity to obtain a Novice license by present holders of the Technician Class license as well as by presently-unlicensed former holders of any class of amateur radio license."

After further discussion, on motion of Mr. Bolvin, VOTED, 9 votes in favor to 4 opposed, to further amend the motion by adding the restriction that former license holders shall be limited to a waiting period of not less than two years; Mr. Thurston requested to be recorded as voting opposed, and Messrs. Chapman and Eaton as abstaining. The question then being on Mr. Dannels motion as amended, the same was ADOPTED, 12 votes in favor to 2 opposed. Moved, by Mr. Crossley, to further amend the motion to provide that a Novice license can be obtained not more than two times. After further discussion, on motion of Mr. Gmelin, unanimously VOTED that the matter is laid on the table.

45) On motion of Mr. Haller, after discussion, unanimously VOTED that the General Manager is authorized to negotiate with David Bell Productions to produce a color film on amateur radio slanted to interest young people in the hobby.

46) On motion of Mr. Haller, the following resolution was unanimously ADOPTED;

WHEREAS, L. A. Morrow, W1VG, has served the American Radio Relay League faithfully and well as Advertising Manager for 21 years, and, WHEREAS, he has been throughout that time an example of utmost devotion to duty and thereby has contributed to the growth and stature of the League and amateur radio, and, WHEREAS, he retires from the League's active staff on May 3, 1968, NOW THEREFORE, BE IT RESOLVED that the Board of Directors of the American Radio Relay League in Annual Meeting assembled do hereby express to L. A. Morrow, W1VG, their deep appreciation for his long and diligent service to the League and amateur radio.

47) On motion of Mr. Spencer, after discussion, unanimously VOTED that the 1969 Annual Meeting of the ARRL Board of Directors will be held in the City of New Orleans.

48) On motion of Mr. Spencer, after discussion, unanimously VOTED that in order to give proper recognition for the outstanding contributions of deserving individuals, a certificate of merit be added

25 and 50 Year Pins

The Board of Directors voted to establish 25 and 50 year pins for those who have been continuously members of the League for those lengths of time.

If you qualify for either mark, please send a postcard to Hq. with your complete name, call and address (the one you use for QST, please) complete with zip code, so we may start on a mailing list. Pins will not be available for several weeks, but we'll handle requests on a "first come, first served" basis, so let's have your request promptly.

to the list of certificates now available to Section Communications Managers and Directors for issuance within their respective sections and/or divisions.

49) Moved, by Mr. Spencer, that the Planning Committee study the feasibility of an allocation for Technicians on the 10-meter band from 29.5 to 29.7 Mc., phone and/or c.w. But, after discussion, the motion was rejected, 3 votes in favor to 12 opposed. Messrs. Griggs and Spencer requested to be recorded as voting in favor, and Mr. Eaton as abstaining.

50) Moved, by Mr. Michel, that in the belief that the Grandfather's Clause of 1952, whereby amateurs who were licensed in 1917 or prior thereto were granted the Extra Class license without examination, is now outdated and unjust, that ARRL propose to the Federal Communications Commission through accepted channels that the 1952 clause be updated and changed from a time span of 35 years from the date that the amateur received his first amateur license. But, after discussion, the motion was rejected (Mr. Eaton abstaining).

51) On motion of Mr. Dannals, unanimously VOTED that the Board commends the members of the Intruder Watch for their fine effort, and the Assistant General Manager for his management control of this valuable program; it is recommended that the activities and results of actions initiated by this dedicated group of amateurs be reported periodically in our official journal *QST*.

52) On motion of Mr. Dannals, unanimously VOTED that the creation of an Advisory Committee for Contests is approved in accordance with the Rules and Regulations concerning Advisory Committees, with any additional data required for compliance with the rules as published to be furnished by the sponsor and approved by the Executive Committee prior to implementation of the Committee.

53) On motion of Mr. Crossley, unanimously VOTED that the General Manager is hereby authorized to reimburse the division directors for actual expenses incurred by them during the year 1968, in the proper administration of ARRL affairs in their respective divisions, up to amounts as follows:

Canadian Division Director.....	\$1500
Atlantic Division Director.....	2400
Central Division Director.....	2400

Dakota Division Director.....	800
Delta Division Director.....	2400
Great Lakes Division Director.....	2400
Hudson Division Director.....	2200
Midwest Division Director.....	1500
New England Division Director.....	2400
Northwestern Division Director.....	2200
Pacific Division Director.....	3000
Roanoke Division Director.....	1500
Rocky Mountain Division Director.....	1600
Southeastern Division Director.....	2000
Southwestern Division Director.....	2800
West Gulf Division Director.....	2400

54) On motion of Mr. Chapman, unanimously VOTED that to continue the Board's policy of reimbursing Section Communications Managers and QSL Managers of the League for certain travel in furthering ARRL organizational activities, the General Manager is hereby authorized to pay during the year 1968 a total amount not to exceed \$12,500 under terms prescribed by the Communications Manager for SCMs, and the General Manager for QSL Managers, following the general pattern established by the Board.

55) On motion of Mr. Thurston, unanimously VOTED that, to continue the Board's policy of reimbursing Section Emergency Coordinators for certain travel in furthering ARRL organizational activities, the General Manager is hereby authorized to pay during the year 1968 a total amount not to exceed \$9,500 under terms prescribed by the Communications Manager following the general pattern established by the Board.

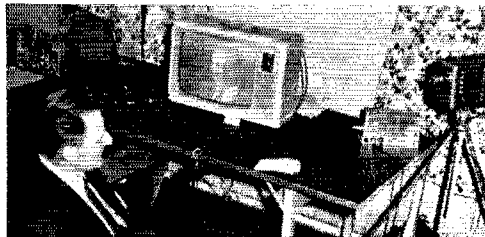
56) On motion of Mr. Griggs, unanimously VOTED that to continue the Board's policy of reimbursing National Traffic System officials above the section level for certain approved travel in furthering ARRL organizational activities, the General Manager is hereby authorized to pay during the year 1968 a total amount not to exceed \$6,000 under terms prescribed by the Communications Manager following the general pattern established by the Board.

57) On motion of Mr. Best, unanimously VOTED that the General Manager is hereby authorized to pay during the period January 1, 1969, and the 1969 Meeting of the Board, expenses against usual authorizations for administrative and committee operations in no greater amounts than 1968 authorized amounts.

58) On motion of Mr. Spencer, VOTED, 11 votes in favor to 4 opposed, that the Board recesses at 11:22 P.M. The Board reconvened at 9:10 A.M. on May 4, with all directors and other persons herein before mentioned in attendance except Messrs. Grammer, McConaghy, and Waters.

59) On motion of Mr. Bolvin, after discussion, unanimously VOTED that the League provide an award for members who have held unbroken League membership for 25 years, consisting of a lapel pin with the figures "25" in a small attached block below the diamond. During the course of the above, Secretary Huntoon departed from the meeting and Mr. Baldwin assumed the duties of recording the proceedings.

60) Moved, by Mr. Bolvin that since, in accordance with the direction of the Board at the May, 1967 meeting, the Merit and Awards Committee has considered the various forms for an award to recognize amateurs licensed 50 or more years ago and recommends the following form in award requirements, the 50-year award shall consist of an appro-



The Candlewood Amateur Radio Club of Danbury, Conn. recently held an open house at the Danbury airport. A crowd examines typical ham gear in the left photo, while (above) WA1AWX uses himself as camera subject during an amateur TV demonstration. (Photos by K1OQJ).

appropriate League lapel pin which shall include figures and words, "50 Year Amateur." The qualification requirements shall be as follows: (1) The applicant must have been licensed as an amateur operator a minimum of 50 years prior to the date of application, (2) At the time of application the applicant must hold a valid and current amateur license of any grade as issued by his Government, (3) At the time of application the applicant must be a member of the League, (4) The burden of proof of eligibility will be the responsibility of the applicant; however, these items will be accepted as sufficient proof: (a) U.S. or Canadian certificate of amateur status (b) Foreign government certificates clearly indicating amateur or equivalent status. After discussion, moved by Mr. Gmelin, to amend the motion to provide that the applicant must have been a League member for five years prior to application; but there was no second, so the motion to amend was lost. After further discussion, moved, by Mr. Spencer, to amend the motion to provide that recognition shall be for 50 years of ARRL membership, in lieu of 50 years of amateur license; on a roll-call vote, the motion to amend was ADOPTED, 12 votes in favor to 4 opposed. Those voting in favor were Messrs. Best, Chapman, Clark, Compton, Crossley, Dannals, Eaton, Griggs, Haller, Sampson, Spencer, and Thurston; those voting opposed were Messrs. Bolvin, Foster, Gmelin and Michel. The question then being on the motion as amended, on a roll-call vote, every director voted in the affirmative so the motion was unanimously ADOPTED.

61) On motion of Mr. Eaton, unanimously VOTED, at 10:10 A.M. that the Board does now resolve itself into a Committee of the Whole for consideration of the General Manager's salary. By request, members of the Headquarters staff departed from the meeting. The Committee arose at 11:10 A.M., and staff members returned to the meeting. On motion of Mr. Eaton, unanimously VOTED that the Board adopts the report of the Committee of the Whole. At this point, Secretary Huntoon resumed the recording of the proceedings.

62) On motion of Mr. Thurston, unanimously VOTED that the Board take up items 12 and 11 of the Agenda, concerning election of officers and members of the Executive Committee. The President appointed Messrs. Green, Metzger and Wicker as Tellers.

63) The Chair announced the opening of nominations for the office of President. Mr. Thurston nominated Mr. Denniston. On motion of Mr. Chapman, unanimously VOTED that the nominations are closed and that the Secretary cast one ballot naming Robert W. Denniston, WØDX, as President of the League for the ensuing term (Applause).

64) The Chair announced the opening of nominations for the office of First Vice President. Mr. Compton nominated Mr. Groves. On motion of Mr. Spencer, unanimously VOTED that the nominations are closed and that the Secretary cast one ballot naming Wayland M. Groves, W5NW, as First Vice President of the League for the ensuing term (Applause).

65) The Chair announced the opening of nominations for an additional Vice President. Mr. Chapman nominated Mr. Best. Mr. Haller nominated Mr. Crossley. Mr. Clark nominated Mr. P. Lanier Anderson, Jr. Mr. Dannals nominated Mr. Compton. Mr. Spencer nominated Mr. Carl L. Smith. On motion of Mr. Gmelin, unanimously VOTED that the nominations are closed. The Tellers announced the result of the balloting as follows:

Mr. Best.....	7
Mr. Crossley.....	1
Mr. Anderson.....	3
Mr. Compton.....	3
Mr. Smith.....	2

Whereupon Roemer O. Best, W5QKF, was declared elected as a Vice President of the League for the ensuing term (Applause).

66) The Chair announced the opening of nominations for an additional Vice President. Mr. Clark nominated Mr. P. L. Anderson, Jr. Mr. Haller nominated Mr. Crossley. Mr. Dannals nominated Mr. Compton. Mr. Spencer nominated Mr. Smith. On motion of Mr. Foster, unanimously VOTED that the nominations are closed. The Tellers announced the result of the balloting as follows:

Mr. P. L. Anderson, Jr.....	7
Mr. Crossley.....	3
Mr. Compton.....	2
Mr. Smith.....	4

Whereupon P. Lanier Anderson, Jr., W4MWH, was declared elected as a Vice President for the ensuing term (Applause).

67) The Chair announced the opening of nominations for Honorary Vice President. Mr. Chapman nominated Mr. Handy. On motion of Mr. Thurston,

unanimously VOTED that the nominations are closed and that the Secretary cast one ballot electing Francis E. Handy, W1BDI, as Honorary Vice President of the League for the ensuing term (Applause).

68) The Chair announced the opening of nominations for Secretary. Mr. Compton nominated Mr. Huntoon. On motion of Mr. Bolvin, unanimously VOTED that the nominations are closed. On motion of Mr. Chapman, unanimously VOTED that newly-elected Vice President Dr. Best cast one ballot electing John Huntoon, W1LVQ, as Secretary of the League for the ensuing term (Applause).

69) The Chair announced the opening of nominations for the office of Treasurer. Mr. Eaton nominated Mr. Houghton. On motion of Mr. Spencer, unanimously VOTED that the nominations are closed and that the Secretary cast one ballot electing David H. Houghton as Treasurer of the League for the ensuing term. On motion of Mr. Best, the Board unanimously expressed to Mr. Houghton deep appreciation for his 23 years of devoted service as Treasurer, (Applause).

70) The Chair announced the opening of nominations for director members of the Executive Committee. Mr. Chapman nominated Mr. Dannals. Mr. Thurston nominated Mr. Smith. Mr. Best nominated Mr. Compton. Mr. Haller nominated Mr. Crossley. Mr. Dannals nominated Mr. Eaton. On motion of Mr. Chapman, unanimously VOTED that the nominations are closed. The Tellers announced the results of the balloting as follows:

Mr. Dannals	14
Mr. Smith	16
Mr. Compton	14
Mr. Crossley	5
Mr. Eaton	15

Whereupon Harry J. Dannals, W2TUK, Carl L. Smith, W0BWJ, Charles G. Compton, W0BUO, and Noel B. Eaton, VE3CJ, were declared elected as members of the Executive Committee for the ensuing term (Applause).

71) On motion of Mr. Haller, unanimously VOTED that the Board extends its appreciation to the Field Engineering Bureau and the Amateur & Citizens Radio Division of the Federal Communications Commission, and to the Telecommunications Division of the Department of Transport, for their continuing assistance and cooperation in administering affairs of the amateur body during the past year.

72) On motion of Mr. Haller, unanimously VOTED that the Board expresses its deepest appreciation to the several Vice Directors present for their demonstration of interest in League affairs by their attendance at this meeting, since Vice Directors incur the expense of attendance out of their own pockets and are to be commended for their interest in the American Radio Relay League and actions of the Board, their attendance and interest as well as their devotion to the League going beyond the call of duty.

73) On motion of Mr. Michel, unanimously VOTED that, to avoid conflicts between hamfests, conventions and similar events, the headquarters establish on a trial basis a register of such events for the next two years and publicize its existence in QST.

74) At this point the General Counsel rendered an extensive report on the lawsuit initiated in the Federal District Court of San Francisco by Dr. Donald A. Miller, W9WNV, against the League and its General Manager.

75) At this point, in view of his election as a Vice President, Dr. Best submitted his resignation as Director from the West Gulf Division, effective as of the conclusion of the meeting, and expressed his appreciation for the honor bestowed upon him as a vice president.

76) The Board was in recess for luncheon from 1:08 to 1:15 P.M.

77) Moved, by Mr. Dannals, that the League request the Federal Communications Commission to amend Part 97 of the amateur regulations to enable former Novices, currently-licensed Technician Class amateurs, and Novices now holding a one-year Novice license, to apply for one additional Novice license having a term of two years. After discussion, moved by Mr. Gmelin, to amend the motion by deleting reference to Technician Class amateurs; but the motion to amend was rejected. The question then being on the original motion, the same was unanimously ADOPTED (Mr. Eaton abstaining).

78) On motion of Mr. Chapman, the following resolution was unanimously ADOPTED:

WHEREAS, on December 21, 1967, Edgar D. Collins completed 25 years continuous service to the American Radio Relay League, be it RESOLVED, that the Board of Directors, meeting in Hartford, Connecticut, on May 4, 1968, in recognition of Edgar D. Collins' untiring effort in behalf of the League, does hereby express its deep appreciation of his loyalty, fidelity and intelligent devotion to the best interests of amateur radio.

79) On motion of Mr. Chapman, unanimously VOTED that the President direct that appropriate steps be taken to enable benevolent-minded people to establish memorial funds by the contribution of money or property, by will or otherwise, to the League for the advancement of interests of amateur radio.

80) On motion of Mr. Chapman, unanimously VOTED that funding not to exceed \$200 be authorized as administrative expenses for the Advisory Committees.

81) On motion of Mr. Gmelin, VOTED to take from the table his earlier motion and pending amendments concerning malicious interference on the amateur bands. After extensive discussion, with the consent of their respective seconds, Mr. Bolvin withdrew his motion to amend, and Mr. Gmelin withdrew his original motion. Whereupon, on further motion of Mr. Gmelin, unanimously VOTED that the Board express its concern over a number of recent instances of malicious interference and improper language on the amateur bands and commends the Federal Communications Commission and other government agencies on their efforts to take corrective action. During the course of the above, Messrs. Haller and Metzger, under the necessity of returning to their homes, departed from the meeting, and the Board was in recess from 2:10 to 2:20 P.M.

82) On motion of Mr. Gmelin, unanimously VOTED (Mr. Eaton abstaining) that the General Manager study ways of simplifying the mail examination procedures. At this point, Mr. Foster, under the necessity of returning to his home, departed from the meeting.

83) On motion of Mr. Bolvin, unanimously VOTED (Mr. Eaton abstaining) that the General Counsel explore the possibility of revision of the

(Continued on page 136)

I.A.R.U. News



INTERNATIONAL AMATEUR RADIO UNION

NEW THIRD-PARTY TRAFFIC AUTHORIZATIONS

United States amateur stations and amateur stations of United States forces personnel in West Berlin may now exchange third-party communications. Eligible West Berlin stations may be identified by call signs such as DL4Q and DL5Q. Third-party communication with amateur stations in other parts of Germany is not authorized.

U.S. amateur stations operating portable from a U.S. base in Barbados, under FCC call signs, are authorized to handle third-party traffic with other FCC licensees and with countries having third-party agreements with the U.S. Such traffic may not be handled with Barbados licensed stations using the prefix 8P.

KG6I WILL BECOME KAI

Japan will soon have a new call district, KAI, necessitated by the reversion of the Bonin, Volcano and Marcus Island groups to Japanese sovereignty. Upon ratification of the reversion agreement by the Japanese Diet and signing by President Johnson, all amateur operation will cease and U.S. call area KG6I will no longer be authorized in those island groups.

Amateurs on Iwo Jima (Volcano Island group) and Marcus Island plan to continue operation by obtaining AMRS (Auxiliary Military Radio Service) authorizations from the Commander,

U.S. Forces, Japan. Under terms of the U.S. — Japan Telecommunications — Electronics Agreement, these stations will operate within the same band and power limitations as do the KA2-KA7 stations at the present time. (Info via J. P. Hogue, Major, USA, Chief, Frequency Allocation Branch, Hq., U.S. Forces, Japan.)

PK REMAINS SILENT

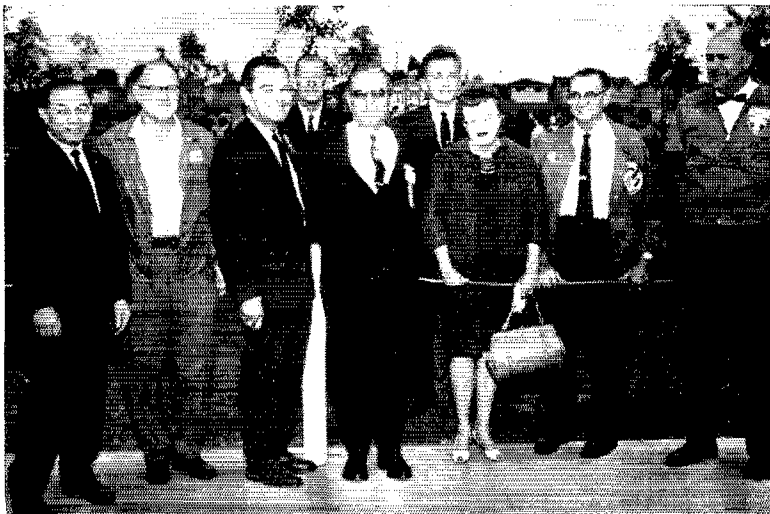
A recent report from Indonesia indicates that hopes for the lifting of the amateur radio ban have fallen. Several PK7 and PK8 stations are operating under license of the Central Java Police; however, political problems still inhibit the determination of a national licensing policy.

EI COURTESY LICENSES

The Irish Radio Transmitters' Society reports that amateurs may obtain visitor licenses for operation in Ireland. Call signs will have EI2-9 prefixes and VAA-VZZ suffixes. Amateurs seeking EI visitor licenses should write IRTS, B. R. Fogerty, EI6X, Secretary, 9 Wellington St., Dun Laire.

NRRL CHANGES ADDRESS

The new address for the Norwegian Radio Relay League is P. O. Box 21, Refstad, Oslo 5, Norway. All correspondence should now be directed to this address.



Here are members of the Southern California and Mexico Amateur Radio Mobile Group and the Mayors of the sister cities Navajoa, Sonora, Mexico, and Santa Fe Springs, California. From left are W6ZOM; K6IPG; Archie Beason, Mayor of Santa Fe Springs; W6UPB; XE2IL, Mayor of Navajoa; W6EIF; WB6PJU; W6DEY; and, W6OZD. (photo by W6YOL.)

U.S. — GUYANA RECIPROCITY

The United States and Guyana have entered a reciprocal operating agreement which was signed and became effective May 13, 1968. The U. S. now has 34 such agreements: a full tabulation appears below.

DX OPERATING NOTES

Reciprocal Operating

(**Bold face** indicates changes since last list.)

United States Reciprocal Operating Agreements currently exist *only* with: Argentina, Australia, Austria, Belgium, Bolivia, Canada, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Finland, France, Germany, **Guyana**, Honduras, India, Israel, Kuwait, Luxembourg, Netherlands, New Zealand, Nicaragua, Norway, Panama, Paraguay, Peru, Portugal, Sierra Leone, Switzerland, Trinidad and Tobago, United Kingdom and Venezuela. Several other foreign countries grant FCC licensee amateur radio operating privileges on a courtesy basis; write headquarters for details.

Canada has reciprocity with: Bermuda, France, Germany, Israel, Luxembourg, the Netherlands, Senegal, Switzerland, United Kingdom and U.S.

Third-Party Restrictions

Messages and other communications — and then only if not important enough to justify use of the regular international communications facilities — may be handled by U.S. radio amateurs on behalf of third parties *only* with amateurs in the following countries: Argentina, **Barbados (only U.S. stations/-8P)** Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, **Germany (DL4Q- and DL5Q-stations only)** Greenland (XP calls only), Haiti, Honduras, Israel, Liberia, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela. Permissible prefixes: CE CM CO CP CX **DL4Q- DL5Q- EL HC HH HI HK HP HR LU OA PY TI YE VO W or K/8P XE XP YN YS YV ZP 4X and 4Z**. Canadian hams may handle these same type third-party messages with amateurs in Bolivia, Chile, Costa Rica, El Salvador, Honduras, Israel, Mexico, Peru, U.S. and Venezuela. Permissible prefixes are: CE CP HR K OA TI W XE YS YV and 4Z.

DX Restrictions

U. S. amateurs licensees are warned that international communications are limited by the following notifications of foreign countries made to the ITU under the provisions in Article 41 of the Geneva (1959) conference.

Cambodia, Indonesia (including West New Guinea), Thailand and Vietnam forbid radio communication between their amateur stations and such of other countries. U. S. amateurs should not work **HS XU XV 3WS or 8F**. Canadian amateurs may not communicate with Cambodia, Indonesia, Laos, Thailand, Vietnam and Jordan. Prefixes to be avoided are **HS JY XU XV XWS 3WS and 8F**.

A.R.R.L. QSL Bureau

The function of the ARRL QSL Bureau system is to facilitate delivery to amateurs in the United States, its possessions and Canada of those QSL cards which arrive from amateur stations in other parts of the world. All *you* have to do is send your QSL manager (see list below) a stamped self-addressed envelope about 4½ by 9½ inches in size, with your name and address in the usual place on the front of the envelope and your call printed in capital letters in the upper left-hand corner.

Cards for stations in the United States and Canada should be sent to the proper call area bureau listed below. Recent changes are in **bold type**.

W1, K1, W1A, WN1¹ — Hampden County Radio Association, Box 216 Forest Park Station, Springfield, Massachusetts 01108.

W2, K2, WA2, WB2, WN2 — North Jersey DX Assn., P.O. Box 505 Ridgewood, New Jersey 07451.

W3, K3, WA3, WN3 — Jesse Bieberman, W3KT, RD 1, Valley Hill Rd., Malvern, Pennsylvania 19355.

W4, K4 — H. L., Parrish, K4HXF, RFD 5, Box 804, Hickory, North Carolina 28601.

WA4, WB4, WN4 — J. R. Baker, W4LR, 1402 Orange St., Melbourne Beach, Florida 32951.

W5, K5, WA5, WN5 — Hurley O. Saxon, K5QVII, P.O. Box 9915, El Paso, Texas 79989.

W6, K6, WA6, WB6, WN6 — San Diego DX Club, Box 6029, San Diego, California 92106.

W7, K7, WA7, WN7 — Willamette Valley DX Club, Inc., P.P. Box 555, Portland, Oregon 97207.

W8, K8, WA8, WN8 — Paul R. Hubbard, WA8CXY, 921 Market St., Zanesville, Ohio 43701.

W9, K9, WA9, WN9 — Ray P. Birren, W9MSG, Box 519, Elmhurst, Illinois 60216.

W0, K0, WA0, WN0 — Alva Smith, W0DMA, 238 East Main St., Caledonia, Minnesota, 55921.

VE1 — L. J. Fader, VE1FQ, P.O. Box 663, Halifax, N. S.

VE2 — John Ravenscroft, VE2NV, 353 Thorncrest Ave., Dorval, Quebec.

VE3 — R. H. Buckley, VE3UW, 20 Almont Road, Downview, Ontario.

VE4 — D. E. McVittie, VE4OX, 647 Academy Road, Winnipeg 9, Manitoba.

VE5 — Fred Ward, VE5OP, 899 Connaught Ave., Moose Jaw, Saskatchewan.

VE6 — Karel Tetteelaar, VE6AAV, Sub. P.O. 55, N. Edmonton, Alberta.

VE7 — H. R. Hough, VE7HR, 1291 Simon Road, Victoria, British Columbia.

VE8 — George T. Kondo, VE8 ARRL QSL Bureau of Department of Transport, Norman Wells, N.W.T.

VO1 — Ernest Ash, VO1AA, P.O. Box 6, St. John's, Newf.

VO2 — Goose Bay Amateur Radio Club, P.O. Box 232 Goose Bay, Labrador.

KH6, WH6 — John H. Oka, KH6DQ, P.O. Box 101, Aiea, Oahu, Hawaii 96701.

KL7, WL7 — Alaska QSL Bureau, Star Route C, Wasilla, Alaska 99687.

SWL — Leroy Waite, 39 Hannum St., Ballston Spa, New York 12020.

¹ These bureaus prefer 5×8 inch or #50 manila envelopes.



Stolen Equipment

A R-390A/URR receiver, serial number 29, has been stolen from the University of Iowa ARC. Some particular characteristics of this receiver are: when the crystal ovens are switched on, the frequency jumps each time the thermostat kicks in; and, the tuning is "jerky." Notify the University of Iowa ARC, Electrical Engineering Build., Iowa City, Iowa 52240.



Correspondence From Members -

The publishers of *QST* assume no responsibility for statements made herein by correspondents.

COMMUNICATIONS ESCALATION

☐ The answer to the question "How can we escalate our communications?" in the May editorial is very simple, and is implied in the fifth paragraph of the same editorial—eliminate all official recognition of number of "countries" worked, whether by DX Century Club, or score in a DX contest.

As long as we attach more value to a piece of paper or a fine-print listing in a magazine than to a genuine communication with the operator of a DX station, most foreign contacts will continue to be as meaningless and unsatisfying as they are at present. Surely, one good half hour ragchew with a DX station is worth more than a dozen contest type exchanges of signal reports.

Let's start a DX Ragchewer's Club! — *Robert V. McGraw, W2LYH, Riverhead, N. Y.*

☐ . . . It seems difficult to suggest a practical means of effecting "communications escalation" without downgrading to some degree the currently-popular operating phases of DX-QSL hunting, or contests. A ham's operating time is limited and he will devote it to those activities he finds most fulfilling. This expended time is rewarding to many in terms of DXCC status or contest scores.

If a similar competitive incentive could be attached to communication per se, the desired escalation might be attained. The League's RCC award is a small though rather ineffectual step in this direction—only one QSO is required. Perhaps a new *communications* award is the answer. The new award would be issued, say, for a minimum of 100 half-hour QSOs with as many different stations . . . — *Donald F. Meadows, W6ZGM, Marysville, California.*

☐ This problem of person-to-person communication has bothered me for some time and even delayed my attempt to get an amateur license for several years because of the fact that the conversations that I heard on the air between amateurs seemed to be rather inane and pointless.

I also have a real complaint against the numerous contests and agree fully with the notion that it creates "organized QRM"—and all on weekends, which is about the only opportunity I have to get on the air . . .

The only idea that I can come up with is a kind of reverse contest which could be a continuing affair over a period of six months or a year and could be for U.S. as well as DX contacts. The point system could be a sliding scale with points awarded on the basis of repeated contacts with the same station, time on the air during each QSO, and possibly points for personal information exchanged, etc. — *Sam Alcesi, Jr., WB2YQG, Jamestown, N. Y.*

☐ We can have a communications escalation if we really want it. We can make DX friendships rather than contacts if we really want to. It should be obvious by now that talking about the communications dearth will not solve the problem. Writing

about and editorializing the problem does not eliminate it. We must do something! And this is the something that I propose:

1. Eliminate all DXCC credits and recognition for contacts made on the 80 through 10 meter bands except for those made during official IARU approved DX contests.
2. Limit each IARU country to a maximum of two DX contests per year. (One could be world-wide and the second one regional.)

These two steps will spread DX fever and ingenuity into the now mostly unused and much wasted amateur bands. DX will become a real and exciting challenge again. Eighty through 10 meters will be opened for world-wide communications rather than closed by "DXing" QRM as is presently the case. And wow! Will the DX contests ever be hot!

I trust that we (the radio amateur, the ARRL, and the IARU) really do want a communications escalation to establish DX friendships and will give this proposal prompt and proper consideration. — *Len Brenner, K3NPC, Malvern, Pennsylvania.*

IMPROVED EMERGENCY COMMUNICATIONS

☐ ARRL and the American Red Cross have long-standing agreements in the field of disaster communications and these agreements have formed the bulwark of the movement of messages in time of crisis. However, in practicality the Red Cross did not find a reliable source of local communications until extensive use of v.h.f. f.m. was established.

During the past few years the use of v.h.f. f.m. has multiplied the effectiveness of the Red Cross job by many fold with the advent of the numerous repeater stations located in major metropolitan areas. Passing of emergency traffic has been amplified to the highest art of science and the effectiveness of this type of communication to the individual who has suffered cannot be minimized.

We visualize in the next few years additional effectiveness in emergency communications through the establishment of intercity relay stations, whereby disaster communications can be handled on a noise-free, crystal controlled, reliable system, rather than the hodge-podge low frequency nets now in operation. For example, should a major tornado strike St. Louis, a relay link to Springfield, Illinois or Evansville, Indiana, could mean the centering of health and welfare traffic into one of these cities by telephone, low frequency amateur radio, or TWX and then handled efficiently on v.h.f. f.m. into St. Louis, thereby avoiding massive delay and pile-up in the St. Louis communications centers.

To create maximum effectiveness this type of communications system will require recognition on the part of the FCC of the repeater-relay station operation in the v.h.f. f.m. spectrum and the reliability of these stations utilizing the technical fail-safe techniques now available. To continue the present licensing requirements of continuous mon-

itoring (versus monitoring capability) and total station logging (versus user station logging) acts as a natural deterrent to establishing a disaster communication system of the highest quality and utilizing the advanced state of the art.

We congratulate the American Radio Relay League for its current interest in v.h.f. f.m. and repeater operation and we look forward to a bright day in amateur radio to come. — *Norman E. Edman, W1OQMT, Director Public Relations, Midwestern Area, American National Red Cross, St. Louis, Missouri.*

TECHNICAL SKILL

☐ . . . The attitude of hams is choking ham radio! Today amateur radio is not a hobby. Or if it is, it is not enjoyed. Today every ham dreams of a Collins S Line, a tower, a tri-bander (yagi), with that Ham-M rotor. It's nice; but, is that what ham radio is about?

Most amateurs who build anything today from a code monitor to that homebrew beam are always being asked "Why did you build it?" And then their products are compared to the commercial stuff. What happens? Either the ham becomes a professional builder of his equipment (paint, lettering, cabinet design etc.) or else chucks up the loot for the much easier commercial stuff. The commercial stuff is prettier, probably works a trifle better, and has that *status* — but costs (and how!) . . .

Amateur radio is a great (the greatest) product. But, it isn't selling. How many hams heard of the ARRL promoting what sort of hobby it is *before* they thought of obtaining a license? The League is crabbing about its drop in members; but, where was it before when I, by chance, picked up a SWL book that mentioned ham radio? Or, before when you first heard the word amateur radio? Sure, they support radio clubs and promote in radio magazines. But that's like advertising to a sold customer. People who go to the radio clubs or read the mags are already interested.

The "professional" amateur (?) attitude allows nothing more. How can the unelectronically-motivated masses be expected to lay out some \$300 plus on the initial outlay? It's easier to keep the ham mystique of the select few "electronic genuises" (ha!). Face it people, our days are numbered. If we don't promote ham radio as a popular hobby, this elite few with their attitude of "professionalism" and high priced equipment will lose frequency after frequency 'till the end.

The fellows down on 11-meters, for all their faults, are popular because they gave the public what it wanted: hobby radio. And they publicized it. They didn't keep it a dark hidden secret. Read your QST's, ARRL, and see how often you have mentioned the "golden days" of amateur radio. The time is 1968, not 1920. Have you ever had an article envisioning the future of ham radio as a social hobby? The ham population has changed, but your attitudes have not.

So plug away to the general public. Take off that serious mask of "professionalism" and tell the people the fun of ham radio. — *Robert Podolsinski, WB2MPE, Irvington, New Jersey.*

☐ When I went into ham radio, I did so because I wanted a relaxing hobby after a hard day's work. I still feel the same way. K2OMP (April QST) wants to tinker and I want to talk. He can have his fun, and I'll have mine, but I don't tell him or anyone else who doesn't agree with me, and the things I like, to "shape up or ship out." Some like c.w.,

others like phone; that's fine. I like c.w. so I'm going to get my Advanced license and I think I'll be able to find a QSO somewhere on the frequencies allotted to me. If I'm an Advanced for the rest of my life, that's good enough for me.

If my set won't work, I just might be able to find a capable licensed technician with the instruments needed to make it work.

If I had decided to become a radio technician, I would have gone to school.

As a Novice of six months and with six crystals, I have WAS, WAC, C.P. 15, RCC, and well on road to DXCC, so I've done all the "shaping up" I intend to do and I don't intend to "ship out." — *Earl E. Payne, W7NSXZ, Aurora, Colorado.*

☐ For the benefit of those who "gripe" about incentive licensing and Docket 15928, I can say from repeated first-hand experience that amateurs never had it so good! For the past three weeks I have been in ground school on the Boeing 720-B; this school is conducted in the Western Air Lines training center in Los Angeles. Simulator procedures and actual flight training will start for my group next week and will continue for a month. FAA examinations are really rough and I must go through three of them before I receive my rating on Boeing jet equipment; first a four hour oral examination on operational theory and the mechanics of the airplane — next another four hour simulator check on all emergency flight procedures (and you can do everything in a simulator that you can in a plane except kill yourself) — and finally a two hour flight check in the airplane — all of this before a hard-hearted, merciless, eagle-eyed FAA inspector. It's rough, but I would have it no other way, for when you finish all of this and receive your rating you know the equipment and you know you can "cut the mustard"! All of this, incidentally, occurs on each new piece of equipment that an airline captain flies — not just the first time he starts flying as a captain. Somehow, RM-499 and Docket 15928 doesn't seem so insurmountable to me as it does to those who do all the crying! — *Carl L. Smith, WQBFJ, Denver, Colorado.*

☐ I notice that the Radio Amateur Section of the EIA wants to undo all that Docket 15928 is attempting to accomplish by having the standards for the Novice license lowered still more than they are now. We should fight this group with all that's within us. If a person can't study and pass the Novice exam as it is at the present time then they should be introduced to the 1750 meter band where a license isn't needed and they can advance through study to an amateur license. I still believe that it was a mistake for a period of two years on the Novice license. — *Ralph Westgrund, W7IJJ, Tacoma, Washington.*

WHAT IS IT?

☐ Perhaps it is the anxious excitement when that newly homebrewed piece of equipment is about to be plugged in for the first time — and the overwhelming sense of pride when it comes to life.

Or may be it is the thrill of recognizing your call as the DX chaser that a "rare one" has singled out from a pileup.

It might be the satisfaction you feel when the newly erected antenna shows a SWR of 1:1 — to say nothing of the \$9 plus that you receive from the first station that you call.

It is perhaps the feeling that most resembles relieved thankfulness when you finally discover and

fix the bug that had been wreaking havoc with the performance of your rig.

It could be the challenge of scrounging for the parts which you need to build that gadget that will place you on top of the heap.

Perhaps it is the fat envelope from the bureau that the postman just delivered.

It might be the unusual accent of the VK who is returning to the CQ that you called when the first rays of the morning sun just began to stream over the horizon.

Maybe it is the verbal handshake of "glad to meet you for the first time Old Man."

It might be the enjoyment of friendships that transcend the mundane and material aspects of life.

I could probably list many more answers to that question so often posed by the uninitiated, "what is it that is so fascinating about your hobby?" — *Mark N. Busch, W2GRD/W4BJAM, Silver Spring, Maryland.*

BOUQUETS

☐ Many thanks for several enjoyable evenings. I have just finished building the three-transistor receiver you described in the March issue of *QST*. It was a lot of fun putting it together and figuring out why it didn't work right off when I had finished.

The performance of this receiver has been a pleasant surprise to me. It pulls in s.s.b. stations better than my superhet.

Thanks again to you and *QST* for enriching the pleasures available in amateur radio. — *Fred V. Amundsen, W1ABC, Needham, Massachusetts.*

☐ "Quads and Yagis" is as excellent a *QST* article as I have seen in a long time. It should go a long way in clearing up these "facts" about the quad antenna tossed around in amateur radio circles such as low angle, vertical component, large aperture and etc.

Your recommending the article for the "antenna-minded" should mean all ham station owners as the cost in time and money for the antenna should be about that of the other basic units, receiver and transmitter to give a good performance of both. — *Wayne W. Cooper, K4ZZV, Miami Shores, Florida.*

☐ I wish to comment on the excellent issue of *QST* for March 1968. The issue was outstanding for its variety of interesting and informative articles.

I cannot recall of ever receiving previously such a fine issue of *QST*. I realize that it is difficult to consistently publish material of universal interest or of exceptional quality, but the March issue was a high point in a series of improvements noted over recent months.

Your staff is to be congratulated on its noted efforts to improve the quality, interests, and service of the journal and my best wishes to you for every success in your efforts. — *John W. Reiser, W2BLR, Williamsville, New York.*

SPECIAL ENDORSEMENTS?

☐ Reading May *QST* the article "Those Higher Class License Examinations," I noticed the questions about RTTY and synchronizing pulses transmitted with TV signals.

Those interested in radio communication should not be forced to learn about RTTY or TV transmission if they are not interested in it. These topics should be obtained by a special endorsement with a special examination if needed, without imposing to study these topics on every licensee. — *Roger Leclair, S.J., Chairman, Institute of Astronomy, Sudbury, Ontario, Canada.*

SPEECH EXAM?

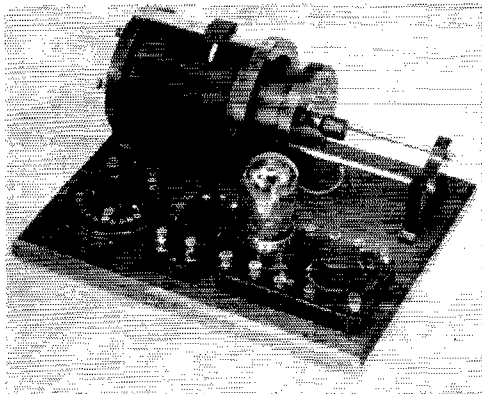
☐ I'd wager a pretty penny, not one ham in 1000 could possibly get a job as announcer for a broadcast station.

To rid the air of 99% of the useless repeats, no one, specially the Advanced hams, should be allowed to get a ticket until they passed a speech exam. What good is it to be able to know the most intricate electronic problems only to go on the air with highest legal power and then garble words. It was bad enough when all was a.m. modulation but now with s.s.b. and fluctuating b.f.o.s.

How about monitors that sent small pieces of tape to these thoughtless souls that mess up our spectrum. I can just see they are the same ones that drive in the middle of the road and take up three parking places.

We sure could do without a lot of them until they make sense when they do get on the air. — *Jas. Art Wilson, Vero Beach, Florida.*

QST



From the Museum of Amateur Radio

Here is a nice little rig somewhat typical of what the amateur of 1910 to 1916 would put together. A homemade loosecoupler, rather nicely done, tunes up to about 1500 meters. The detector is a Clapp-Eastham crystal using any of the common minerals, except galena which worked better with a "cat-whisker." The Murdock variable condenser is of .001- μ f capacity. This could be greatly increased by filling the casing with castor oil. The loading coil was made by the E.I.Co. and has a jumble-wound tapped coil in the base. Used with a big antenna, quite a lot could be heard.

YL news and views

CONDUCTED BY LOUISE RAMSEY MOREAU* WB6BBO

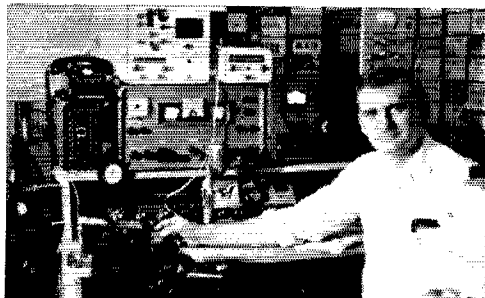
YL-OM 1968

A contest is a contest is a contest to those who view the many different types of scrambles for contacts with a jaundiced eye. But is it? Is there one amateur, who really gets deep into contest operation, who finds that any two are really alike? To each person who participates a contest has a very special appeal. It is a deadly serious operation; a carnival; a compelling drive for points; a roller coaster ride; a test of equipment; or a side show complete with barkers. It's very careful planning, and its "warm up the filaments momma, we're working the big one tonight!" We do it for kicks, for laughs, and we do it with charts and aids, and check lists, and propagation reports. And we set our contests within contests, those little personal competitions of ourselves against a friend, or fellow club member. But outside of that "bargain basement" atmosphere that upsets so many non-contest amateurs, there is one necessary element: Operating ability. It is the skill of boring down under layer on layer of QRM to get some hard to get section or country. It's band consciousness and which one to work during certain hours, as well as stubborn stick-to-it-iveness that keeps the contest addict working during conditions that make the casual operator give up in disgust. Only the traffic gang can match the contest people for stick to it until you get it even if your family thinks you are nuts.

For nineteen years the YLRL has sponsored the annual YL-OM contest in February and March of each year. For the OMs this is the one time when "cherchez la femme" is as simple as listening for that "CQ OM" that identifies a feminine call. But beyond the interest in discovering that the call belongs to a YL, there are fringe benefits for men and woman alike. For the OMs it is a fast way to increase the total contacts for the YLRL certificates like YLCC, WAS-YL, WAC-YL, or catch the necessary gals needed for a club sponsored certificate. For the women it adds the advantage for DXCC, WAS, WAC, not to mention all the other awards given for so many contacts. For everyone who loves the excitement, and the melee, it's a *contest!* One of the most interesting activities in amateur radio.

The YL winners of the 1968 contest were dominated by DX, with PY2SO taking first

*YL Editor QST. Please send all news notes to WB6BBO's home address; 1036 East Boston St., Altadena, Calif. 91001.



WB2SXX, Larry, one of the active OM participants in the YL-OM '68. (WA2BXK photo.)

place in both c.w. and phone. C.w. second place went to VE3BII, who always has a very high score in all YL contests, while KSONV was in third place. K8ONV took second place in the phone segment, while K9LUI was third.

For the OMs, the fifth call area was dominant. K2EIU/5 settled into second place honors in both c.w. and phone. In c.w. W5WZQ was top man, and W1PYM took third place. In OM Phone, K5MDX held first place, and K4MYC/4 placed third.

W4TVT, Contest Chairman, and YLRL Vice president, sends her thanks to all the participants for their careful preparation of the logs. No one was disqualified for illegibility. If logs were entered and the entry is not included in the list it is because of non-observance of the rules.

Congratulations to the winners. For those who are anticipating the next one mark your calendar, the dates are: Phone, Feb. 22, 23, 1969, c.w. March 8, 9, 1969.



Pete Olson, WA2BXK took a picture of his station that helped maintain the high OM scores in the YL-OM '68.

FL C.W.	
PY2SO	61,380
VE3BI1	37,661*
K8ONV	22,761

YL PHONE

PY2SO	90,216
K8ONV	44,712
K9LUI	36,450

OM C.W.

W5WZQ	4,471*
K2EIU/5	4,200*
W1PYM	3,150*

OM PHONE

K5MDX	7,619*
K2EIU/5	4,444*
K4MYC/4	4,180*

YL C.W.

K1NEL	17,556	W2AAU	1,750
K1QFD	12,488*	WB2MRA	864
K1WXF	3,469*	WB2UVB	689*
WA2WHE	16,575*	WB2WAD	531*
WB2OQU	12,760*	WB2BHJ	200*
WB2JCE	8,160	W2DMK	189*
W2EBW	5,977	W2RXX	156
WB2PYI	4,998	W2IP	100*
K3SJS	21,525*	W3BQN	1,486*
W3LSL	8,360	WA8EXX	1,378*
W3CDQ	1,740	W3QMX	880*
WA3AOJ	341*	W3RYV	593*
WA4VKG	21,525*	W3ADE	425*
WA4VVF	21,087*	W3GN	280
W4NGE	12,525	W3DYA	179*
K4RHU	5,484*	K3YBW	146
K4VDO	3,397	K4BAL	2,613*
WA5SKI	16,905	W4RNL	2,544*
W9MLE/5	3,325*	W4JUJ	2,295*
K8ONV	22,761	W4LK	1,700
WA8USU	16,820*	W4OWE	1,666
WA8FSX	13,787	W4ZOK	1,513*
WA8KMT	13,760	W4DVR	1,020*
WA8EKQ	12,184*	WB4INL	518*
WA8OFW	9,490	W4DS	100
WA8ENW	5,499	W5WZQ	4,471*
WA9HLW	7,975*	K2EIU/5	4,200*
WA9WNI	2,664	W5RUK	1,836
WA9CCP	2,475*	W5QZ	960*
W0APPK	11,344*	W5QNY	356*
WA9YL	7,632	WB6THT	1,415*
VE3BI1	37,661*	K6OT	792
VE3GTI	13,520	W6WLV	735*
VE6DZ	5,400	W6RQZ	539*
VE6ANK	4,278	W6QFU	340
DJ9SB	3,248	W6CLM	180
HA5KDQ	3,104	W7CFJ	1,875
OH5RZ	3,140	K7AYF	1,840*
OK1AZQ	3,570*	K7VIU	446*
PY2SO	61,380	W7BNV	11*
SP6AZY	7,166*	WA8RDW	1,105*
SP5YL	2,723*	K8HKM	1,031*
UA1ZX	70	K8NQP	999
VK3KS	19,256*	WA8KME	427*
ZL2JO	5,980*	W8MXO	384*
		WA8VOG	289*
		WA8CNN	150*
		W8IOR	125*
		W8VDF/8	70*
		W9LNQ	3,910*
		W9JOK	2,636*
		W9NLF	1,513*
		W9QWM	1,283*
		W9UTQ	1,036
		K9GDC	1,031*
		K9VIE	858
		K9GDF	550
		WA9MMT	360
		WA9VPP	206*
		W9TCU	137*

Confirmation logs:

LA6ZH	
VE6ABV	

OM C.W.

W1PYM	3,150*
W1HOZ	1,519
W1JVZ	546*
WA1EIJ	414*
W1GKJ	374
W1MRW	276*
WA1FHU	240
K2DDK	2,814*
WB2FRE	2,083*

WA9NSR	80*
W0LRW	2,470*
W0KCG	1,899*
K0EZH	1,305
K0QIX	1,031
W0QMZ	866*
K0WNV/6	607
VE6UP	1,333
VE1AE	1,150*
VE2AQO	825*
VE3FDP	416*
CR7IZ	9
DJ9OZ	124*
E42HR	70*
G3IDG	90*
IT1AGA	425*
JA2EKR	53*
JA2CUS	45*
JA5IU	25
LA8PF	38*
OH3MF	263
OH6NH	130
OH5OD	5*
OK2QX	300*
OZ4H	56*
PZ1AH	776*
SP8MJ	144
UA1ZX	70
XE1RD	646*

Confirmation Logs:

W3CBF	
W4LIN/2	
W9WR	
HP1BR	
LA6ZH	
SP5ATO	
VE7AJ	

YL PHONE

W2OWL	7,065
K3WAJ	19,110
WA3AOJ	11,825
WB4BOJ	20,440*
WA4UWK	6,660
K4RHU	4,156*
WA5OVX	22,328
K5DAB	18,368
WA5QQR	6,938*
WA5SKI	2,920*
W6PQI	13,644*
K7RAM	13,702
K7UHN	10,009*
K8ONV	44,712
WA8ENW	13,050
WA8FSX	12,350*
K8PXX	9,010
WA8KMT	7,191
W8ZNO	6,204
WA8UYJ	3,512
WA8OFW	3,744
K9LUI	36,450
WA9VKB	24,880*
W9GHO	14,700*
WA9FRS	11,310*
WA0PPK	26,163*
W0JUV	15,288
K0EPE	11,024
W0AYL	3,280
K1L7FQQ	80,640
VE4ST	20,221*
VE3BBO	11,895*
VE3GTI	10,431
I1SGZ	2,695
C66CO	8,178
DL3LS	21,318
JH1GMZ	2,300*
PY2SO	90,216
VK3KS	8,702*
ZL2JO	21,525*

ZS5FN*	9,075*
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Confirmation logs:

W4TVT	
K8ITF	
K0BTV	

OM PHONE

WA1CJR	3,135*
W1BAB	2,310*
W1PYM	2,291
W1HOZ	1,288
WA2BXX	1,875*
WB2SXX	1,610*
K2DDK	1,203
K2PXX	1,188
W2QKJ	984
W2COB	935*
WB2EXZ	836
WB2UQJ	300
K2JTU	216
W2BSI	88*
W2IP	50*
W3BQN	2,251*
WA3EXX	761*
K3UGG	450
K4MYC/4	4,180*
K4BAL	2,052
K4GHR	1,696
W4TZX/4	1,581
W4JUG	1,125
WA4KQO	918
K4YFQ	864
W4LK	513
W4DS	100*
K5MDX	7,619*
K2EIU/5	4,444*
W5NQR	2,100
WA6KNE	1,204
WB6THT	1,120
W6QFU	270
W6RQZ	179*
W6CLM	36
W7ECI	1,363
K7AYF	990
W7DZB	391
WA8WZG	630*
WA8RDW	298*
W8FTW	90
K9UCR	3,150*
W9LNQ	2,718
K9VIE	1,820
K9NLF	1,511*
W9ECY	841
K9HDZ	816
WA9NSR	61*
WA6GZA	1,410
WA0RDP	897
WA0TIL	560
K0QIX	150*
K0QYG	61*
JA1BNW	5
I1A8PF	5*
W4HSC/VO2	1,350
VE3OL	747*
VE3BMB	289
VE3WBW	641*
ZS5FF	5*

Confirmation logs:

K2BX	
W9MG	
K0ETA	
JA2POI	
VE3FHQ	

*after a call means low power multiplier claimed.



WA3GMN, Peg Sayre, is a part of a real "ham family." OM is WA3GMO, son WA3CRS, grandson WA3LBS is now in Viet Nam, and a son-in-law is WB6QYL. Peg is a National Rifle and Pistol instructor, and has participated in national matches.

LA-YLRC 1968-69 Officers

The newly elected officers of the LA-YLRC for the year 1968-1969 are:

President: Vada Letcher, W6CEE

Vice President: Maggie Moore, WA6VDK

Corresponding Secretary: Gladys Eastman, W6DXI

Recording Secretary: Terry Lockwood, WA6RXO

Treasurer: Roberta Baldwin, WB6DFN

The membership of the club is composed of women who hold amateur radio licenses in the greater Los Angeles area. There are several members who are from Santa Barbara, and San Diego as well.

W5KRI, Deanna Mercurio

When Deanna "discovered" amateur radio, and confessed her desire to become a part of the amateur fraternity to the OM, she found that she didn't need to put on any pressure at all for she had touched one of his secret desires. So they both were licensed in 1962 as WA0DFA, Deanna, and WA0DFB, Sam.

But being in radio wasn't just the normal type of "hamming" to Deanna. She talked the school administrators into permission to put a station in her Spanish Lab, and then as she puts it, "the fun really began." She kept schedules with Spanish-speaking countries and her students learned the



Deanna Mercurio, WA5KRI

language by using it on the air, so that the course became more than just words in a text book. The experiment was a great success.

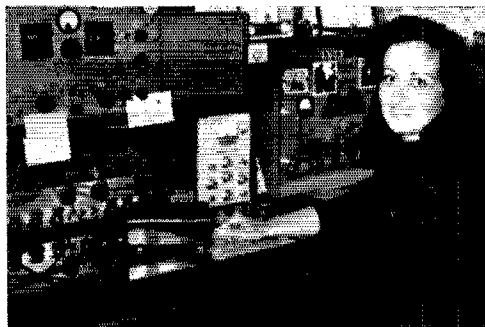
In 1964 the family moved to Texas, and Deanna received her present call WA5KRI, and the OM became WA5KRJ. A member of YLRL and TYLRUN, Deanna also belongs to GAYLARK and the Houston Amateur Radio Club.

WA5KRI will be heard mostly on s.s.b. on 20, 40, and 75 meters. Her operating hours are "when the children are asleep." During these "quiet hours," when she isn't involved with Angela, 5, and Phillip Lee, 15 months, she enjoys just plain visiting and meeting people on the air. When not on the air, or caring for the family Deanna enjoys bridge, and putting around the kitchen trying out new recipes.

QST

Feedback

The list of YLCC totals in the YL Column in June 1968 should also have listed Marge Campbell, K4RNS, with 900 YLs for her YLCC.



WB6RMX, Audrey McRevey, is a "graduate" of the W6OWP Code Practice sessions. In two years she has progressed from a "scared Novice to a proud General." Thanks to W6OWP. Audrey holds a 35-w.p.m. endorsement and is dreaming of Extra Class.



July 1943

... K. B. Warner, in his editorial, addresses himself to new operators in the Armed Forces, offering congratulations that they are now full fledged operators. A great many of them have learned the art in service schools and of these, a goodly percentage will become amateurs after the war is over. They will then learn the joys of operating their own rigs.

... Charles Service, W4IE, urges amateurs to be on the look-out for spies and saboteurs who are known to be loose in the country.

... Warner announces the appointment of Clinton B. DeSoto, W1CBD, as Editor of QST, enumerating his many qualifications and outstanding record as a ham and journalist.

... We have a new type soldier in the Services. He is known as a "Tank Destroyer," born of the

(Continued on page 132)



CONDUCTED BY BILL SMITH,* WB4HIP

Impulse Noise Reduction

Noise is the primary limiting factor in v.h.f. communications. If we could effectively eliminate all noise, including that generated electronically, previously masked signals would become apparent and path attenuation would be the only limiting factor. Al Burson, K5WXZ, has spent untold hours studying methods of noise reduction, with results that include the design of a widely used impulse-noise blander. Here, in the first of two parts, is a report on that study.

Much has been written on *white noise* or *smooth noise*, and most of us are familiar with low-noise r.f. amplifiers and the factors involved in low-noise receiver design. Once you have a "low-noise receiver," another type of noise becomes apparent. *Impulse noise* then becomes the major limitation in amateur reception, especially in the v.h.f. bands.

Impulse noise, as used here, means power line buzz, auto ignition, electric motor noise, most other forms of man-made noise, and rain static. One could include radar interference, but not natural static (atmospherics).

A study of this impulse noise with an oscilloscope having wide bandwidth, or with the home TV set, brings out some interesting facts. The noise has a very high peak-to-average power ratio, much like radar. Most all impulse noise has a very fast rise time, 0.1 microsecond or less (or it wouldn't bother at 144 MHz.) and a short pulse length, generally under 1 microsecond. Most power line interference has a pulse about every 500 to 1000 micro-seconds. If the receiver could be shut off during such pulses, we would only lose 1/500 of the signal and the noise could not be heard.

Inspection of these pulses at the output of a typical 144-MHz. converter, with a bandwidth of 2-3 MHz., would show them to be millivolts or volts in level, while the desired signal is in microvolts. If these pulses could be limited to our desired-signal level they would not cause much harm either, since the noise is only there 1/500th of the total time. Why is it then the noise pulses cause so much trouble? One has to take into account receiver selectivity, and what happens to a fast pulse applied to a band-limited amplifier.

Borrowing some more facts from radar design, a given pulse input has an optimum bandwidth to reproduce the pulse at the output of an ampli-

fier. Wide bandwidths give good reproduction but permit more smooth noise to appear at the output, lowering the signal-to-noise ratio. Narrow bandwidths alter the wave shape and stretch the pulse. The output pulse length is no longer related to the input pulse, but depends on the bandwidth of the amplifier. With the narrow bandwidths needed and used today, impulse noise is lengthened and reduced in amplitude until the pulses run into each other and produce continuous noise at the receiver output. We can no longer silence the receiver part of the time and gain anything. We would lose as much signal as noise, because both are present. The amplitude also becomes comparable to the signal, so we can not achieve any help with amplitude limiting. From this we can state a rule that to effectively "operate on" the noise the work must be done before the selective circuits of the receiver. The wider the bandwidth before our operation, the less time the noise is present; therefore the less time needed to silence the receiver. If the noise is limited to the signal amplitude, the wider bandwidth reduces the amount of time the signal is contaminated with noise.

At this point we need to make a decision. There are two ways to prevent the noise from causing much trouble: limiting and blanking. The likelihood of encountering strong local and open-band signals affects the method we choose. The necessary overall bandwidth of a receiver depends on the modulation of the received signal: about 200 Hz. for c.w., 3 kHz. for s.s.b., and 6 kHz. for a.m. What we have to worry about is what happens when someone turns on a transmitter across town, say 50 kHz. from the frequency of a weak signal we are trying to copy. Let's consider our selectivity to be lumped; that is, we use crystal or mechanical filters. This unwanted signal will not pass through our filters since it is 50 kHz. away but it is close enough to pass through the r.f. mixer and i.f. stages ahead of our filter, at full strength, since no a.v.c. is developed.

For a given amplifier, tube or transistor, there is a dynamic range the device will pass without objectionable distortion. The lower limit will be set by the noise figure of the device. Let's say the device we choose can handle a range of 100 db. total. This is quite close to the dynamic range needed in the first r.f. stage. From the weakest signal down in the noise to the strongest local, we would find 100 db. difference or so. In many cases it would be more.

If we set the top limit our device can handle at 100-mv., we can see from Fig. 1 what happens to

*Send reports and correspondence to Bill Smith, WB4HIP, ARRL, 225 Main St., Newington, Conn. 06111.

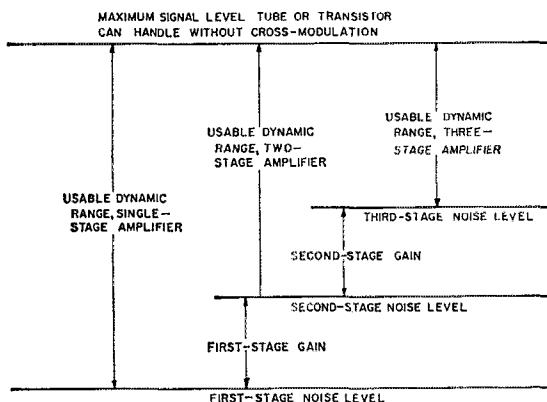


Figure 1. Reduction of dynamic range in multistage amplifiers without effective automatic gain control.

our multistage receiver. If the r.f. stage has a gain of 20 db. and is followed by a mixer with a 100 mv. top limit, we must decrease the input signal level by the r.f. stage gain or we will overload the mixer. This, in effect, decreases the dynamic range of the signals we can look at to 80 db., because the r.f. stage noise sets the lower limit.

A typical modern day h.f. receiver uses double conversion. There is an r.f. stage followed by two mixers before we reach the filter. At 14 MHz., a typical i.f. used with v.h.f. converters, one may have 30 db. of gain in the r.f. stage and first mixer, for a signal that is only 50 kHz. down the band. This means that if the second mixer is able to handle a dynamic range of 100 db. the range of the signal level at the input would have to be 30 db. less to prevent exceeding the overload limit. Now we must take our 70-db. dynamic range left and subtract 30 db. of gain for our v.h.f. converter. At the input to our converter we have now a range of only 40 db. in signal level that the total system can handle before overload. Filters determining selectivity should be as close to the antenna as possible; right after the first mixer. This also means we should use not over one r.f. stage. With the advent of FETs, v.h.f. mixers with a noise figure under 3 db. at 144 MHz. are possible.

When we start working on impulse noise we must consider what effects noise circuits will have on the ability to handle strong signals. Let's examine the widely-used Handbook limiter. The circuit has two high gain stages. The second stage will be the reference for overload and the first stage gain will be 20 db. This 20 db. of gain must be added to 30 db. of converter gain for a total of 50 db. reduction in dynamic range. This does not consider the effects of the diodes which will make the actual situation much worse. Obviously, we should search for some better way. If we try the blanking approach we can divide the

blanker into a signal channel and a noise channel as seen in Fig. 2. The input signal from our converter is applied to a high-gain, wide-band, i.f. amplifier to amplify the noise pulses, and also to the input of a delay line. The noise amplifier should be designed using conventional pulse i.f. amplifier techniques such as used in radar receivers. At the detector output we want a pulse out for every impulse noise pulse at the input, and we must consider delay times, blocking, pulse stretching, and other typical radar i.f. problems.

The detector is followed by several pulse-shaper stages, to generate the final pulse that controls the gate, which has several requirements that must be met. It must have a large amount of attenuation when turned off during the noise pulse, but no loss when passing the signal, and there must be no cross-modulation produced when passing the desired signals. The rise and fall times must be controlled, so not to produce too much noise by opening and closing the gate.

Since it takes a specific amount of time through the noise channel to develop the gating pulse, the desired signal path must be delayed to insure that the gate is closed by the time the noise pulse in the signal channel reaches the gate, and that the gate will not reopen until after the end of the noise pulse. The gating pulse is made longer in the pulse shaper of the noise channel. In the signal channel, the signal is starved with a passive delay line, which is really no more than a low-pass filter. Design the delay line for whatever impedance you want, usually 50 ohms, and, with care, the loss can be kept low.

The gate itself is a transistor used as a switch. Biasing the base turns the switch on; the resistance between collector and emitter becomes very low. Reverse biasing turns it off; the resistance between collector and emitter becoming very high. The transistor is connected across one of the last sections in the delay line. We can now short the delay line to ground when the transistor is on, and when the transistor is off the delay line will have no effect on the circuit. Since the delay line is around 50 ohms impedance, and uses a large amount of capacitance to ground, compared to the capacitance of the transistor in the off condition, we can ignore the effect of the transistor. We must, however, consider what happens if the desired signal is large enough to forward bias the collector-base junction of the

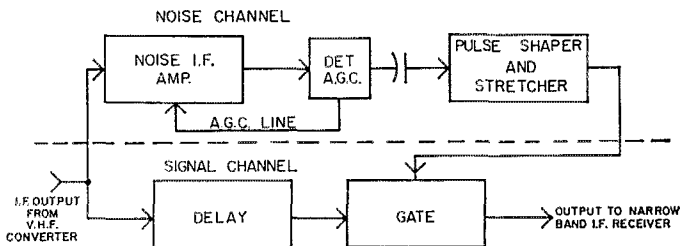


Figure 2. Blanking method of noise reduction using separate signal and noise channels.

transistor; cross-modulation occurs. A transistor with a high base-to-emitter breakdown rating should be chosen, so the bias in the off condition at the base may be set higher in voltage than the peak signal level across the delay line when receiving a strong local signal.

More to come!

OVS and Operating News

50 MHz. has really been poppin'. The *E_s* season got into full swing in early May for most areas of the country although K4MGX, Florida, and K6EDX say "not too good." However, reports reaching us before deadline tell of openings nearly every day between various areas of the country during the first three weeks of May. The initial openings were over predominantly north-south paths beginning mostly in the early evening hours and in some instances, lasting until after midnight. VP7s NA and NS, KP4CPK and W1HOY/KP4 are adding just a taste of DX to the annual serving of *E_s*. And if one doesn't believe the s.s.b. transceiver hasn't changed six, well, you just haven't listened!

Thanks to W1HDQ, WA1DPX, WB2s, UVB VFX, ZDP, W3KWH, K4FKO, K4MGX, K4RCT, WA5FPS, K1ZAT/5, K7ICW, W8CVQ, WASEOW, WA9SDT and K0GJX for their reports of *E_s* openings.

Last month we touched upon the widespread *E_s* and *F₂*-layer activity of April 20. We're still getting reports on that one! K6EDX relays word from Argentina's widely-worked LU3DCA, "... fantastic conditions to the United States weekend of April 20-21st. On 20th I worked Wisconsin, Illinois, Florida, Texas, South Dakota and California. On the 21st I worked California, Pennsylvania, Colorado, Missouri, Nevada, Utah, Texas, Florida, Alabama, Arizona, Mississippi along with the "usual" KP4s, NEs and TI2NA. Our standing is now 34 states on six meters." LU3DCA's potent signal emits from three 4CX250Bs and a 4-element Yagi.

During the same weekend, K6EDX heard or worked CE2BM, CE3s BQ, QG, LU1MBJ, LU2DLS and LU3DCA by *F₂*-layer propagation, and most areas of the U.S. on single- and double-hop *E_s*.

Now from around the country, these reports of DX worked the third weekend of April. W3KWH: LU3DCA; K4YFN: LU3DCA; W5WAX: HC1FS (16 watts a.m. to vertical dipole); WA5PDD: CX6BW; WA6HXW: CE3QG, LU3DCA, LU4DFN; W7FN: CE3BQ, CE3QG (Seattle to Chile; best DX reported.); K7ICW: LU3DCA, OA4C; WA7ECY: CE3BQ, CE3QG; W0EKB: CE3QG; W0WKB: CE3QG; K0GJX: CE3QG, LU3DCA, LU4DFN. The same South American stations were worked by dozens of other stateside operators, but these are the stations which reported contacts and they illustrate the conditions that existed between 1900 and 2300 GMT, April 20 and 21.

The following weekend was nearly as productive, at least from southern California. WA6HXW reports working the following between 1900 and 2100 GMT, April 28: CX6BW, LU5CK, LU1DMA, LU6DLB and CE3QG. That path distance is roughly 6000 miles. On May 1 and 5, W6ABN reports working some of the same South Americans. He and WA6HXW note 17 days of *F₂*-layer propagation from the Los Angeles area during April! W6DOR reports working CE3QG on the 29th and the Chilean mentioned having heard Japan at 2355 GMT. A few minutes later W6DOR says he heard a JA sta-

tion but was unable to get the full call because of fading. We have unconfirmed reports from K6EDX that CE3QG worked Japan and CT3AE, Madeira Islands, during the third week of April. K6EDX says he strongly suspects the reports are valid and has written CE3QG for confirmation. CE3QG was worked as late as May 9th at K6EDX, and Bob also reports YV5BTS, Caracas, active on 50.04, with 30 watts and a 4-element Yagi. K6EDX and K6RNQ are preparing a report on Cycle 20 50-MHz. DX which will appear in these pages shortly. It should be extremely interesting.

Looking in the opposite direction, W6DOR informs us that he will be operating in Alaska during the middle of July. He has applied for a KL7 call for the period, but if it does not come through in time he'll be /KL7. He'll be in the first 100 kc. on c.w., the second hundred on s.s.b., and the third on a.m., watching closely for signs of DX.

Mel Wilson, W2BOC, who has been studying 50 MHz. propagation for at least 30 years, has another study underway. He is looking for information on long, single-hop paths (1500 to 2500 miles) on nights of large auroras. During the past ten years there have been numerous reports of such contacts at various geomagnetic latitudes, with signals being clear and strong, without auroral buzz. Most reported occurrences have been between 2000 and 2200 hours local time. Mel suggests that the following dates, plus or minus a day, may produce auroras; June 21, July 13 and August 8 and 20. Please report any instances to W2BOC and this column.

44-MHz. news this month is highlighted by meteor scatter. The April Lyrids shower was fair to good, and early reports appeared in last month's column. K4IXC worked K1MTJ, Maine, on the 19th, after many previous unsuccessful schedules. K1MTJ also worked WA4LTS, South Carolina, on the 21st. K4IXC says his antenna is down for repairs and enlarging — now I wonder just how large he is going to make that array? One would think he will find it difficult to improve on his already fat signal. W5ORH, the Oklahoma cowboy, worked K4QIF, Virginia, and K4GL, South Carolina, on the 20th. The contact with K4GL took but 2½ minutes. And in addition to the Lyrids successes, W5ORH reports several on random meteors, adding, "... these guys can make good contacts anytime if they will just get on and run. You don't need shower help on paths up to 1200 miles." True, and now is the peak time of year for random meteors. As previously reported, W0EYE and W3KWH covered a 1335-mile path between Colorado and Pennsylvania on the 21st, and on the 22nd W3KWH worked W5HJV in Oklahoma, after hearing him calling CQ on the 144.1 *E_s* and m.s. watch frequency! The contact took about one hour to complete. K6JYO says, "not much of a shower" after unsuccessful schedules with VE7BQH, B.C., and W7UBI, Idaho.

The Aquarids shower produced a May 1 contact between K4QIF and K5WXZ, Texas, giving K4QIF his 30th state from Virginia in about 9 months. Iowa's K0MQS found the shower good, with the peak on the 4th. Dick contacted WA4LTS, South Carolina, on the 1st, W2CRS, New York, on the 3rd, and W3BDP, Delaware, on the 4th. Delaware was state number 42, and the last needed east of the Rocky Mountains. They're going to get tough now, Dick!

Good late April tropo reports come from two Florida stations, W4UUF at Pensacola and K4IXC. W4UUF reports a handful of contacts along the Gulf Coast as far west as Texas, but bemoans the

lack of activity compared to past years. He also worked CO3NR, Cuba, on April 20. K4IXC likewise worked stations in Texas, Louisiana, and Alabama on several April nights. Apparently tropo in other areas of the country has not been up to par, judging from the lack of reports.

For those interested in records, W6YK has laid belated claim to the first two-way U.S.A. contact through Oscar III. He worked K6HMS on orbit 9 at 0936 GMT, March 10, 1965. K9AAJ and K2IEJ have been recognized as establishing the U.S.A. "first" during orbit 13, although the true first contact was between HB9RG and DL6EZA. See *QST*, page 56 May, 1965.

Because of the length of the column this month, the states-worked boxes will appear next month, with a considerable number of additions. We've still got room for yours!

220 MHz. reports are more numerous this month. K4IXC, Florida, (220.072) is scheduling K4GL, South Carolina, (220.059) over a nearly 500-mile path. K4IXC says K1ABR, Rhode Island, is probably running high power by now and that they will be scheduling. K4IXC is disappointed that he has not been able to find more "takers" for 220 tropo and meteor scatter schedules. He runs a kw., and a Yagi stack at 80 feet.

VE2DFP, Beaufort, Quebec, will accept August Perseids schedules. Don has a pair of 11-element

Yagis and 120 watts, s.s.b. and c.w. And W1YTW, Kittery, Maine, has come to 220 with 160 watts output. K4GGI/1 says the Portland area station has plans for more power and a large antenna. W1YTW is a good c.w. operator and is probably interested in tropo and m.s. schedules.

W2SEU, Freeport, New York, says the states-worked box revision prompted him to dust off his 500-watter and go looking for new states on 220. Fred has 12 states worked and would no doubt accept schedules. W2SEU's comments, "I want to thank you for the updating. This should have been done before. Good work — it got me moving on 220 again." Fred was near the top of his call area when the revision struck him from the list. Nearly 50 others have favored the revision. See the March column for details, and send in your records.

At Hopewell Junction, New York, K2DNR will resume m.s. schedules with K4IXC shortly after having worked W3UGV, Md., state number 7 via the tropo route. And K1YON reports two new 220 stations in Connecticut: WA1GTP, Essex, and WA1ION, Avon.

420 MHz. interest continues, but activity reports are scarce. At Richmond, Virginia, W4FJ's schedules are paying off handsomely. Ted is up to nine states, to lead the fourth call area, after a 345-mile contact with K4GL. W4FJ is also scheduling K2YCO and

(Continued on page 140)

Second International V.h.f. Conference

The Second International V.h.f. Conference sponsored by the East Coast VHF Society, WA2WEB, was held May 2-4, 1968 in Paramus, New Jersey in conjunction with the Garden State Amateur Radio Exposition (see pg. 60). This was perhaps the largest and most diverse assemblage of v.h.f.ers ever held. From outside of the U.S. came VE1CL, DJ3RG, VE3ENZ, VE3BPR, HB9RG, PA0FB, VK3ATN, JA1BMI, and VK5ZEL. U.S. participants include W6DNG, W1JSM, K2TKN, W6QED, W2UK/KH6UK, W6OLO, K1ABR, W21MU, K0LJN, W4GJO, W2AZL, K2UYH, WA5UTB, W1HDQ, WA5BPS, W7ELQ, K6MVH, W3SDZ, K4MOC, WB6IOM, and W2AMJ, just to mention a few! Meetings and forums on a variety of v.h.f. topics took place over the three day period.

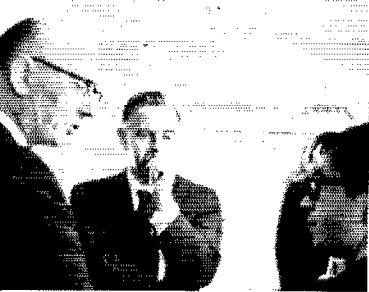
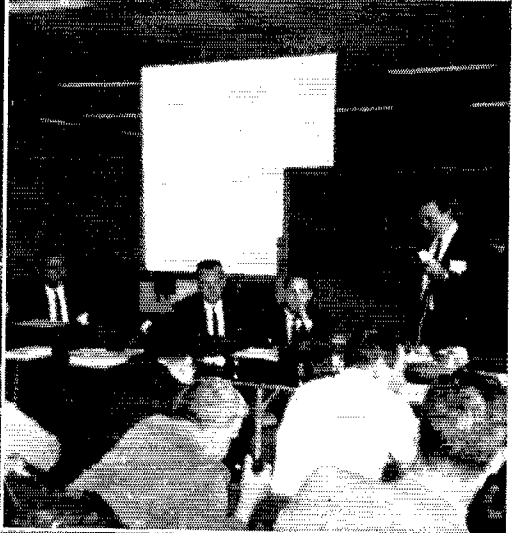
The moonbounce forum brought together a large number of the world's notable moonbouncers. The question arose of what motivated the conference participants to engage in amateur moonbounce activity. Almost unanimously, the reason was for the challenge of doing something almost impossible.

WB6IOM pointed out that there is great satisfaction in making moon-bounce contacts since accomplishments come as a direct result of a carefully engineered system and operating skill, unlike other propagation modes which rely on the chance of propagation anomalies. W6DNG said that his interest in moonbounce was sparked from a study of matter transfer by electronic means. W21MU added that current experimental moonbounce work may eventually lead to its

wide-spread use for everyday amateur activities.

Other topics and questions raised related to choice of frequency band, antenna polarization, equipment problems, and future prospects for moonbounce. Agreement was reached on a circular polarization convention: transmit right-hand, receive left-hand. Little unanimity was found, however, in selection of a frequency band. While engineering considerations point to 1296 MHz. as an ideal amateur moonbounce frequency, there is still a large following for 2-meter work. In concluding remarks, W21MU expressed the feeling that promotion of moonbounce might best be accomplished by education in the form of good written articles on the subject especially on equipment realization for u.h.f.

The national f.m. repeater session was well attended with representatives of repeater groups from all over the U.S. Many f.m. technical topics were discussed including the use of time division multiplex on a repeater channel in heavily populated areas. The problem of availability of information about f.m. techniques was investigated. It was found that greater *QST* coverage could be achieved if f.m.ers would produce more articles on the subject. Plans were announced for expanded coverage of f.m. in the 1969 edition of the *Handbook*. A discussion of repeater regulatory matters centered on the petition to FCC by the Buffalo, N. Y. repeater group. While most of those present had minor disagreements with the proposal, now RM 1209, a consensus of support was achieved.



Here are photo highlights of the International V.h.f. Conference sponsored by the East Coast VHF Society at the Garden State Plaza, Paramus, N. J. Upper left photo shows VK3ATN (standing) being greeted by his moonbounce correspondent W2IMU and an unidentified kangaroo, while an airline stewardess looks on. Upper right, PAØFB (center) is welcomed at the airport by K2GNA (left) and Dr. Hoogstraten. Center left, W1HDQ addresses one of the many v.h.f./u.h.f. forums. Center right shows the well attended national f.m. repeater meeting with (from left) W4BUTB, K2IEZ, WA5BPS, and K6MVH. Lower left, KØ1JN, W2IMU, and K2UYH ponder several moonbounce problems. Lower center shows ARRL First Vice-president W5NW at the East Coast VHF Society's banquet. Lower right, HB9RG tells of the Swiss-German moonbounce effort. (Photos by K2HHS, WB2DLW, K2LME, and WA1IUO.)



How's DX?

CONDUCTED BY ROD NEWKIRK,* W9BRD

Why?

Everybody has a pet theory as to why our world seems to be turning kookier by the minute. Yours may be as valid as the next person's. In this game originality counts as much as rationality, and any number can play.

In that connection, and as a continuation of DXHPDS Air Pollution Committee observations, we now call attention to a provocative article from the Wayland (Mass.) *Town Crier* of September 22, 1966, generously forwarded by WA2IPC. It reports on interesting testimony given at a public works hearing concerning proposals to erect a local overhead high-voltage a.c. transmission line. We excerpt:

Are overhead electric power transmission lines as dangerous as they are ugly? Is electromagnetic radiation an air pollutant of sorts? A newly arrived Wayland resident — William Saxton, Ph.D., of Oak Hill Rd. — opened up this area of concern in voluntary testimony. . . .

Dr. Saxton, who earned his doctorate at Harvard, is an army reserve captain called up last January because of the Vietnam war. He is stationed with the Army Electronics Command, Fort Monmouth, N. J., currently assigned to temporary duty at Harvard where he is involved in a research project. . . .

"There is no question in my mind," he told the *Crier*, "that there is a definite relationship between electromagnetic radiation and the workings of the human anatomy." He reported on a recent paper by Russian scientists concerning the effects of this radiation.

"No doubt," Dr. Saxton said, "from this and other research, the radiation does have an effect on the central nervous system." He emphasized that it will be "several

years" before science really knows how much of a detriment electromagnetic radiation is to human functioning, but it has been found that those persons most exposed and most susceptible to it are at best "more fidgety, more nervous" than is ordinary.

"Results of most studies," Dr. Saxton related, "are incomplete, but early evidence indicates that electromagnetic radiation has a pronounced effect on human beings." He said that overhead power lines emit direct radiation at a frequency of 60 cycles per second, which might prove dangerous for anyone exposed to it for long periods of time because many activities of the human body take place at frequencies of 20 to 100 cycles per second. A matter for research is what happens to those human pulsations when influenced by a force of another 60-cycle pulsation entering the body from an external source. . . .

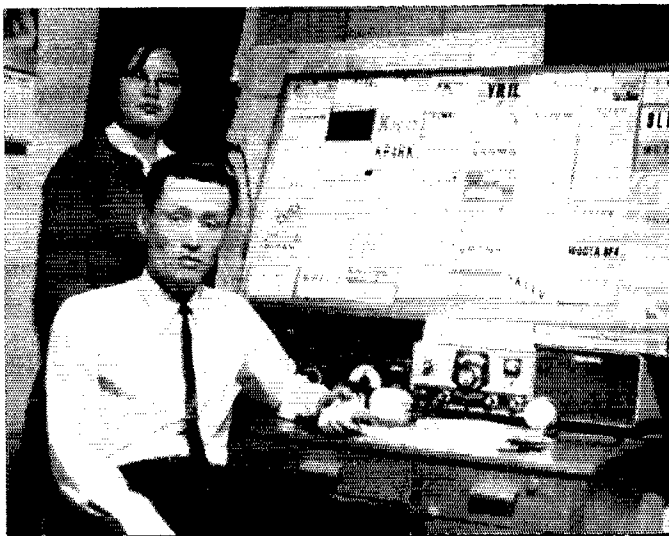
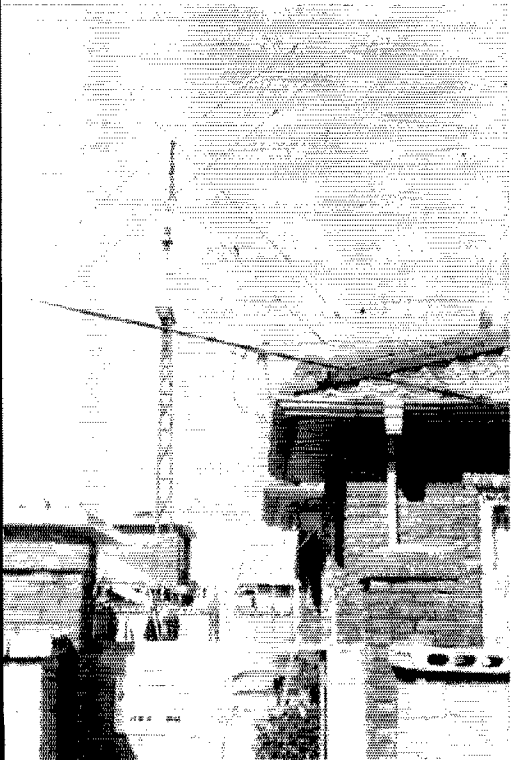
"There is no longer any doubt that certain forms of radiation are detrimental to human functioning. I predict that this will be a focus of national attention in a few years." Dr. Saxton also mentioned the increased interference to television and radio caused by high-tension lines.

He emphasized to the *Crier* that the result of this electromagnetic radiation is evident to the eye or to the ear insofar as television and radio are concerned but is not detected by the senses when it enters the human body. Therefore its effects are not easily measured. He stated that electrical companies and utility agencies could be severely criticized in time for ignoring the potential danger of electromagnetic radiation.

Another paper used by Dr. Saxton was prepared by a team at Syracuse Veterans' Administration Hospital, headed by Dr. Robert O. Beck. In a report of its findings Dr. Beck's group noted an increase in the number of psychiatric patients in areas which had experienced intense magnetic storms. Radiations from a magnetic storm, Dr. Saxton said, are in the same frequency range as that of power lines. (Reprinted by permission of the *Wayland-Weston Town Crier*)

In an era when students dictate to faculties, when criminals haul policemen to court, when spending is more virtuous than saving, and when ill-bred DX hogs are tolerated by their brazenly victimized brethren, who knows? Maybe we are being bugged by a great big buzz-zz-zz.

HM1AJ, shown here with wife HM1AM, is chief Korea s.s.b. DXponent on 14,190-14,230 kHz. where he watches for W/Ks around 0600 and 1200 GMT with his quad pointed Statesward. Cho busily puts the finishing touches on his ARRL DX Century Club application.



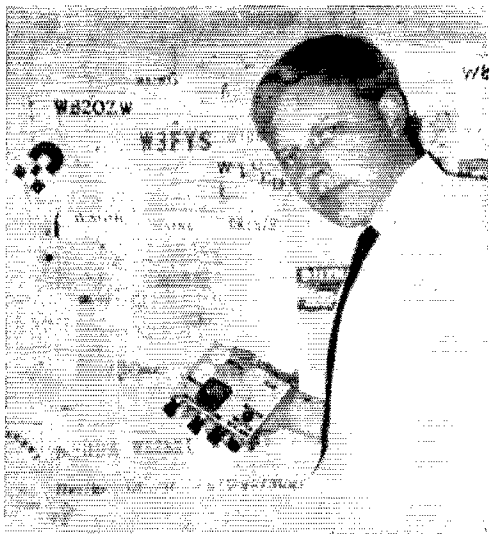
*7862-B West Lawrence Ave., Chicago, Ill. 60656

What:

Continuous wave gets our DX spot-check spotlight this month as promised, except for 14 MHz, which we usually treat separately for space reasons. Man, the code clan is really cleaning up from 10 through 160 meters as this ride on the "How's" Bandwagon clearly shows. As usual, parenthesized figures stand for kHz, above the lower band limits, numerals outside parens representing Greenwch whole hours. *Giddap, Pegasus!* . . .

15 Novice DXploits, overdue for documentation, loom large in the logs of WNs 110N 118H 3JAB 4GRN 4GSS 4GTI 4IIF and 8YHN; CN8FV 21, CO2DL (132) 15, CRs 4BA (152) 22-23, 6AL, CTIs TT LQ 22, CX1JM, two dozen DJ/DK/DL customers, DMs 2BZN 14, 2UFA 3UEA 4EL 4WKL, DU7SV, EAs 7CL (108) 14, 8ET 18, 8FE 19, ten Frenchmen, FG7s XT XZ (101), FP8CS, loads of Ge. GI6TK, GMs 3AWW 20, 3IMZ 3JDR-5AFF 6RI, GW3KUY, HAs 1V1 5AW 5DJ 16, 6VK 8UF, HB9s AGH OC 19, RX 16, HI7ATK (180), IIs BDK 13-14, SF 15, ITIs MNG 18, PLAs, JAs 1DDZ 6HKC, KG4USM (108) 2, KH6s EBQ FRF 22, GHB NP 23, KL7CCK 1, KP4BBN (111), KV4CK 18, KZ5s GN (153) 22, HIC 20, JQ NG RPN, LAs 2TA 7TH 15, LUs 1BB 1, 1DNY 0, 4OD 0, LZs 1KBD 15, 2FA, OAANZP 22, OEs 1RG 2NGL 5CA 5ANL 15-16, 5NKL 6RAG 18-19, 7AZ, OHs 3KL 14, 6AA 14, 6NS 6UW 6WY, OKs 1AUZ 1CG 1SD 1VK 2B1X 14, 2KR 3KGP 21, 3KFU 3KHE, ONs 4LC 5BT 5VZ 19, 5LW 5TO, OX1AB 20, OZ6HS, PAs GMZ GRH 18, LV 8OL 15, ZAV 18, eighteen Brazilians, twenty Swedes, SPs 2BBD 3A1S 2AJ0 23, 5AFL 5CJL 9ZHQ 20, TG9s CD EP, T2DO 20, UAs 9BG 9BZ 16, 9XU 19, 9MX, UB5s DV 15, JR KED 16, TQ 14, UG2AZ, UQ2AS 20, UT5CC, UW3PW 15, VOIs GF 21, JK 21, VPs 2AR 9CA 18, VQs 8CC 19, 9B, WA3DVO/8P6, W2PKZ/V99, WH6s GKD (182) 0, GLB (180), WL7s GIC (108) 20, GOU (153) 22, WN9VFX/KP4 22, WP4s DAJ (118) 13-14, DCL 21, DCR (140) 23, XEs 1CM 1MN 1NNR 1XX 2CC, YOs 2CD 18, 8GL, YUs 1AG 14, 1NEO 20, 1NH 2NEG 15, 3FPR 18, YVs 3IS 19, 5BWJ (111), 5CKJ (110), 5CKR/1 (124) 18-19, ZD7GS, ZE1CV, ZL1HW 1, ZSs 4IO 19, 4JU 20, 5BK (180), 6BGE 6VJ, 4U1TU 14 and 5Z4SS.

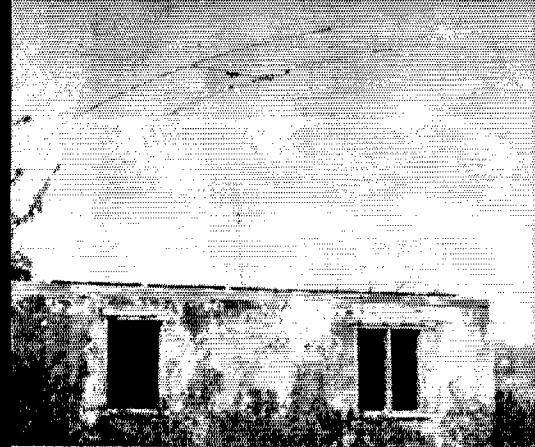
15 c.w. below the Novice slot is even more prosperous, according to mail from Ws 1AYK 1DAL 1VAH 2ICO 3HMR 4YOK 7BE 8IBX 8YGR 91NQ 9CVZ, Ks 1FKW 2UPD 5MHH 5YUR, WAs 1CJE 1CYT 1DJG 1FHU 1ION 3RSD 3HRV 4YOK 5M1N 5PUQ 7BE 8MCC 8PVN 8VRB 9TFM 9VR, WB2s PFG SSK ZNZ and 11ER: GBs 1AV (27) 22, 3ZK 4LQ (40) 20, 7AQ (48) 20, 7BV (40) 19, GM1AR (15) 20, CNs 2AY (77) 19, 8CC 8MII (17) 10, 8MV 19, 8MZ, CO2s BB (77) 16, RL (37), GPs 3CN (70) 22, 6FN (92) 20, CRs 3AD (90) 13, 4AG 4RB 8SP (56) 19, 6AI 6AL (54) 20, 6BX (80) 18, 6CK (50) 13, 6CN 17, 6CX 6EI (26) 17, 6FA (85) 20, 6HG (40) 11, 6IX (33) 20, 6KB (66) 19, 7BN (60) 18, 7IZ (72) 18, CTs 1BJ 1HT 2AA (42) 14, 3AS (22) 20, CXs 1BBO (36) 20, 1BBV 7AP, DJ2JB/G13 21, DMs 2ADC (4) 2CPL (50) 18, 3GO, DU7SV (80) 13, EAs 6AX (21) 14, 8DT 8EJ (15) 8, 8FR (30) 7, 8FC 8FE (37) 18, 8FF 8FJ 8FO (76) 18, 9AQ (90) 20, 9EJ 7-18, ELs 1NJ 2AJ 2AY 19, 2NJ 2NY (26) 18, 2RL 12, 2Y (22) 16-17, EP2HB (12) 12, ET3s FXA (65) 17, USs (13) 19, FG7s XE XJ XT (162) X, X (50) 21, FH8C 19-20, FM7W (21), P08s AA BV, FP8Cs, FW8RC (12) 1, G6ZY/CN (49) 12, GCs 3IEW 4LI, GD3AIM (35) 12, HAs 1KSA 1SB (40) 17, 2MU (13), 3CF 3KNA 5DJ 5KDP (26), 5KZF (55), 7PJ (30), 8CY (92), 8UD 8UH, HG1CG (26) 20, HISIBG (51) 21, HKs 3RQ (55) 10, 17UL, HLU9s (51) 10, HM5BF (79) 10, IS1PBP (10) 12, ITIs AGA MNG, JAs 1AGW 1BRK 2ACA 2CHS 2IPE 3FCG (60) 0, 8AF 7ARW (65) 1, 7CRU 7SM 7YFA 8ZO 9CAF 9YCE, JH1s AGW CWZ, JTK1KA (43) 8, K1FNA/KG6 (40) 12, KAs 2KS (22) 2, 9AA 9, KC4USM (28) 2, KGs 4CX (28) 22, 4DF (46) 19, 4DK (47), 6AAV (40) 23, KL7s IR MF (52) 46, KRs 5AI (48) 17, 6UD 8DK (42) 14, 8EA (31) 11, KV4s CI (3) 11, CK EY, KX6s 10B 0, BR (47) 12, FN FX (40) 11, KZ5s AJ (75) 16, O (15) 9, RP (80), LABAD 18, many LUs, LX1C (39) 20, LZ1s CD (49), KAA (30) 14, KBG, MP4s BGU (50) 17, DAT (15) 13, MBC 17, OAs 4PF 4UO 7BI (94), ODSs BZ (21) 18, LX (1) 17, OEs 1MRW 16, 1RG (10), 1RS 3VP 5M1L (10) 19, 5MPL (17), 5PX, OX3s AB 16, AS (25) 16, OYs 2EL (30) 11, 2H (34) 18, 4R (36) 18, PI1KMA, PJs 2MIE 3CC (45) 18-20, 3CJ (50) 17, many PY friends, PZ1AH (9) 12, SPs galore, SV8s WF WF (40) 15, TP2s WKU WLC (26) 14, TGs 4SR (60) 23, 9CD (94), 9AA (5) 15, T12s DO (100) 20, LA, T3JAS (4) 18, TL8CM, USARTEK (35) 8, UAs 2AC 9BZ 8KFG 0LH 6LS (52) 10, 9MA (30) 13, 9MD 9MX 9RS (5) 15, UB5s KBA KED (29) 10, KLD 9M TR, UG6As (25) 18, UH8s BO (74) 10, KAJ (78) 11, UH8s AM (95) AX (50) 15, FB (15) 9, KBA (93) 7, UJ8AB (55) 12, UL7s BJ (74) 11, BX (24) 11, KAA (27) 10, XG, UM8s AP (30) 11, IJ (33) 13, KAA (60) 12, UNIKAM (18) 14, UP2s KBC (16), NW (69) 11, UT5TL, UV0EH (52) 10, UW3s AU (33) 15, FW, VKs 8UG 9GN, VPs 2MK (50) 18, 2MO 2MU (50) 15, 2MQ (46) 20, 2VL 16-17, 7NF 15, 7NQ (52) 20, 8IU (45) 20, 8JH (54) 20, 8JG 9BK (10) 20,



OX3FS uses this homespun two-watter to work all continents consistently on 20 c.w. from Narssarsuaq, southern Greenland. Finn likes the low edge of the band at 2200-2300 GMT. He works as an engineer in Denmark's space program. (Photo via WB2OZW)

VQs 8CC (50) 17, 8CJ (45) 11, 9B (47) 20, 9J (20) 23, VRs 1C 22, 3C 5AC 22, VSs 6AA (89) 16, 6EY (35) 23-1, 6FX (28) 12, 9MB (50) 11, VU2s CM (48) 7, JA (17) 16, KV (28) 13, LN (68) 20, M8K 23, RQ (50) 17, VZ (60) 15, XEs 1AAG 1FJR (30) 22, 1NNW (45) 2AAG 21, XT2FA (29) 17, XW8s BP (29) 16, CAL (29) 16, YAI2C (30) 7, YOs 2BS 9AEM (32), 9IDQ (13), YSs 1WKJ (23) 17, 2OB (58) 21, a gob of YUs, YV5s CIY (55) 17, CKR/1 (124) 18-19, ZB2s A (70) 21, BF (19) 13, BO 18-19, ZC4s BI (17) 10, GM 15, GB (4), JU (50) 11, MC (95) 9, RB (60) 9, ZDs 5X 7GS 8AJ (65), 8J (50) 23, 8RC (18) 20, 8Z, ZEs 1CY (35) 18-19, 1JL 4JS (9) 18, ZF1s DX 18, GC 17, several ZLs, ZP6AY 14, ZS3s HF (69) 19, LU (24) 20, 3A2CL 16-17, 4As 1PR (70) 16, 1ZV (70) 16, 2AAG, 4S7s DA (20) 19, EC (60) 17, 4U1TU (30) 18-19, 4X4s CX HQ 21, QA (30) 13, 4Z4s AG 17-18, BG 22, 5A3TP, 5H3KJ (88) 20, 5N2AAF (15) 13, 5R8CQ (45) 16, 5Us 2AB 2WS (33) 14, 7AN 17, 5Z4s KL SS 17-18, 6W8s AW (53) 18, BL BF (40) 19, DQ DW (10) 13, 7O7s AM 17, PAX (35) 17-21, 7X2s ED (88) 16, WW, 3P6s AE BU (32) 20, 9A1B, 9G1s GC HAI (33) 18, HQ 17, 9H1s AC (34) 11, AV AZ (10) 18, Q (70) 16, 9J2s BC (11) 20, CL HZ (18) 20, MX (40) 18, VB (30) 17, 9L1TL, 9M2LN (50) 16, 9Q5s CD (5) 23, EH (30) 7, PT (85) 13-14, TH (78) 18, WS (3) 20, 9V1s LK (32) 16, NV (60) 17-18, OK 16, OR (50) 17, OS (43) 18, OV (12) 15, 9X5s PS (50) 18, SA (55) 18, 9Y4s AT (49) 11 and RA.

40 c.w., usually piled high with DX armament near its low edge, comes through for Ws 1DAL 1VAH 3HMK 4YOK 7BE 8YGR, Ks 5MHH 9UIY, WAs 1CYT 1DJG 1FHU 1ION 3RSD 5MBC 5PUQ 8MCC 8PVN, WBs 2FPG and 6UBC with GO2DR (6) 4, CRs 4BB (7), 6DA, CT2s BO ZA (5) 4, loads of DJ/DK/DL friends, DMs 2AFH (2), 2XLO (4), 2ZL (4), 3MEL (3), 3XI 1PL, EAs 2DT 8FJ, ET3FMA, numerous IAs, FP8s AP 1P (6) 7, DY (14), ED (10) 4-5, G6ZY/CN (25) 2, GCs 2LU (26), 3IEW, HAs 1SB (11), ISX (3), 3CF (3), 5FA (7), 7FJ (5), 7PP 8CK (8), 8UP (5), HGs 2SZ (51), 8FN 23, HIs 7JMP 4, 7NMC (3), 8RV 4, HKs 3APT (27) 3, 1PP 2, 7XI (64), IS1CQ (5) 21, ITIAGA (9), JAs 1AAT/2 2CNT (1) 8, 3DGC (17) 9, 4DBQ/mm 6AK, JH1DTC (1) 8, KC4USM 11-12, KG6AAV (4) 8, KH6s LJ DQ 12, KP4s BBN BCL (5), DAC (19), UW, KV4s AM CI, KZ5s GN FX, sundry LUs, LZs 1DF (8), 1KPG (5), 1KSA 1KSD (10), 2KAD 2KAF (10), 2KBI (45) 21, 2KLC 2KRAI (15), MP4BEU, OA4UO, OEs 1NY 3PWV (16), 3SBW (3), 5CA 5NT (6), 5SGA (9), ample OKs, OIIs 1WF (7), 2BCP (11), 2BR/mm (12), 5TY (9), 7NF (6), OY6RA, PJ3CC 4, a handful of Pys, PX1KT (3) 23 0, PZ1s AH (27) 3, CQ (7) 5, SMs 1GVJ (21), 2DUX (4) and others, sixteen SPs, TA1NC (15) 23, TGs 4SR (12) 6AA 4, UAs 2CA (5), 9KAB 0EQ (5) 8, UB5s HA HL (10), IU (9) 21, KAG (25), KFF (16), KNI (4), KIX (3), OI 2, PG 4, UC2s KAK (7), KBC (7), UD6BV (3), UG6AG (10), UO5W, UP2KNI (9), UQ2s AS (5), KCS



VP2KW (WØCA) poured out plenty of delicious Anguilla QSOs this spring from an old hurricane-smitten police barracks, the island's highest elevation at 213 feet a.s.l. Nick is better known as former WØIC. (Photos via W1CW)

(15), MR (3), UR2JW (24), UT5s BL BP (3), NG (5), OZ (5), NG (5), PK (35), UA, some UWs, UY5s MV RV (5), UU (4), XG (6), VESME (20), ten VKs, VO5s 1AW (12), 2, 1DE 2AW, VP8s 1PV (3), 2AR (23) 4-5, 2MO (5), 5, 2VL (7) 2, 8JD, VO8CC (2) 2, VR2DK 11, XE2AAG, XV5PC (3) 22, XW8BP (2) 14, forty YO-YU codehoums, YN3KM (53), YVs 1EN 4JJ 4OY 4TI 5BPG (4), ZC4GB, ZDs 5X 8J 2-3, 8Z, some ZLs, 3A6EJ (19) 18, 4X4s RD VO (3), 8P6CJ (49), 7X8AH 9, 9A1B (5), 9J2VB, 9L1TL (22) 4 and 9V1LK. ---. ---. Up-band WN3s 3INI 4GSS 4GTI and 4IIF knocked off CT3AM (175), an HK or two, WH6GMW, WN4IQR/KH6 and other nifties amidst the howling SWBC bedlam.

80 c.w., at least for the summer up north, finds the bluish off its DX rose, although DX pretties may pop out of the static for Ws 1DAL ISWX 1VAH 4YOK, WAs 1CYT 1FHU 1GXE 8MCQ, WN4IIF and others undaunted by high noise levels. Oh, stuff like CR6NK, CX2BBT, DJs 2OU 2RT 4PX 68I 7IK 88V, Dks 1BN 2NB, DLs 1AY (30), 1GN 1RK (7), 1VU 9CC (2), DMs 2AJE 4, 2CZL 3BE 3OC 3WYF 4ZWL (6), 4ZXH (4), EI9J, ET3FMA (5) 19, Fs 2PO (2), 3OA 5LE (7), 8TM (10), Gs a-plenty, G13s OQR SKH, GW3s ITZ SVY, HAs 1SX (5), 3GF 3MB (7), 5DI (4), 5KDO (3), 9PH (7), HB9s 9EO 9LN (6), 9SJ (1) 19, H18RV, HK3RQ, HPIXHG (10), I11Z (7), JAs 1BRK 7XF, KV4AM (10), LAs 1XI 6EI (7), 6U (10), LU6HEE, LZs 1KAA 2KKZ (7), OEs 4JMB 5QEL (6), OH9NH, a mob of OKs, ONs 4HC 4XG 5GK (5) 8, OZs 1HO 4DX 4UN (5) 1, 7X, PA0FLX, PY1BTX, PZ1s AH (10) 7, CF (10) 6, a dozen Poles, SMs 4BJJ (7), 5WI 6CKV, T12WR, UAs 9GW 9KAZ (6) 17, 9KCO 9KOC 9KFG, UB5s KAA WJ, UG2s AA AR, UD6AM, UP6DF, UG6AD, UH8CS, UI8s AI AP, UL7s OG GW, UO5AR (10) 23, UP2KNP (6) 7, UO2s AN (10), MR, UT5s BJ KDP MG (7) 2, MM, VKs 2EO 2NS 2QL 2VN 3APN 3EZ 7SM, VO1AW (8) 0, VP8s 2MJ (2) 3, 2VL 7BG 7DX, YOs 3RF (7), 4WV (4), YUs 2FVW 2GAB 4AAW, ZL2AFZ 9-10, 3A2AC, 4L3A 1, 4U1TU, 4X4VO, 5Z4KL, 9H1s AG AM (10) 23 and AN.

10 c.w. performs admirably for Ws 1AYK 1VAH 3HMR 4YOK 5QGZ 8YGR, Ks 1FKW 3CUI, WAs 1CYT 1DJG 1FHU 3HRV 5PIF 5PPZ 8MCQ 9QBM and 11ER, thanks to CE2CR, CO6RM, CR8s 6CK (50) 12, 6HC (50) 9, 6HG (51) 8, 6ID 19, 6KB (45) 18, 7BN (40) 9, 7IZ (50) 16-17, CT3AS (80), CX8s ACC (56) 12, 4JK (50) 18, DJ2IB/CT3 (15) 17, DM2s AFD (47), AYJ (41), BYG (67), EI9s J (23), S (71), EP3AM (30) 15, ET3s FMA USA (22) 15, FH8CE (20) 10, G6ZY/GN (81) 16, GCs 2FMV (90), 3WMR/a (46), 3WQE/a (12), HA6LL (12), HGs 2KRD (90) 13, 6NC (47), H18IBC (25) 17, HK3s AVK BAE (45) 19, IT1AGA (43), JAs 1GWZ (20) 9, 3DGC 9, 3HCJ 8, 3NOC 10, 4DGG 10, 6BEE 7ERF 9JGO, KGs 4CX (80) 20, 6APD 22, KR8s 6KJ (45) 11, 8EA, KV4AD (88) 15, KX6FN 2, KZ5s GO 23, TS (20) 19, LA0AD (22) 10, LU8s 3EX (62) 16, 8DQ, OEs 1RG 18, 5CA (47), OYs 2H 5O (14) 18, PJ3CC (14), taboo PK1AA (1) 13, PYs 2BGL 2SO (14), 5ASN (30) 11, SFs 3AIJ 14, 6RT (47), 8AJ 14, 8BVH (41), 9AQE (41), ST2SA (20) 19, TAIQR (30) 8, TJI8s AG AJ (68) 17, AS (30) 14-15, QQ (40) 15, UAs 9CP 10, 9MX 10, UB5s KAB (52), LS (42) 18-19, UD6CR (30) 8, UF6DR (30) 11-12, UH8AE (70) 14, UI8BI (40) 11, UL7IT (34) 10, UM8s ABC (15) 12, AP (35) 10, UP2NX (41), UO2KCS (15) 14, UV3AAM (49), UW9KCV (50) 10, UV5AN (47), VKs 8HA (35) 12, 8NO 2, 9GN 22, VO1s AW (32) 15, HN (100) 18-19, VP8s 2MK (40) 15, 2VL 21, 7DX 8JG (45) 18, 8JH (50) 19, 8JT (37) 17, VO8s 8CC (25) 14, 9B (35) 19, VS6FX

(35) 10, XE1JD (56) 17, XW8BP (35) 11, YA1ZC (47) 10, YO8s 2BV (13), 7VJ (39), YS2OB (25) 17, YU3s 4EK (47) ER (38), ZC4s BI (30) 10, JU (58) 17, ZDs 5X (2) 15, 8J (33) 17, ZEs 1AS (14), 3JO (30) 19, ZSPQ (75) 19, 4L3A 13, 4S7RN (35) 12, 4Z1AG (60) 19, 5H3KJ (38) 16-17, 5U2AB (55) 10, 5Z4SS (75) 19, 6Y5s AR (16) 6, ET, 7P8AB (73) 17, 7OTLZ (85) 9, 7X6AP (85) 10, 8P6CJ (19) 15, 9GLHM (52) 15, 9V1s LK (15) 10, OC (37) 11 and 9Y4AT (45) 20.

160 c.w.'s following grows steadily with Ws 1BB 3DPE 9PNE 9VXO, WAs 1FHU and 6IVM in the "How's" 1.8-MHz. vanguard. After years of struggle and sweat the first Nine top-band WAC apparently has fallen to W9PNE. "I was about to give up entirely this year when I heard our League President, W0NWX, work KA9MF. I couldn't hear KA9MF but decided to continue scheduling Asians and try a different 240-ft. wire for 1995 ka. March 8th I finally worked KA9AKI" W0VXO keeps adding more JA/KA contacts to his Colorado log, sometimes switching successfully to s.s.b. W3DPJ finished his first year on 1.8 MHz. with 13 countries, five continents and 48 states, working 5Z4LE in March, and ZL3RB as late as April 27th. Other possibles on various 160-meter DX lists are GE3CZ, DJ8s 4SS (28) 23, 7YR (25) 21, DL9KRA, EIs 4AL (70) 0, 4AN 9J (25) 23, F3BQ, dozens of U.K. candidates including GCs 31EW (20) 5 and 8HT, HB9YL, JAs 1BHG 1RST 2CLI 3AA 4IO 7AO 7CQB 7NI 9BD, OE2JG (26) 23, thirty OK/OLs, PA6s BRM (27) 23, FCM GMU, PY2BJH (27), PZ1AH (27) 5, VKs 5KO (2) 20-21, 9GN, VO1FB (5), VP8s 2VL (3) 4, 7DX, YV1OB, ZB2s AP AY (25, 75), ZC4RB (74) 21 and ZE3JO (1) 3-5. How will revised Stateside 160-meter regulations affect DX doings? In the old Class B and C License days of thirty years ago the band was one roaring mess around the clock — plenty of short-haul fun! But we shall see.

That's all we have room for this trip but later on we'll scan other loggings, especially the phone doings of (20) Ws 1AYK 1DAL 2DY 2VOZ 4GTS 7BE 8IBX 8YGR 9LNQ, Ks 2UPD 4TWJ 9UIY, WAs 4WIP 5PPZ 5PUQ 6JDT SKRE 8MCQ 9TFM, J. Stevens; (15) Ws 2DY 4AJJ 4GTS 8YGR, WAs 3HRV 6JDT 9TFM F3VN/W2, Mr. Stevens; (10) Ws 2VOZ 4YOK 8YGR, K4TWJ, WAs 1IED 3HRV 8MCQ 9TFM; and, sooner or later, the 20-meter c.w. ledgers of Ws 1DAL 2ICO 6EAY 7BE 8IBX 8YGR, WAs 1FHU 11ON 3HRV 5PPZ 6JDT 9TFM, WB2ZNZ and 11ER, plus informants to file. Sunspots, keep it comin'!

Where:

SOUTH AMERICA — VP8JG (G3UAC) writes from Stonington island, "I will QSL all QSOs eventually. However, at this antarctic location I receive only one mail a year. Much also goes astray. I request all cards be sent via CX2AM or, preferably, through RSGB." ---. ---. Lack of liaison causes W3HINK to relinquish management of YV5CEY QSLs, but WB6TFE continues to represent YV5CIIL cardwise and promises one-day service for s.a.s.e. (self-addressed stamped envelope) petitioners provided log transcript is at hand. ---. DX News Sheet mentions E. Chilvers, 1 Grove Rd., Lydney, Glos., England, as a possible source of assistance toward QSLs from VP8s FL and JH. ---. "I've sent out some 24,000 QSOs for HK0AI since 1957, about half of these at my own expense," reports W9WIM, feeling that nobody should have trouble confirming this one. ---. A postal strike impeded most

Chile mail this spring, including outbound CE9AT pasteboards.

EUROPE—"UY5AD QSLd direct from Kiev," comments W6EAY, "the first Russian QSL ever received here outside bureau channels." WB1FJO says he can help expedite UAIKAC confirmations W1CW of ARRL's DXCC Desk has it that HV38J QSOs on December 17, 18 and 21, 1966, as well as April 4-6, 1968, can be confirmed via W6G00P WB2RLK undertakes MA17CRW QSL duties as of May 4, 1968 As a QSL route to EA6ITU *DX News-Sheet* recommends the League's 3rd call area bureau branch, attention W3MR WA1WIP skeds CT2AR (WAI-LEX) each Thursday for up-to-the-minute log transcripts that make for quick s.a.s.c. response. K2AGZ may now be of assistance toward CT2AS confirmations Calls, QTHs and other data pertaining to rumored Albanian amateur action threaten enough "How's" space to necessitate their omission. Thanks, nevertheless, for passing along word of all those "ZA" encounters. Eventually one may pan out!

AFRICA—"W7FFF logged some six thousand QSOs as a ZD8BB in 1965-'66 and the QSL chore got rough," remarks W6EAY. "I've asked RBC to furnish me with his logs, so anyone still minus a ZD8BB card may write to either of us." "I'm now QSLing for CR6LF QSOs on or after April 16, 1968," notifies W3HNK, already manager for GW3DZL, KV4PY, PA9COE, PZ1CF, SM5 5BUT #BUT, T12JCC, 4X1s RD and UH K6BIA iterates that QSLs for 5Z4DW should go direct or by way of HSGB, not via the RSEA bureau VQ8CC wonders why he's a "QSLer of the Month" in one *QST*, a QSL-wanted item in the next. Steve's a thorough QSLer, direct in response to International Reply Coupons, otherwise via bureaus ZE1JE of R&R announces, "Special multi-color QSLs have been printed and will be sent to all stations working ZE1WPC during its ten-day (April-May) period of operation."

OCEANIA—WA6MWG relieves K6ZDL as KG6IG's QSL tender. "Please be assured that we have all logs for KG6IG," writes Pete to W1CW, "and there will be no interruption in QSLing." WA6MWG and XYL Jessie also manage the confirmations of FK8AC, FO8BQ, HC5NW, HM2BD, KH6BH and KJ6DA Note the new address for W3DVG/KH6/KS6/VR6 in the catalog to follow. Ron answers s.a.s.c. requests direct, others via bureau, and wants no U.S.A.-issued IRCs. You may be running into Ron on 15 as K1DWU VERNON's *DX pressays* 5W1AT became 5W1AR in April, still QSLing through W1ZXTI "I have VR2DI logs for QSOs from March 23, 1968," advises VE6TK, Bill's QSL manager since this April 1st. Dunc reminds W/K applicants that U. S. postage isn't usable in Canada, so submit s.a.c. with IRCs when patronizing VE/YO QSL agents KH6GJW (WB6GFD) is unable to assist with VR3DY-KH6GLQ QSLs and recommends reaching Ed via Box 762, Kaaunakakai, Molokai, Hawaii, 96748 K1I6-EDY's operator Ed tells W6EYM his activity has been on 20 only; scratch the 21-MHz. c.w. model active this spring L1DXA's *DX Bulletin* observes that Nauru's VK9RJ is an avid philatelist who appreciates help with his collection VK6LA QSLs go via VK7ZKJ, VK6JW cards via VK3UQ, according to the latter's advice to W6RFB P.O. Box 2127, Djakarta, and P.O. Box 8, Bandoeng, are possible QSL paths

to Indonesia's reviving ham population An Australian post office fire apparently destroyed some outbound VK5XK/VK2 QSLs. If your Lord Howe pasteboard is overdue, recheck with VK5XK "If VK9KS manages to get on from the Solomons as planned, I'll handle his QSLs," forewarns W1YRC.

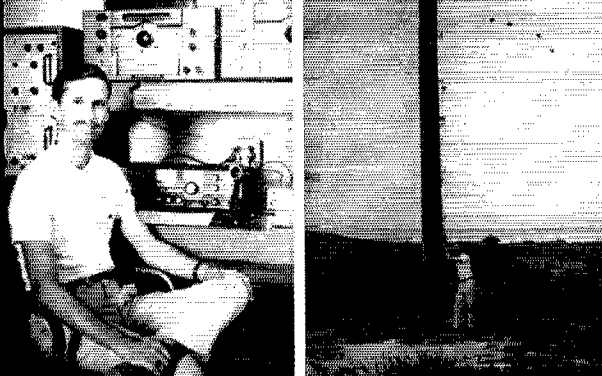
HEREABOUTS—"W2OFB has agreed to undertake QSL chores for H18s GGG and LC for QSOs after February 1, 1968," states W9SZR/4. "Ex-H18RVD has gone the equivalent of incentive licensing with the result that his call now is H18RV. K3EST continues to be manager of his QSLs for QSOs after January 1, 1968. No logs are available for H17JMP and H18RVD QSOs prior to 1968." W3RX prescribes reference to the *Postal Manual*, Chapter 2, International Mail, Subchapter 220, Part 221.25, for discussion of International Reply Coupons in minute detail W6SSO is QSL rep for T18ABL and XE1DP, no others "Wonder how many old-time DX men recognized the author of 'A 500-Watt Power Inverter' in May *QST* as an old K4NI of 1928 Navassa island fame," muses W4ZZ. "I hooked him forty years ago with the standard '10 Hartley, indoor wire and O-V-2 blooper. Ten years later I spotted his name as author of another *QST* article, wrote him and got his K4NI QSL for 1938 DXCC credit." W6N now holds all W9NW DXpeditionary logs at his old W6QKC address. "Cards will be answered directly if enough IRCs or postage is included with requests. Otherwise QSLs will be sent via bureaus. . . . Within a year or two everyone making contact with those DXpeditions should receive cards." W5SUHG adds his call to the list of those offering to perform as QSL managers for DX stations in need, and s.w.l. J. Stevens is establishing a pool of such volunteers known as QSL Managers International at 1703 E. Washington St., Bloomington, Ill., 61701. "We will mostly enlist short-wave listeners wanting to take on managerial duties but will welcome hams as well." W5PM designates W5BUK as FG77C's QSL aide on the traditional s.a.s.c., or s.a.c. with IRCs, basis WA3EFT feels his 132/86 countries worked/confirmed ratio is pretty measly but it seems to be in line with general findings. All depends on how fast you work 'em and how diligently you dig for QSL holdouts. By the way, W4JUK and WA4WP seek word on CE6XE; W4GTS is stamped by JY1BA and ST2PO; W8MLX hunts for ex-P7CP; WA3EFT digs for confirmations from FB5Y, OI0NL, OX3s KI LP, PX1GS, VP2AZ, VQ9B, VSASQ, XP1AB and 7Q7RM. Any 'alp? Your "QSLers of the Month" turn out to be CR6DI, DJ5GL, DU1s PH OR, EA0AH, ET3-USA, FO8BS, G2MI, GC3GS, GD3R/PK, HK0BKX, I1SAT, KS0CQ, LZ1BW, OH2BLR, P15MI, SK6AB, SVs 1AN 0VL, 1G9GF, T12DO, T11AS, TR8AG, VK9s GN XI, V0LAW, YK1AA, ZD3D, 4A1LLS, 5U7AL, SP6AY, 9M2LN and 9N1MI, plus QSL tenders Ws 2CTN 2G1HK 3KVQ 4OPM 9JVF, K9GCE, WA6AIF and VE3IG, each specially commended in this month's dispatches from front-line "How's" correspondents Ws 1D4L 4UP 8YGR, K5LL, Ws 11ON 21IU 9TFM and F3VN/W2 for pasteboard punctilio. Any quickies you want saluted here?

ASIA—HM1AJ writes, "My QSL manager since February 10, 1968, is W2CTN. Cards with International Reply Coupons will also be answered direct by myself, 100 per cent." W0CSZ finds that AP4TBO QSLs are issued by VE1ASJ only on receipt of reports of S3 or better. Oil up that 8-meter! S.a.s.c. or s.a.c. with IRCs from non-W/Ks, will secure 4ZHIP QSLs from WB2WOU, an arrangement effective April 1, 1968 K1TWJ disclaims XW8 QSL connections, but K1UHY still manages 9V1MS-9A18MS pasteboards and says, "Many cards arrive with no s.a.s.c. or IRC's courtesy. Most of these seem to be from newer DXers who are unaware of customary QSL procedures." Time to restate that for direct reply, unless specifically waived, self-addressed stamped envelopes (self-addressed envelopes with International Reply Coupons when appropriate) should be included in mailings to QSL managers herein designated. This is proper practice when seeking postal response from anyone, for that matter. Now for a scamper through individual specifications suggested in "How's" mail, being mindful that each recommendation is necessarily neither "official," complete nor accurate:

- CP8AZ, Box 64, Riberalta, Bolivia
- CR6LF (via W3HNK; see text)
- GR7IC, P.O. Box 135, Porto Amelia, Mozambique, E. Afr.
- GT1RT, P.O. Box 3, Oliveira de Azemais, Portugal
- DL4JP (via K7YUC or 11DFE)
- F3VN/W2, P. Turillon, 38 Skytop Dr., Ramsey, N. J., 07446
- FG7TF, G. Soussing-Luzio, 35 rue Bebian, Pointe-a-Pitre, Guadeloupe
- FH8CF, P.O. Box 304, Moroni, Comoro Islands
- FO8BX, P.O. Box 545, Papeete, Tahiti
- FR7ZR, J. P. Viode, Stn. Seismologique de la Plaine des Cafres, Reunion Island
- FR7ZS, M. Daverat, Box 130, St. Pierre, Reunion Island



5Z4SS is a widely worked member of the Nairobi DX gang. Ernie particularly enjoys the current 21-MHz c.w. boom. (Photo via WA3HRV and WN3JAB)



VP5C (K3NAU), very popular on 10, 15 and 20 phone with his one-element triband quad, expects to represent South Caicos until March of '69. Charlie favors 28,650, 21,350 and 14,337 kc., the latter in a Coast Guard net Mondays through Fridays at 1600-1700 GMT. VP5s AA and AB also are frequently available from the Turks & Caicos. (Photo via K3WUW)

(A. Miller, 62 Warward Ln., Selly Oak, Birmingham, 20, England), Japan DX Radio Club *Bulletin* (JA1DML), Long Island DX Association *DX Bulletin* (W2GKZ), Newark News Radio Club *Bulletin* (L. Waite, 39 Hannum St., Ballston Spa, N. Y., 12020), North Eastern DX Association *DX Bulletin* (K1AMP), Northern California DX Club *DXer* (Box 608, Menlo Park, Calif., 94025; attn. K6CQP), Southern California DX Club *Bulletin* (WA6GLD), Utah DX Association *Bulletin* (W7LEB), *VERON'S DXpress* (PA9s FX LOU TO WWP) and West Coast *DX Bulletin* (WB6UJO).

Whence:

SOUTH AMERICA — ICRA announces this year's all-mode Independence of Colombia DX Contest slated to run from 0001 GMT July 20th to 2359 the 21st on 10 through 80 meters. North American stations earn 3 points per HK contact, 1 point per non-HK contact, and for final score multiply contact-point total by the sum of HK call areas and band-countries worked (no crossmode work allowed). Trade the usual RS- or RST001, RST002, etc., serials. Logs, a separate sheet for each band and mode, go to Colombia Independence Contest, % ICRA, Box 581, Bogota, Colombia, for arrival no later than September 30, 1968, to be eligible for trophy and certificate awards. "I've been active in Grahamland for the past sixteen months," acknowledges VP8JG (G3UAU), "and have had hundreds of contacts with W/Ks who display a fine standard of c.w. operating." VP8JG will have single-sideband gear available henceforth. . . . KC4U5Y swaps local 14-MHz. QRM with neighbor ZL5AA on Ross island.

EUROPE — DARC (Germany) invites amateurs throughout the world to participate in its *WAE DX Contest*, No. 14 in the series, scheduled for c.w. from zero GMT, August 10th, to 2400 the 11th, and phone on September 14th-15th, same times. Non-Europeans will trade. RST001, RST002, etc. (no "T" on voice of course) with Europeans one per band at one point per QSO (2 points per 3.5-MHz. QSO). Additional points are yours by sending "QTC" (QSO reports) to European stations at one point per QTC. Each QTC consists of (1) time in GMT, (2) station call, and (3) QSO number of any previous WAE Test contact. For example, WA9BRC raises DJ9YL and earns a contact point thereby: WA9BRC previously worked G3LUV at 1207 GMT for G3LUV's 96th Test QSO. So, besides the QSO point for his serial swap with DJ9YL, another point goes to WA9BRC if he successfully transmits "1207/G3LUV/096" to DJ9YL. WA9BRC can work DJ9YL later on the same band only for sending additional QTC. Over the entire Test period each QTC can be sent to Europe by WA9BRC but once, and DJ9YL can accept no more than 10 QTC per band from WA9BRC. Thus the more Test QSOs accumulated, the more QTC are available to parlay into additional points. *Scoring:* Multiply combined QSO and QTC points collected on all bands by the combined numbers of multipliers collected on all bands, the latter deriving from DARC's Worked-All-Europe Countries List — CT1 CT2, Germany, Spain, EA6, EI F FC G GC GI, Scotland, Shetlands, GW HA, Switzerland, Liechtenstein, HV I IS IT, Norway, Bear Island, JW JX LX LZ, San Marino, OE OH OIH OK ON OY OZ, Holland, PX, Sweden, SP, Greece, Rhodes, Crete, European Turkey, TF UA/UV/UW-18 UB/UT/UY5 UC UN UO UP UQ UR, Franz Josef Land, YO YU ZA ZB2 3A and 9H1. Entries go to W. Skudlarek, DJ6QT, An der Klostermauer 3, D-6471 Hirzenhain, West Germany, postmarked no later than September 15, 1968 (c.w.) or October 15, 1968 (phone). Top Test performances in many regions will be rewarded with testimonials of merit. *Note:* Work no more than 36 of the 48 available hours each week end, and split the 12 hours not used into no more than two rest periods. . . . TF2WLC is manned by WA4BNT at Keflavik airport, and WA4PED says Wayland will be there for the Navy till next January. . . . DM2ATL's research indicates that DM3 3YPD 3ZLQ 3MSF 3FA 3BE 4SBO 2CPL 3ZIC 2CUO and 4WKL finished in that order in the c.w. section of this year's ARRL DX shesbang. The '68 WADM DX Test is scheduled for the third week end of October, more details subsequently. . . . WB6JKQ and K7YUC help keep 11DFE active on 10, 15 and 20, c.w. and a.s.b. JKQ is angling for San Marino DXpeditionary fun. . . . A special REF activity honored pioneer French physicist Gustave Ferrie on May 25th-26th, and Sevran Radio Club's F5KD promoted feverish anniversary DX activity in April on 7, 14 and 21 MHz. . . . That May I26KBD outburst occurred on the rare isle of Ponza, according to

(Continued on page 148)

- HC2RZ, Box 6500, Quito, Ecuador
- HI8s GGG LC (via W2OFB; see text)
- HM1s AJ AM (via W2CTN; see text)
- HR4ET, Box 3, Amapala, Honduras
- I1DFE, P.O. Box 421, APO, New York, N. Y., 09293
- I5IJ, T. Privitera, I1IJ, 10 Piazza Bologna, 00162, Rome, Italy
- IOART, P.O. Box 511, Florence, Italy
- K6BAG/8P6, D. Jessen, USNavFac, FPO, New York, N. Y., 09553
- KS6CT, W. Hallberg, Dept. of Education, Pago Pago, U.S. Samoa, 96920
- MP4TCE, Amateur Radio Club, RAF Sharjah, BFPO 64
- PK8YGR, P.O. Box 8, Bandoeng, Indonesia
- SK5A, Box 6, Mjolby, Sweden
- SM7CRW (via WB2RLK; see text)
- TAs IAM IIB 1RT 2SG, via R. Guard, jr., K4EPI, P.O. Box 7542, Patrick AFB, Fla., 32925
- SP5CLK (via W1RLV; see text)
- TL2WAS, Box 3461, San Jose, C.R.
- UY5AD, P.O. Box 533, Kiev 4, Ukrainian S.S.R., U.S.S.R.
- VP2s GBG GBH (via VE3DLG)
- VPs 5RS 7HC (to ZD8CC)
- VQ9s B, DH, P.O. Box 191, Mahe, Seychelles
- WU2DIA, B. Heade, IPWS Stn., Panjma, Goa, India
- YD2DWG/KH6/KS6/VR6/mmm, R. Maples, K4DWU, Rt. 3, Box 12, Fuquay-Varina, N. C., 27526
- YU7LBC (via K7YUC or I1DFE; see text)
- ZD8CC, R. Strong, % RCA/MTP, Ascension, Patrick AFB, Fla., 32925
- 4Z4HF (via WB2WOU; see text)
- 5VZAB, P.O. Box 362, Lome, Togo
- 7P7WW, Box 453, Blantyre, Malawi
- 8P6CA, J. Richardson, Warners Terr., Christ Church, Barbados
- 9K2BJ, P.O. Box 8419, Kuwait
- CNS8E (via W2GHK)
- CR7FLM (via LREM)
- CT2AR (via WA4WIP)
- DJ2IB/CT3 (to DJ2IB)
- FC2CD (to F2CD)
- FC7TG (via W5BUK)
- FG7TI/FS7 (via K9GCE)
- FK8AU (via VE3ACD)
- FO8CA/p (to F2BS)
- GB3MEE (via G3RAD)
- G3PRC (via G3WGW)
- GC5ASF/a (via RSGB)
- GE3AOB (via WB6RYN)
- HB9WN (to HB9WN)
- HI8RV (via K3EST)
- HI51BD (to W6HDO)
- HI53DR (via K7CBZ)
- HI53TM (via K3LTU)
- HI53ZZ (via K3FYS)
- HV3SJ (see text)
- IOART (via I1LA G)
- I26KDR (via VE3ACD)
- JY1HRU (via JA1EZM)
- K5HQR/KS4 (to K5HQR)
- KG6IG (via WA6MVG)
- KH6GLU (see text)
- KM6DE (to K6LVJ)
- KW6GH (via W2CTN)
- PX1KT (to F3KT)
- PX1SZ (to DL6SZ)
- PX1VU (to DL3VV)
- TF2WLC (via WA4PFD)
- UA1KAC (see text)
- VK9KS (via W1YRC)
- VK6VK (via VK6CD)
- VP2VJ (to KP1DBU)
- VP8JG (via RSGB)
- VR2DI (via VE6TK)
- VR3DY (see text)
- WA4MP/KH6 (to K4BS)
- WA9ROV/KG4 (via W9MSG)
- XE0EUQ (to W8EUQ)
- YU7LAE (to SM5PW)
- YU5CIL (via WB6TEE)
- ZB2BC (via ZB2A)
- ZC4RAF (to ZC4AK)
- ex-ZD8BB (via WA6FAY)
- ZF1WPC (via RSR)
- ZF1RD (via K8LSG)
- 3A0EJ (to DK1KO)
- 5Z4LK (to VQ8CC)

Your committee on QTHs this run: Ws ICW 1DAL 2DY 2IC0 2VOZ 4GTS 4UF 4YOK 4ZZ 5PAI 6EYMI 6RFB 9SRZ, Ks 3UZZ 3WUW 4TWJ 6BIA 8SLG, WAs 1PHU 1IED 2WGS 3HVR 4WIP 5MCQ 9TFM, WBS 2ZNZ 6GFJ, F3VN/W2, KH6GJW, ZE1JE, Canadian DX Association *Long Skip* (VE3DLG), Columbus Amateur Radio Association *CAR Scope* (W8ZCQ), DARC's *DX-MB* (DL3RK), *DX News-Sheet* (G. Waits, 62 Belmore Rd., Norwich, Nor.72.T, England), Far East Auxiliary Radio League (MI) *News* (KA2LL), Florida DX Club *DX Report* (W4BRB), International Short Wave League *Monitor*



Operating News



GEORGE HART, WINIM, Communications Manager

ELLEN WHITE, WIYYM, Deputy Comms. Mgr.

Administration: LILLIAN M. SALTER, WIZIE

DXCC: ROBERT L. WHITE, WICW

Contests: ROBERT HILL, WIARR

Training Aids: GERALD PINARD

BPL Medallions. At the bottom of each BPL column there is reference to a 1954 issue of *QST* for details about the BPL Medallion. This seems a long time back, and it has been requested that the information be repeated; so here goes.

At the Board Meeting in 1954, it was moved and carried that medallions be issued to each amateur who "made" BPL the third time. These took the shape of small bronze miniatures with a ring at the top for dangling from a watch chain or otherwise affixing to one's clothing. It was to be a sort of status symbol, something to be worn by traffic men who have achieved the BPL three times or more since June 1, 1954.

The BPL medallions are issued automatically by headquarters, without necessity for application, on the basis of records kept of BPL listing for each amateur who makes it. The third time his call appears on the BPL list, he is sent a small affidavit card on which he indicates that all traffic was handled in standard ARRL form on amateur frequencies. When he has signed the card and returned it, a blank medallion is sent down to the engraver's to have the call letters engraved on the back. It is then shipped to the expectant recipient—free all the way.

There is only one medallion to a customer. You don't get one every three times you make the BPL, only the first time. It's a one-shot award. You also don't get it immediately after you submit your third BPL total. The BPL has to be included in your SCM's report and printed in *QST*, then the wheels begin to move. In general,

allow six weeks after you send in your third BPL total before you begin to feel you have been overlooked.

As with all contests and awards, questions keep popping up. For example, a husband and wife team make BPL jointly. Someone changes his call. Someone else moves. How about MARS traffic? How about clubs and club stations? All these questions can be answered (we hope) by the essential rule that only individual amateurs working at their own stations are eligible for this award. You cannot qualify by operating someone else's station, nor can the person whose station you operate qualify on traffic you handle for him. Club and military-base amateur stations are not eligible. MARS traffic (i.e., the traffic handled on MARS frequencies) does not count. No "joint" traffic totals can be counted—if husband and wife use the same gear that's quite all right, but they have to use their own calls in handling the traffic and in counting it.

All OK on BPL medallions, now? The note at the bottom of the box will now be changed to refer to July, 1968, *QST*.

Dummy Loading. How often have you tuned around the band and found a lot of "dead" carriers blazing away, or been bothered by them during a contact? Plenty, we'll bet. The FCC requires that you log and identify each transmission made, but we'll wager very few operators either log or identify a transmission made simply to tune up an antenna. Or listen on the frequency before doing so either, in all probability. At least

OPERATING EVENTS (Dates in GMT) ARRL-IARU-SCM-Affiliated Club-Operating Events

July	August	September
7 LO Time (League Officials only) 11 Qualifying Run, W6OWP 12 Qualifying Run, W1AW 13-15 CD Party (c.w.)* 20-21 Independence of Colombia Contest (p. 98, this issue). 21 Minnesota QSO Party (p. 106, this issue). 20-22 CD Party (phone)* *League Officials and Communications Dept. Appointees only.	2 Qualifying Run, W6OWP 3-4 Md.-D.C. QSO Party (p. 104, this issue). 4 LO Time (League Officials only) 10-11 WAE DX Contest, c.w. (p. 98, this issue). 17 Qualifying Run, W1AW 17-18 Indiana QSO Party (p. 105, this issue) New Jersey QSO Party	5 Qualifying Run, W6OWP 7-8 VHF QSO Party VU/487 Contest (c.w.) 8 LO Time (League Officials only) 11 Frequency Measuring Test 14-15 VU/487 Contest (phone) WAE DX Contest (phone) 17 Qualifying Run, W1AW 26-28 YLRL "Howdy Days" Oct. 12-14 CD Party (phone) 19-21 CD Party (c.w.) Nov. 9-11 SS (phone) 16-18 SS (c.w.)

that's the impression one gets from tuning across a band during the busy part of the day. For every station in contact or trying to make contact, it seems there are half a dozen tuning up.

Matter of fact, quite a few letters are being received commenting that WIAW's frequency during bulletins and code practice seems to be a popular antenna-tuning-up spot; but that's another story.

For most tuning purposes, a dummy load does the job. How do you make a dummy load? Easy, just solder an electric light bulb onto the end of a piece of coax and connect the other end to your transmitter output. If the bulb blows, use a larger one. Of course you can use a large resistor instead, but the bulb has the advantages of visibility for tuning to maximum output. If you want to be sophisticated, there are some good dummy loads available commercially. For testing the output of an amplifier, throw that dummy onto the output; don't do your testing on the air.

When it comes to finding out how an antenna loads, or if it will load, or how to make it load, you have a slightly different situation. Some on-the-air testing is often necessary; not as often as you think, but once in a while. Some pencil-and-paper calculation and careful measurements can avoid a lot of fiddling around. If you cut a dipole to length, feed it with coax, make sure the output is matched to the input, it'll load. Same with a beam, yagi or quad or what-have-you. Construct it right and you'll have a minimum of cutting and trying. If you do have to put a signal on the air while you're loading up, take a

listen first. Avoid clobbering a QSO or a net. Even if the band is crowded, there is usually some spot you can use for your non-communicating emissions. Nothing is so maddening as having some idiot with a warbulating carrier plop on a frequency you are using and send twiddle-de-twa, twiddle-de-twa, a few NST's and more warbulating carrier — or a "Hellooooooo test" and a slow count from one to four and back. Sometimes the band sounds like a bunch of harmonic's.

How about some mutual cooperation in keeping this kind of garbage to a minimum, fellas? — WINJM.

CODE PROFICIENCY PROGRAM

Twice each month special transmissions are made to enable you to qualify for the ARRL Code Proficiency Certificate. The next qualifying run from WIAW will be made July 12 at 0130 GMT. Identical texts will be sent simultaneously by transmitters on c.w. listed frequencies. The next qualifying run from W6OWP only will be transmitted July 11 at 0400 Greenwich Mean Time on 3590 and 7129 kc. **CAUTION!** Note that since the dates are given per Greenwich Mean Time, Code Proficiency Qualifying Runs in the United States and Canada actually fall on the evening previous to the date given. *Example!* In converting, 0130 GMT July 12 becomes 2130 EDST July 11. Each month the ARRL Activities Calendar notes the qualifying run dates for WIAW and W6OWP for the coming 3-month period.

Any person can apply. Neither ARRL membership nor an amateur license is required. Send copies of all qualifying runs to ARRL for grading, stating the call of the station you copied. If you qualify at one of the six speeds transmitted, 10 through 35 w.p.m., you will receive a certificate. If your initial qualifications is for a speed below 35 w.p.m. you may try later for endorsement stickers.

Code practice is sent daily by WIAW at 2330 and 0130 GMT, simultaneously on all listed c.w. frequencies. At

WIAW SCHEDULE, JULY 1968

The ARRL Maxim Memorial Station welcomes visitors. Operating-visiting hours are Monday through Friday 1 p.m.-1 a.m. EDST, Saturday 7 p.m.-2:30 a.m. EDST and Sunday 3 p.m.-10:30 p.m. EDST. The station address is 225 Main Street, Newington, Conn., about 7 miles south of Hartford. A map showing local street detail will be sent upon request. If you wish to operate you must have your *original* operator's license with you. The station will be closed July 4-5, in observance of Independence Day.

GMT*	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
0000	.....	CW-OBS ¹	CW-OBS ¹	CW-OBS ¹	CW-OBS ¹	CW-OBS ¹	CW-OBS ¹
0020-0100 ⁴	.....	3,555 ⁶	3,555 ⁶	14.1	14.1	7,08 ⁶	14.1
0100	.....	Phone-OBS ²	Phone-OBS ²	Phone-OBS ²	Phone-OBS ²	Phone-OBS ²	Phone-OBS ²
0105-0130 ⁴	.....	145.6	3,945	145.6	50.7	1.82	21.41
0130	Code Practice Daily ¹ 15-35 w.p.m. TThSat., 5-25 w.p.m. MWFSun.						
0230-0300 ⁴	.....	.....	3,555	7.08	1,805	7.08	3,555
0300	RTTY-OBS ³	.....	RTTY-OBS ³	RTTY-OBS ³	RTTY-OBS ³	RTTY-OBS ³	RTTY-OBS ³
0310-0330 ⁴	.....	.....	3,625	14,095	3,625	14,095	3,625
0330	Phone-OBS ²	.....	Phone-OBS ²	Phone-OBS ²	Phone-OBS ²	Phone-OBS ²	Phone-OBS ²
0335-0400 ⁴	.....	.....	7,255	3,945	7,255	3,945	7,255
0400	CW-OBS ¹	.....	CW-OBS ¹	CW-OBS ¹	CW-OBS ¹	CW-OBS ¹	CW-OBS ¹
0420-0500 ⁴	.....	.....	3,555 ⁶	7.08	3,945	7,08 ⁶	3,555
1700-1800	.....	21/28 ⁵	21/28 ⁵	21/28 ⁵	21/28 ⁵	21/28 ⁵	.....
1900-2000	.....	14.28	7,255	14.28	7,255	14.28	.....
2000-2100	.....	14.1	14.28	14,095	21/28 ⁵	7.08	.....
2200-2300	.....	21/28 ⁵	21,075 ⁶	21/28 ⁵	7,255	14.28	.....
2300	.....	.....	.....	RTTY-OBS ^{3,7}	.....	.....	.....
2330	Code Practice Daily 10, 13 and 15 w.p.m.						

¹ CW-OBS (bulletins, 18 w.p.m.) and code practice on 1,805, 3,555, 7,08, 14.1, 21,075, 50.7 and 145.6 Mc.

² Phone OBS (bulletins) on 1,82, 3,945, 7,255, 14.28, 21.41, 50.7 and 145.6 Mc.

³ RTTY OBS (bulletins) on 3,625, 7,045, 14,095 and 21,095 Mc. 170/850 cycle shift optional in RTTY general operation.

⁴ Starting time approximate. Operating period follows conclusion of bulletin or code practice.

⁵ Operation will be on one of the following frequencies: 21,075, 21.1, 21.41, 23.08 or 28.7 Mc.

⁶ WIAW will listen in the novice segments for Novices on band indicated before looking for other contacts.

⁷ Bulletin sent with 170-cycle shift, repeated with 850-cycle shift.

Maintenance Staff: W1QIS W1WPR. * All times/days in GMT. general operating frequencies are approximate.

DXCC NOTES

As a result of discussions at the May meeting of the ARRL Board of Directors, we are pleased to announce the following with regard to DXCC endorsements.

To review current policy, submissions for DXCC endorsement are made on a basis of 20 for those whose totals are below 300. For example, if you have a present actual total of 120 confirmations now credited, you should not make a further application until you have 20 (or more) cards to submit. This would let you reach (or pass) the next 20-level endorsement, i.e. 140. Another example: If you have a present actual total of 125 confirmations credited, you would not make further applications until you have 15 (or more) cards to submit, allowing you to reach (or pass) the next 20-level endorsement, i.e. 140.

Effective July 1, 1968, for those having an actual accredited total of 300 or better the submission basis will be 5, rather than the previous basis of 10. For example, should you have an actual total of 300, you will be able to make a further application when you have 5 (or more) cards. This would allow you to move up to the 305 level. If, for example, your current actual accredited total is 303, 2 (or more) cards would be acceptable since that too would bring you up to the 305 level. Please note that no endorsement stickers will be issued for these intermediary levels. Stickers will continue to be given for even 10-level marks and the QST endorsement listings will be shown at the appropriate 20-mark level (between 100 and 300), and the 5-mark levels above 300.

Honor Roll credit submissions will continue to be accepted during March and September only, for the June and December QST Honor Roll listings. If you are not currently on the Honor Roll, but have enough cards to bring your new total up to (or past) that of the last-place position shown on the previous Honor Roll listing, you may submit the new cards during March and September.

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Announcement is hereby made of two deletions to the ARRL Countries List. These deletions are *Y59H . . . Kuria Muria* and *ZC6 . . . Palestine*.

Contacts made with Kuria Muria November 30, 1967 and after will be considered the same as contacts with Sultanate of Muscat & Oman (ALP4M, VS9O).

The ZC6, . . . Palestine listing, comprised of the UN Truce Area bordering on Israel, no longer exists and therefore that listing is being deleted.

Honor Roll totals which will appear in the December, 1968, issue will have these two deletions made to them automatically.

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Reference is made to the DXCC Note appearing in the May, 1968, issue. The VP2ME confirmations and operation mentioned in that DXCC Note are not concerned with the operation by ZD8HL, ZD8WZ and ZD8RD in January, 1966, as VP2ME. QSLs for VP2ME contacts dated January 25 to 28, 1966, can be, and have been, accepted for DXCC credit.

(Continued on 132)



DX CENTURY CLUB AWARDS



From April 1, through April 30, 1968, DXCC Certificates based on contacts with 100-or-more countries have been issued by the ARRL Communications Department to the Amateur listed below.

New Members

HB9MD . . . 253 W6IDW . . . 226 W9AB . . . 155 W0DAD/6 . . 147 K4BBK . . . 142 SM4DJE . . . 141 W1DTP . . . 137 PN7A0D . . . 131 W1LQN . . . 131 W1LWZ . . . 127	YU2RAZ . . . 127 W0WUA . . . 123 O96GC . . . 122 W4AAMT . . . 121 K71AE . . . 119 9H1AK . . . 116 DLXAX . . . 115 J43CF . . . 114 DL4XG . . . 113 PY1NO . . . 108	G3PEJ . . . 106 D148CC . . . 105 G3VDL . . . 105 LA7QI . . . 105 OE2HVL . . . 105 W3DNL . . . 105 Y03KA . . . 105 H1MFM . . . 104 OK1ARN . . . 104 DL4SV . . . 103	W4AST . . . 103 W6NEX . . . 103 HA1KVM . . . 102 K9KVR . . . 102 OK2BCI . . . 102 SM3ABG . . . 102 W8KYD . . . 102 W6LZO . . . 102 DL8QP . . . 101 KZ5AJ . . . 101	VE1ZT . . . 101 YF6VY . . . 101 W1AGA . . . 101 ZL1AAF . . . 101 G3IDJ . . . 100 K1KNQ . . . 100 K1UJX . . . 100 K3Z6K . . . 100 K44G . . . 100 K4TSJ . . . 100	K8VBS . . . 100 WA1GYF . . . 100 W42CFD . . . 100 WB2O1Z . . . 100 WB4FJO . . . 100 W48LSP . . . 100 WA9TFL . . . 100 VE3CAA . . . 100 VE4AF . . . 100 Y09HL . . . 100 YU5XID . . . 100
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Radiotelephone

SM5BCO . . . 289 VE5J8 . . . 146 HB9MD . . . 139 K4VYN . . . 137	W0DAD/6 . . 125 WA5LMG . . . 121 W1DTP . . . 119 YU2RAZ . . . 119	WB4AMT . . . 114 KR6ALB . . . 113 W3LF . . . 112 HA5DG . . . 109 ZB2AO . . . 107	WB4EEM . . . 104 K2PXX . . . 103 OE1CEW . . . 103 W4AST . . . 103 W80VM . . . 103	GP5ED . . . 102 G3VZD . . . 101 WB2BDL . . . 101 W6A8A . . . 101 WA9FZQ . . . 101	K4DPG . . . 100 KR6TAB . . . 100 OK1ZL . . . 100 WB4CGY . . . 100 W9UHD . . . 100
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Endorsements

Endorsements issued for confirmations credited from April 1, 1968, through April 30, 1968, are listed below. Endorsement listings through the 300 level are given in increments of 20, above the 300 level they are given in increments of 10. The totals shown do not necessarily represent the exact credits given but only that the participant has reached the endorsement group indicated.

330 W6UOV	WB6OOP K2PXX K6EDE	WA4LXX W9UIG W0PAH	K8YIP W1PYM WA7FIG W9NNC WA9IVL	W7YBX	W9UTQ	W4MOJ	W9RCF WA9LMY W9VCQ
320 W9HB	280 PY7YS WA2DLJ W6RGG W9WKU X72YP	240 K4GSS K5SSZ PA0VO W9LKJ WA9IBT	200 DJ4XA 11LCL K3BSY W1MLJ WB2PWU W4EJL	180 DL7CT K1EIN K6YUI VE5JS WA2UBC W3GJR W4JD W4USM WB6CPE W9BMD	160 K2DNL G5PQ HB9ADD OK2FO SM3GJD VE3BX VE4XN VE5DP WA2LOR W3UHN	140 GM5AFF H8ZE K2DDK K4RSM PY5QE VE3FYF W4PEW W4WHK WA4FFW WA4SYA W5IRG	120 DJ3YC K2CC VE2BUW WA1FU WA2QFE W4EXO W4HY WA5LMG W7GX

Radiotelephone

330 DL1IN W2HTI	W2FGD W0MLY	240 K0BUR W5GXP	W6DZZ W6RGG W8GUZ W8LUZ W9WKU 7P8AR	K5QHS K8VCB K4RQZ K9IFL VE4AS W6YYS W6PTS XE1MMM	K4RHL W9DOR	120 K8THT K8YIP WA1BJY WA1HN W5LXX W5NQR W4SNQJ W6ZC WB6OYM W8PQD W6SHY
310 K6CYG W2MES W4RLS	280 PY7YS W8CUO XE2YP	220 F5IA HYRK W1WKO W2MOP WB2WOH W5RNG	200 H1KI HLCL	180 K2BQO	160 11ZV WB2OLN WB2RLK W7YBX	140 DU1FH F5SJ W82RLK W3MDJ W4PEW W6ZC W8HX W6SHY

ATLANTIC DIVISION

DELAWARE—SCM, John L. Penrod, K3NYG—RM: W3EEB, PAM: W3DKX, W3DNN has been appointed by Chief Army MARS to handle telephone relay traffic; W3ACDV vacationed by camping at Indian River; W3GSM has a new antenna system; a new Galaxy transceiver boosts K3CVZ's air time; new Novice WN3-KFF is the son of W3CZS; K3WLP boosted his 2-meter station to 300 watts and 44-element antenna; W3DKX, W3TKM, W3CZK and K3URP have volunteered to man the civil defense RACES station at the State C.D. Center. W3WR visited W3MIK and talked at long lengths about the olden days of ham radio. Everyone attending the Army MARS Dinner reported that they enjoyed themselves. Net reports: DEPN, QTC 5, QNI 66; DTAIN, QTC 12, QNI 20; DSAIN, QNI 54, QTC 1. Traffic: W3EEB 184, W3DKX 50, W3GSM 15, W3-HWC 5, K3NYG 4, W3ADUM 2.

EASTERN PENNSYLVANIA—SCM, George S. Van Dyke, Jr., W3HK—SEC: W3AES, RMs: W3EML, K3-YG, K3MVO, W3MPX, PAM: K3MYS, V.H.F. PAM: W3FGQ, EPA, QNI 383, QTC 630; PFN, QNI 566, QTC 678; PTTN, QTC 442; EPA V.H.F., QNI 281, QTC 448; EPAEP&TN, QNI 547, QTC 324. OO reports were received from W3FGQ, W3BFF, W3NNG, K3HNP, K3EMA, K3WEU and K3RDT; OVS reports from W3FGQ, W3EMQ, W3CL, W3EEC, W3JHT, W3-ALZ and W3BJQ; OBS reports from K3RDM, W3-EEC, W3AFI and K3WEU; FMT reports from W3-BFF, W3PF, K3LPD, W3KNG, W3JET, W3HKL, W3-PHF, K3DEX, W3BGN, W3NNG, K3HNP, K3EMA and K3RDT. EPA hit another record month in April. Liaison between EPA and EPAEP&TN is developing. Penn State ARC will be on with a k.w. soon. K3WEU's Book Review Net is going along nicely on 6 meters. W3AFI was temporarily rockbound when his v.f.o. developed voice problems. K3MDG reports that traffic from patients at Valley Forge Hospital, K3JHQ, is increasing. W3INC is enjoying PTTN and DX on the side. W3RV has moved out of the cellar. W3EML reports a successful EAS meeting. W3HNK has added CR6LE to his QsL service. W3FAF still is studying hard. W3-BNR's XYL presented him with a jr. operator. K3RUA temporarily is on the sick list. The Del. Valley OCWA Net will move to 3917 Sun. mornings. K3MVO still gets lots of traffic even though he is traveling half of the month. The following stations moved up to Advanced Class: W3EIO, W3EMQ, W3GLZ and W3HGX. Nice weather is cutting into W3CUL's skeds. K3NSN is back on day work and relaying traffic on 15 and 20. W3JJCJ is working on his big "G." New officers of the U. of P. ARC are W3FRP, pres.; K3WJQ, vice-pres.; W3AEQW, secy.-treas.; W3CJU, public relations officer. W3EMQ will be operating W3AEQ this summer. The following made the BPL: W3MPX, W3CID, W3-HDI, W3CUL, W3VR, W3ACTP, W3HHU, W3EML, K3MYS, W3AFI and K3WEU. The Central Bucks High School ARC call is W3KBI. All EPA appointees are invited to join the Mt. Airy V.H.F. ARC Picnic Sun., Aug. 11 at Flourtown, Pa. Traffic: W3CUL 2903, K3MYS 1218, K3NSN 1188, W3VR 884, W3EML 787, W3FGQ 762, W3ACTP 592, K3VBA 383, W3CID 329, W3MPX 323, K3LNV 252, W3ATQ 238, W3HDI 221, K3MVO 217, K3YVG 187, W3AEEC 170, W3AFI 156, W3GAT 144, W3HHU 139, W3AOJ 128, K3PIE 126, K3WEU 123, W3EXW 119, W3FPM 107, W3HK 103, W3JJCJ 84, W3HVR 78, W3KJJ 78, W3GLI 75, W3-PCF 74, W3NNL 69, K3WBJ 65, W3MJO 61, W3EXB 57, W3FPC 51, K3FOB 50, K3JHQ 46, W3VAP 45, W3CFU 42, W3CND 40, W3CCKA 31, W3TOR 31, W3BSV 26, W3JKX 21, W3HMU 17, K3PSO 16, K3-RUA 15, W3ADE 14, W3RUR 13, K3MDG 9, W3RV 8, W3OY 7, W3BNR 4, W3HNK 4, W3PVY 3, W3BJQ 2, W3CL 2, W3FAF 2, W3ALZ 2, W3YHO/3 2, W3BFF 1, W3BNR 1, W3EU 1, W3AINC 1, W3OML 1.

MARYLAND-DISTRICT OF COLUMBIA—SCM, Carl E. Andersen, K3JYZ—SEC: W3LDD.

Net	Freq.	Time	Days	Sess.	QTC	QNI	Mgr.
MDD	3643	2300Z	Daily	31	351	12.4	W3HTQ, RM
MDDS	3643	0030Z	Daily	30	94	6.3	W3CBG, RM

• All operating amateurs are invited to report to the SCM on the first of each month, covering station activities for the preceding month. Radio Club news is also desired by SCMs for inclusion in these columns. The addresses of all SCMs will be found on page 6.

MEPN	3920	2200Z	M-W-F	22	100	24.5	K3NCM, PAM
		1700Z	S-S				
MDCTN	3920	2200Z	T-T-S-S	16	85	12.7	W3SRC, PAM
MSTN	50.4	0000Z	Su				W3EOP
CVTN	145.62	0200Z	Th-Sa	8	3	3.8	W3CFK
	28900	0200Z	Th-Sa				

New appointments: W3HTQ as RM of MIDD to replace K3OAE, who has resigned; W3SRC as PAM of the new Maryland-District of Columbia Traffic Net; W3DEJ upgraded from OO Class III to OO Class I. Endorsed appointments: W3CDQ as OBS; K3FLD as PAM, ORS and OPS; W3ECP as ORS; W3TN as ORS for the eleventh year; K3QDC as ORS; K3QDD as ORS; W3RPC as RM and ORS; W3ACVN as ORS; W3EOV as OPS. W3TN still has a perfect record of the solo BPLer for MDC as he earns it again this month. W3CFK published a good article on 2-meter f.m. in the Antennas RA magazine. W3ERL's XYL is a new Novice. W3KCA. W3AYS is now W3NB and will be on from Kent Co. in the coming MDC-QSO Party. W3CZ has been barnstorming various Md. counties with his mini-watt transistorized gear. W3FRL tried out his high school French on VE2BDQ. W3EOP/3 is on 220 Mc. W3PRC reports making WAC and WAS after 20 years. K3LED is turning to antenna farming. W3GAU claims credit for getting the first new Advanced Class ticket in MDC on Nov. 24, '67. W3ZNV soon will be on RTTY. W3JBY will be on a canoe trip in July. St. Johns College High School ARC has the new club call, W3JBE, and new Novices WN3s JXH, JJV, JJJW, KDB, KDC and JXL. WN3YS is now General Class. W3FA finds that planning is easier than the physical effort required for antenna transplants. W3JPT was reelected chairman of the IMCO sub-committee on radio communications. W3ECP reports the promotion of W3CAY to Col., USAR, and that W3AVQ is on the ailing list. W3GEB has improved his signal with a dropping dipole antenna. W3DPJ has worked ZL3RB on 160 meters as well as 5Z4LE. The annual PVRC-FRC get-together was a great "rag-chew" highlighted by W3MQ, of FRC, presenting the PVRC/FRC ARRL DX Trophy to PVRCer H18XAL/W9SZR/3, and W1ARR, ARRL Hq., presenting the SS club gavel to PVRC president, W4ZM. Traffic: (Apr.) W3TN 326, W3HTQ 314, W3CBG 259, K3JYZ 119, W3EKP 112, K3GZK 100, K3ZLE 100, W3ATQ 84, W3ADO 74, W3CFK 68, WN3IYS 63, W3-JBY 55, W3PRC 43, K3FLD 42, W3PQT 37, W3GEB 36, W3IRQ 26, W3ECP 25, K3LFN 19, K3ORV 18, W3-ZNV 18, W3FA 17, W3AHUJ 9, W3FRL 8, K3WUW 8, W3EOP/3 2, W3JHP 2, W4TFX/3. (Mar.) W3CFK 46, W3ZNV 22, K3FLD 18, WN3IYS 14, W3LBC 8.

SOUTHERN NEW JERSEY—SCM, Edward G. Raser W2ZL—Asst. SCM: Charles B. Travers, W2YPZ, SEC: W2FK, RMs: W2KIP, W2BLY, PAM and NJPN Net Mgr.: W2ZL Congrats to W2IUV, who made the BPL. NJN reports QNI of 520 and traffic total of 369. NJPN reports QNI of 585, traffic total of 254. W2LW will be your new SEC when W2FK (formerly W2BZJ) leaves for Florida in June for good. Sorry to lose Walt; he did a great job. W2ZL exhibited part of his historical wireless collection at the Amateur Radio Expo put on by the Garden State Amateur Radio Club, Inc., at Garden State Plaza, Paramus, N.J. May 2, 3 and 4. K2US, its call, handled 5000 messages with 11 stations in operation, complete with message center. W2KIP, NJN Net Mgr., returned from Naval Reserve duty in Puerto Rico June 3. W2BGM made 80,000 points in the Apr. C.W. CD Party. W2BLV expects to be more active now that his work load is settling down. W2PU made 149,000

MARYLAND-D.C. QSO PARTY

August 3-4, 1968

All amateurs are invited to participate in the third MD-DC QSO Party, sponsored by the Maydale ARC (MARC), in order to promote friendship and operating ability among the Radio Amateurs of the world.

Rules: 1) The party begins at 2200 GMT August 3 and ends at 2200 GMT August 4. 2) A station may be contacted only once on each band and mode (i.e. c.w.-phone-RTTY). Separate logs must be submitted for each mode. 3) Exchange: MD-D.C. stations send QSO number, RS(T), and county. (Independent cities, Baltimore and Washington, D.C. count as separate counties). All others send QSO number, RS(T) and ARRL section or country as applicable. 4) Scoring: MD-D.C. stations score one point for each number sent and one for each received, multiplied by each different ARRL section of country. All others score one point for each number sent and one point for each number received, multiplied by each different Maryland county, (25 total). 5) Certificates will be awarded the highest scoring station (total all modes and bands) in each ARRL section and country. When more than six stations submit logs from one section, second place will be awarded. More than ten, third place will be awarded. 6) A readable copy of the log showing contest station call and location, QSO numbers sent and received, county and/or ARRL section or country should be mailed to C. E. Andersen K3JYZ, 14601 Claude Lane, Silver Spring, Maryland, 20904 (post-marked before Sept. 1, 1968). Each entry must include a signed statement that the operator has observed all the regulations of his country and that the decisions of the contest committee will be accepted as final. No logs will be returned. Enclose an s.a.s.e. if the contest summary is desired. 7) Suggested frequencies: 3575 3850 7075 7275 14,075 21,075 14,275 21,325; 50.2 and 145.2. Novices 3735 7175 and 21,110.

points in the CD Party. K2SOL is trying to stimulate the 6-Meter Net for better delivery outlets. WB2SZK is building 432-Mc. gear. K2ARY reports sending his regular OBS skeds 6 times this month on 146.88 Mc. WB2APX has a new Swan 500-C. WB2SFX also enjoyed the Apr. CD Party working 40 meters. W2ORS and WB2SZK submitted OO reports. W2WJ keeps skeds with WB2VEJ, our new 81-year-old ORS. The SNJ V.H.F. Net operates on 50.25 Mc. at 1900 local time Sat. and Sun. only. WB2UVB is NCS. Traffic: WB2UVB 619, W2ABY 284, W2YPZ 153, W2ZI 117, W2PU 105, WB2YMQ 79, W2ORS 70, WB2BGH 69, W2ABLV 38, W2ANL 25, W2CKF 22, WB2VEJ 16, WB2SFX 13, K2SHE 12, WB2APX 3, W2AKP 3, WB2SZK 1.

WESTERN NEW YORK—SCM, Charles T. Hansen, K2HUK—SEC: W2RUF, PAM: W2PVI. RMs: W2MTA and W2RUF. The NYS C.W. Net meets on 3675 kc. at 1900, ESS on 3590 kc. at 1800, NYSPTEN on 3925 kc. at 2200 GMT, NYS C.D. on 3510.5 and 3993 kc. at 0900 Sun. and 3510 kc. at 1930 Wed., TCPN 2nd Call Area on 3970 kc. at 0945 and 2345 GMT, NYS County Net on 3875 kc. at 1400 GMT Sun. and 3510 kc. at 2345 GMT Mon. Please note the changes listed above. W2MITA, as Net Mgr. of NYS C.W., has been appointed RM. Many thanks to W2FEB, who has been an RM for seven years. Keith has resigned as RM but continues as ORS and as a valuable net member. WB2NNA has been endorsed as OO. Please note the frequency changes in NYS C.W. and NYS CN above. They went into effect in June. W2LYG has changed his call to W2QC. WB2VSL passed the Advanced Class exam. W2PVI announces that the NYSPTEN Picnic will be held Aug. 17 at Cooperstown. The Utica ARC has changed its club call from W2WUX to K21Q; W2AZNE remains as trustee. W2RQF has retired and is now a member of the Old Old Timers Club. W2FR reports that he and K2KIR hosted the Eastern Area Staff meeting in Syracuse the latter part of April. The meeting was most successful with all members present and WINJM as guest. WB2SMD, who is 15 years old, got his Extra. Congratulations! The OARC announces that since this is Centennial Year for Ogdensburg it will issue a certificate for working two club members. Send applications to the OARC, Lois Ierlan, 725 Proctor Ave., Ogdensburg, N.Y. 13669. W2TMI went on a Caribbean cruise and operated as a VP2 and as PJ3CC. Now he's working on QSL cards. Hi, WB2VVZ and WB2VSA got their Advanced Class licenses. The FRATS (Frontier Radio Amateur Teletyp-

writer Society) had a meeting and distributed more gear which had been released by W.U. W2Z1A presented a color film talk on his DXpedition to the Cook Islands to the ARATS. Rudy visited the Islands to make ionospheric measurements during the solar eclipse. Traffic: (Apr.) WB2GAL 415, W2FR 399, W2HISB 259, WB2OYE 251, W2AITA 140, W2RUF 133, WB2SMD 119, W2QC 108, W2FEB 62, WB2VND 57, W2PZL 39, W2RQF 37, WB2VSL 35, K2OFV 24, W2FCG 23, W2GLA 18, W2AZNE 16, K2IMI 13, W2CFP 11, K2DNN 11, K2-BWK 8, W2PNW 8, WB2WZG 7, W2AZPD 5, W2BLO 4, W2PVI 4, W2RWR 4, W2EEC/2 1. (Mar.) K2CC 209.

WESTERN PENNSYLVANIA—SCM, Robert E. Gawryla, W3NEAL—SEC: W3KJP, PAM: K3VPI (v.h.f.). RMs: W3KUN, W3MFB, W3UHN, K3SOH. Traffic nets: WPA, 3585 kc. daily at 7 p.m. local time. K3OTY was the winner of the "William G. Walker Memorial Award" for 1967. W3KUN was honorable mention. It is with deep regret that we announce W3KWL, ex-W8AOE, as a Silent Key. He was a past SCM of WPA, OA4SO, son of OA4OS, pres. of the Peruvian Radio Club, is a new student at Pennsylvania State University. He was accompanied to Penn State by his mother, OA4AJ. She spent a few days in the area as the guest of the W3LNW family. K3OTY put up a new C133 tri-band beam. K3WFP is now transmitting bulletins via automatic tape pre-recorded. W3ELB has a new NCX-200 on the air. W3FFO, W3HLN, W3GIV and W3AWB are now on RTTY from the Erie area. The Venango Mike and Key Club held its annual dinner Apr. 27 at Seneca, Pa. W3UHN now has 160 DX stations confirmed. New Advanced Class licensees in the area are K3OTY, W3AXC, W3AZZ, W3HAE and W3HNV. W3HQM is a new General Class license holder. W3REB had his identity changed. He is now W3NW. *Kilowatt Harmonics* reports that W3SHT will be attending school in Florida until June. K3OLG had a write-up in three radio club bulletins besides the *Pittsburgh Press* for his excellent handling of an SOS distress call from a sinking ship. The incident took place last March. Now that spring weather is here, traffic totals show a decline. Traffic: (Apr.) W3HLI 312, W3IPU 228, W3NEAI 197, W3KUN 153, W3LOS 128, K3SOH 118, K3HEK 75, (W3KAT, K3AHT, W3NEAL, ops.) W3AKH 67, W3HNS 60, W3GQJ 37, K3PY5 33, K3SUN 25, K3HCT 24, K3SMB 19, K3ASI 16, K3RZE 13, W3MFB 10, W3YA 8, W3SELB 7, W2KAT/3 6, W3-GPK 4, W3LOD 2.

CENTRAL DIVISION

ILLINOIS—SCM, Edmund A. Metzger, W9PRN—SEC: W9RYU, RM: W9EVJ, PAMs: W9CCP and W9URLA (v.h.f.). Cook County EC: W9HPG.

Net	Freq.	Times	Days	
1EN	3940 kc.	1400Z	Sun.	21
ILN	3960 kc.	0300Z	Daily	170
NCPN	3915 kc.	1200Z	Mon.-Sat. }	402
NCPN	3915 kc.	1700Z	Mon.-Sat. }	
IL PON	3925 kc.	1730Z	Mon.-Fri.	517
IL PON	5,125 Mc.	2300Z	Mon. & Thurs.	No report
IL PON	145.5 Mc.	2300	M.W.F.	81
TNT	145.36 Mc.	2100	Sun.-Fri.	No report

W9WYB, K9WMP, K9RAS, W9LNO, W9JUV, K9SOO, W9HPG, W9CNC, K9BLB, W9DGV, W9INF, K9KEP, K9KRW, W9MKL, W9VOX, W9TZN, W9RWD, W9A-RVY, K9ORP and K9AAJ participated in the League's recent Frequency Measuring Test. The League's Executive Committee approved the Northern Illinois DX Association, Inc., the Wood Dale Radio Club, Inc., and the Naperville Community High School Radio Club for League affiliation and declared them duly affiliated societies. W9LYA's new QTH is Skokie, with a new XYL and an Advanced Class license. W9QYK has a new 18AVQ and would like to get in touch with some RTTY-ers in his area. W9QLW reports that the Ninth Regional Net passed 551 pieces of traffic during Apr. W9SFB is now an Advanced Class licensee. The Indian Hill Amateur Radio Club at the Bell Telephone Laboratories at Naperville, Ill., is on the air with a Galaxy MK12 and the call W9WSL. Nominations are open for the Illinois Amateur of the Year Award. Contact the Hamsters at 6000 South Tripp, Chicago, for details. This is your last reminder to make reservations for the Central Division ARRL Convention which will be held in Springfield, Ill., Fri. and Sat., Aug. 3 and 4. Write Convention Committee at 104 North Sixth St., Springfield, Ill. PAM W9EVJ celebrated his 32nd wedding anniversary in April. The new officers of the Skokie Six Meters Indians are W9BOD and K9BDJ. K9KZY received his Master's Degree and is now working for United Airlines. W9GVY has a new Swan and has be-

come an avid DXer. WA9UHA received his WAS certificate, W9DOQ is the new acting net secretary of the NCPN because of the move of K9BTE to a new QTH of Rockford. WA9VOL and WA9OMN passed the General Class exam. W9UHD received his DXCC certificate W9KFK is the new secy. of CATS. K9WVP is building a new HW-100. This column's sympathy is extended to W9HYI whose wife, WA9MZB, passed away recently. K9WEH received WAZ No. 2400. W9BGX, the Northwestern University Club station, has a recently-acquired Hunter Bandit 2000 and TH6DX beam to help to bring in DX scores. WA9MHU is the only BPL recipient this month. Traffic: (Apr.) WA9MHU 566, W9KII 361, K9-KZB 306, W9NXG 102, WA9O'DD 93, W9EVJ 82, W9YII 77, W9HOT 63, WA9PPA 61, WA9TUM 55, W9DOQ 53, WA9POZ 41, K9WMP 33, WA9QBM 28, WA9RCQ 20, W9CWH 19, W9KVF 12, W9LNQ 8, W9KQJ 7, W9PRN 7, W9IDY 6, WA9PFB 6, WA9SDT 4, W9SXL 4, WA9TCN 4, K9ERC 3, K9RAS 3, W9UHD 3, WA9BRZ 2, WA9QZE 2, WA9UHA 1. (Mar.) WA9TUM 54, WA9QXT 27, KIDGQ/9 26.

INDIANA QSO PARTY

August 17-18, 1968

All radio amateurs are invited to participate in Indiana's QSO Party sponsored by the Indiana Radio Club Council, Inc. Certificate hunters will find this party an excellent time to work for the Hoosier "500" Award. For full particulars on HFA, SASE to Hewitt Mills, WA9LTI, IRCC Sec'y, 289 West Sumner Ave., Martinsville, Ind.

QSO Party Rules: 1) The Party will begin at 2300 GMT Saturday August 17 and end at 2300 GMT Sunday August 18, 1968. 2) The general call will be "CQ IND" with Indiana stations adding "from IND" to avoid confusing with other ninth call area stations. 3) All bands and modes may be used. Valid contacts are made between stations on the same band and mode. Same stations may be worked on different bands or mode for additional contacts only. 4) Exchanges must include contact number, call, Indiana county, state, province, or country. Indiana stations may add HFA points after county. 5) QSO Party scoring: Indiana stations multiply all contacts by number of different states, provinces, or countries worked. Others multiply the number of contacts by the different Indiana counties worked. 6) Awards: Plaque to highest scoring station within and outside of Indiana. Certificates to highest scoring station in each Indiana county, each state, province, or country. Multi-op stations are eligible for certificates only. Judges decisions final. 7) Submit logs showing date, time, contact number, calls mode, band, county, date, province, or country, and point summary. Block print your call, mailing address including zip code, and operating address if different. Include signed statement that all rules have been observed. Send logs (no HFA, please) to Robert A. Lyles, K9HYV, 706 Spring St., Michigan City, Ind. 46360 on or before September 16, 1968. Please enclose SASE for copy of results. Good luck.

UJN, WA9UKN, WA9SCY, K9HAB, WA9TQD, WA9CWE/9, K9MIGW, WA9HLA, W9OBH, W9VCF/M9, K9FFX, K9VCP, WA9CWE and K9ATV, Net Control. The following are due for annual endorsement in July: RM W9HRY, ECs WA9BGI, W9BZI, W9DZC, K9HYV, K9QJT, K9XPT, OPS W9DZC, OO W9AQW. The Indiana Amateur TV and U.H.F. Club met May 4 at the Naval Avionics Radio Club. W9NPT said slow-scan is being seen in four continents. WA9EUN gave a talk on u.h.f. antennas. W9HWX gave a demonstration on color TV for amateurs. QIN Honor Roll: W9BDP 30, K9VHY 28, WA9MTY 25, W9KII 23, WA9VZM 23, W9QLW 21, WA9KAG 19, WA9KOH 19, WA9FDQ 16, WA9MXG 15. *Amateur Radio Exists because of the service it renders.* A BPL certificate for Apr. traffic went to K9IVG. Traffic: (Apr.) K9IVG 1126, K9FZX 291, WA9-LTI/WA9MTY 242, W9HYI 208, WA9KAG 144, WA9-MXG 78, K9CRS 66, K9EFY 66, W9BUQ 53, WA9BGI 40, WA9KOH 39, W9UEM 38, K9HYV 37, K9VHY 37, W9FWH 35, K9CBY 31, W9AIPS 26, K9HZY 24, K9HWQ 21, WA9BHG 20, W9SNQ 18, W9WGN 18, W9YXX 17, W9JBQ 14, W9RTH 14, K9FUJ 12, W9GJZ 12, WA9AXP 11, K9QJY 11, W9CUC 10, W9DZC 9, W9BDP 8, WA9-JIX 8, W9PMT 7, K9ILK 6, WA9QXM 6, W9DOK 5, K9QVT 4, K9GBR 3. (Mar.) W9QLW 103, WA9MXG 45, W9QUH 9, W9AQW 2.

WISCONSIN—SCM, Kenneth A. Ebner, K9GSC—SEC: W9NGT, RMs: W9DND, W9CBE and K9KSA. PAMs: W9NRP, WA9QNI, WA9QKP, WA9IZK and K9DBR.

Net	Freq.	Time	Days	QNI	QSP	Mgr.
BWN	3985 kc.	1145Z	Mon.-Sat.	445	289	W9NRP
BEN	3985 kc.	1700Z	Daily	774	165	WA9QKP
WSBN	3985 kc.	2200Z	Daily	1347	292	WA9QNI
WIN	3662 kc.	0045Z	Daily			W9DND
WSSN	3780 kc.	2330Z	Sat.	392	40	K9KSA
WRN	3625 kc.	2330Z	Sat.	28	—	W9CBE
SWRN	50.4 Mc.	0200Z	Mon.-Sat.			K9DBR
SW2RN	145.35 Mc.	0130Z	Daily	173	38	WA9IZK

Net certificates went to W9ODD for WIN and W9GVP for BEN. New appointees: K9UIY and WA9SAB as OBSs. Renewed appointments: W9QNI, W9BUG, K9QKG and W9CFS as ECs, W9GOC as OPS, W9GOC and W9RTP as ORSs, W9KHH as OVS, W9NRP as PAM and W9S90 as OO. The WNA Picnic will be held July 14 at Pond Du Lac. For information ask on any of the nets. FMT results: W9BCY 4.5, K9GSC 6.9 and WA9EZU 109.5 p.p.m. error. The Central Division Convention will be held Aug. 3 and 4. W9UKR passed the Advanced Class test, and made CP-20 w.p.m. It is with deep regret that we record the passing of former Division Director W9GPI. WA9PKM passed the Advanced Class test, and his son passed the Novice the same day. WA9-RAK was elected pres. of the Wis. Valley Radio Assn. The Robert M. LaFollette HS ARC is now affiliated with ARRL. Traffic: (Apr.) W9AOW 515, W9BCH 362, W9DND 247, WA9QKP 240, W9ESJ 232, W9DYG 219, W9CXY 114, WA9QNI 111, K9KSA 110, WA9RAK 108, K9FHI 80, K9CPM 63, WA9SYD 56, W9GXU 50, WA9GJU 48, W9ODD 47, W9AYK 42, WA9SSH 40, WA9TUP 38, WA9VNP 38, K9JPS 37, W9NRP 37, W9-DXV 33, WA9LRW 28, WA9PKM 26, K9GSC 19, K9-TBY 17, W9IRZ 10, WA9SAB 8, K9ZMS 4, K9GDF/9, 2, WA9OFF 2, W9ONI 2, WA9WYR 2. (Mar.) W9CXY 176, W9GXU 56.

DAKOTA DIVISION

MINNESOTA—SCM, Herman R. Kopischke, Jr., W9-TCK—SEC: WA9IEP, RMs: K9ORN, WA9EPX. PAMs: WA9MMV, WA9HRM, MSN meets daily on 3685 kc. at 2330Z. MJN meets Tue.-Sun. on 3685 kc. at 0000Z. Noon MSPN meets Mon.-Sat. on 3945 kc. at 1705Z, Sun. and holidays at 1400Z. Evening MSPN meets daily on 3945 kc. at 2315Z. Appointments renewed: W9BUC as EC Crow Wing Co., K9ZRD as EC Wa-basha Co. and K9UXQ as ORS. W9UWG has a new Hunter Bandit 2000 along with a Swan 350 which he loads into a three-element Triband beam. WA9OVV is using a Swan 350 into a two-element quad. W9ZSA is using a home-brew linear, driven by a TR-3, into a two-element Triband quad. W9QXK has his new SB-101 working FB, W9LOL, W9PAN, WA9MZW and W9BE operated W9AA in a recent WPX Contest. K9UYN, W9HEN, K9IYF-WA9PVP and W9ISJ participated in the Feb. FMT. Wonder how many operators have built the I-C electronic keyer designed by W9ZHN and K9UXQ that was described in April QST? If you have been thinking about a keyer, this one is hard to beat. To make it easier, complete parts, including circuit board, are available from W9ZHN. A reminder to Novices: If your license was issued for

INDIANA—SCM, William C. Johnson, W9BUQ—Asst. SCM: Mrs. M. Roberta Kroulik, K9IVG. SEC: WA9-KWH.

Net	Freq.	Time	Tfc.	Mgr.
IFN	3910	1330Z Daily 2300Z M-F	295	K9IVG
ISN	3910	0000Z M-F 2300Z Sat.-Sun.	666	K9CRS
		2130Z M-S		
QIN	3656	0900Z Daily	196	W9HRY
IPON	3910	1250Z Sun.	94	K9EFY
Indiana VHF	50.7	0200Z M-T	80	WA9NLE
Indiana V.H.F. Nets			91	W9PMT

WA9KAG, mgr. of the River Forecast Net, reports Mar. traffic as 43, Apr. traffic as 42. W9LLU, mgr. of the Great Lakes Emergency Net, reports Mar. traffic as 60. To all v.h.f. nets: Make your report to W9PMT, PAM for the v.h.f. nets. W9ARI is back on the air with a complete Collins S/Line. W9YB has a complete f.m. set up on 6 and 2. WA9KWH, Ray E. Reichard, 816 W. Water St., Portland, Ind. 47371, is the new SEC for Indiana. K9ATV reports that the Madison County Chapter American Red Cross held open house with communication by the following amateurs: W9EJH, W9OJH, WA9-

one year before the new regulations took effect it is good only for one year. If in doubt check with the FCC rather than get into problems from hear-say reports. Traffic: (Apr.) KOZRD 165, KOORK 154, WAOMMV 108, WAOTAW 106, WAOQEF 97, WAOEPX 71, WOHEN 54, WAOFRI 47, WOTCK 43, WAOIYM 35, WOKYG 35, KOSNC 30, WAQODB 27, WAKWVO 26, WOUIMX 21, WADOT 20, WOBUC 19, KOZBI 18, KODEF 15, WADPT 10, WOISJ 10, WAOJPR 9, WAOLVK 9, WOKLG 6, WOEQO 5, WOKNR 5, KOLWK 5, KOSXQ 5, WAOCJH 4, WAONQH 4, KOPIZ 4, WOIYP 2, WAOPT 1, WAOSSN 1. (Mar.) KOORK 86, WAO-
 ODB 29, WAKWVO 22, WOE 1.

MINNESOTA QSO PARTY

July 21, 1968

All radio amateurs are cordially invited to participate in the third annual Minnesota QSO Party, sponsored by the Viking Amateur Radio Society.

Rules: 1) Contact will be between a Minnesota station and a station outside of Minnesota, or between two Minnesota stations. Valid contacts may be made once on c.w. and once on phone, on the same band. 2) Time periods are as follows, in GMT: Phone operation 0000 to 0400, and 1600 to 2000. C.w. is from 1200 to 1600, and 2000 to 2400. 3) Suggested frequencies: C.w.—3580 7080 14,080 21,080. Phone—3880 7280 14,280 21,380 28,680 and 29,600 (channel 60). Contacts on any other bands or frequencies are valid and are encouraged. On all bands, but especially on 75 and 80, please listen carefully for nets and avoid them. 4) Scoring for Minnesota stations: Multiply total QSOs times your multiplier which is the total number of different ARRL sections and countries worked on c.w. PLUS the total number of different ARRL sections and countries worked on phone. Minnesota may be counted as a section, if worked. Countries must be listed on the ARRL countries list and may not include or be a part of any ARRL section. 5) Scoring for stations outside of Minnesota: Multiply total Minnesota QSOs times your multiplier, which is the total number of different Minnesota counties worked on c.w. PLUS the total number of different Minnesota counties worked on phone (Possible 87 on each mode). 6) Exchange: Minnesota stations send QSO number, RS(T), and county. Others send QSO number, RS(T), and section or country. 7) First place award certificates will go to the highest scoring station in each section or country, provided that station makes at least 5 QSOs, and to the highest scoring station in each Minnesota county, provided that station makes at least 20 QSOs. Certificates will also be sent to the highest scoring Minnesota station and the highest scoring station outside of Minnesota. 8) Logs must contain all of the contact exchange information, plus date, time, band, mode, multiplier lists, and score computations. Logs must be post-marked on or before Aug. 12, and a self-addressed stamped envelope should be enclosed if certificates or the published results are desired. 9) Send logs to: Viking Amateur Radio Society, Box 3, Waseca, Minnesota 56093.

NORTH DAKOTA—SCM, Harold L. Sheets, WODM—SEC: WAQAYL, OBS: KOSPH, PAM: WQCAQ, RM: WAQEL. The NDSU held its Annual Hamfest May 5 with over one hundred in attendance. The main speaker was WOCO, who dates his ham activity back to 1913. WOMB, Dakota Division Vice-Director, attended. WAQAYL was MC. Your SCM made a few remarks. The County Award from the NDSU went to WAORVM and KOGGL, Class C, and WAQIPT, Class B. WNOUDC, the NYL of KORS, found the hidden transmitter. WOTUF is back after a few weeks vacation on the West Coast. The Fox Club has started another series of radio classes for the Novice Class. The Bismarck Club has been doing well with its classes with WOOT working with them. WODM has wound up his classes at the Valley Jr. High. KOOVE is in Detroit, Mich., on an assignment. He will be mobile while there. WNOUDB is a new call in Grand Forks. WAQAYA and NYL WOVNV, WOMB and WQBF were guests of WAQGRX and WQGB during the Hamfest at NDSU. WOBH is feeling better. WODM took a side trip and

visited WOTXQ at Detroit Lakes. Don't forget the International Hamfest coming up on July 20-21 at the International Peace Garden. If you have any questions, get in touch with WAOKRI, Munich, N.D., 58352. It is being held on the American side at the Main Lodge this year. KOSPH says that he has retired now and can ham a lot. I would like to thank all who worked so well this past winter as net controls, in nets and the rest of the fine amateurs in North Dakota for their efforts in promoting amateur radio in the true spirit of the amateur.

Net	Sess.	Check-ins	Tfc.	NCSs
PON	12	200	12	WAØHUD
YL WX Net	15	222	15	WAØGRX—WAØMND
ND RACES	21	600	79	KØSPH, KØPZK, WØFEJ WØHJU, WØCAQ, WØEJF

Traffic: WAQELO 121, WAOHUD 68, KOSPH 21, WODM 15, WQNI/O 10, WAØMND 8, WAØJPT 3, WAØTBR 3.

SOUTH DAKOTA—SCM, Seward P. Holt, KOTXW—SEC: WAOCPX, PAM: WAOCWV, RM, WOIFP. Net Managers: WAOPN, WAOLG, WAORIQ and WAOPZA. Net Manager WAOPNB has arranged to have a "Ham of the Month" selected in our section. We are happy to congratulate WAOLG on being the unanimous selection for Apr. Upgraded licenses: Extra Class WAOCYF, WAOCFX, WØBJV. Advanced—WAORIQ, WAORCX, WAOPNB and WAØBZD. New tickets: General—WAØSJK, Novice—WØSØFS, WØØTRS, WØØTVQ, WØØTCS, WAØSNW, WAØUGN. Net reports:

Soo Two Net	QNI 17, QTC 1.
NJQ Net	QNI 406, QTC 59
Early Session Net	QNI 336, QTC 15
Late Session Net	QNI 1091, QTC 54
WX Net ½ mo.,	QNI 212, 15 sessions
Morning Net ½ mo.,	QNI 231, QTC 7, 15 sessions
SD C.W. Net,	QNI 181, QTC 73, 26 sessions

Traffic: WOZWL 273, WAOPNB 205, WØSCT 122, WAOLLG 68, WAØMYS 53, WAØPDE 24, WØVYV 24, WAØRIQ 23, WAOCPX 20, WAØPZA 15, WØDVB 12, WØDJO 11, KØYQZ 10, WAØJUM 7, WAØJXH 1, WAØNZY 1.

DELTA DIVISION

ARKANSAS—SCM, Curtis R. Williams, W5DTR—SEC: WA5IIS, PAM: WA5PPD, RM: W5NND. The EC appointment of WA5KQU has been extended another year. Many Arkansas amateurs are to be complimented on their outstanding efforts during the Greenwood tornado disaster. W5ØBD has qualified for his 87th BPL! He now has 93,742 traffic points to his credit, undoubtedly the highest in Arkansas. Fort Smith and Central Arkansas ARCs each report that 8 members of their Novice classes have passed the code exam. How about signing up for the AREC with your EC today. We now have 115 AREC members in Arkansas. Net reports for Apr.:

Net	Freq.	Time	Sess.	Tfc.	Stations	Mar.
OZK	3790	0000Z	29	38	266	W5NND
RN	3815	2330Z	30	68	818	WA5PPD
APN	3885	1100Z	26	21	635	K5ABE
APON	3925	2130Z	22	169	305	W5MJ0

ARCUA reports a successful drill with the Washington County Red Cross. The Arkansas Severe Weather Net has been very active on 3990. You can help make this net more effective by offering your assistance during periods of severe weather warnings. Traffic: W5ØBD 1236, WA5AVO 306, W5NND 96, WA5KEF 61, WA5PPD 44, W5DTR 28, W5SMS 19, K5EDH 5.

LOUISIANA—SCM, J. Allen Swanson, Jr., W5PM—SEC: W5RUK, RM: K5ANS/5, V.H.F. PAMs: WA5-DXA, W5UQR.

Net	Freq.	Days	Time/GMT	Net Mar.
LAN	3615	Daily	2330/0300	W5MBC
Delta 75	3905	Sun.	1330	WA5EVI
LaPON	3915	Sun.	1300	W5KC
LARTTY	3612.5	Sat.	0100 (Sun.)	W5GHP

It is with sincere regret that I have accepted the resignation of W5CEZ as RM. Carl has been named State Dir. La. Army MARS. The new RM is K5ANS/5. Almost 400 turned out for the BRARC Annual Banquet and Hamfest. W5BJG has moved to Florida but we welcome WA5NBT/5, K5ABA went from Conditional to Extra Class in one day, taking Gen., Adv. and Extra.

W5VUH is a new OVS. WA5HAP and K5DKR are active on 2 meters and in Air Force MARS. W5HRM has been appointed EC for Jefferson Parish and WA5QVW for Ouachita Parish. W5BUK was 1st. winner in the Va. QSO Party. WA5KLEP is reworking his antenna farm. W5BV, W5CEW, WA5CAU and W5HKR had a "3900" breakfast at BR. WA5ACY has applied for membership in the OOT Club! WA5LQZ made 187 contacts in the recent CD Party. Hains in the Bastrop-Monroe area assisted the local TV station in the Central Palsy Drive. WA5LGO has been operating portable. W5NQR is at work on the 1969 La. QSO Party. The Stidell ARC is looking for a new club site. K5AGI has been commended for helping more than ten fellows get Novice licenses. The GNOARC is issuing a certificate commemorating the 250th Anniversary of the founding of New Orleans. Send extract of log showing three contacts with N.O. stations to WA5CST. The gang in Lafayette recently saw the film *Melutian Skywatch*. W5LDH held a meeting in Biloxi with his Asst. Directors, SCMs and SECS prior to his attendance of the Board Meeting. W5PKS gave a short dissertation on FCC exams at the BR Hamfest. K5JBC is chasing DX on 14 and 21 with a quad. WA5GYB and WA5EMK are now Advanced Class. CE8DK recently visited W5TXN. Traffic: W5KRX 23, W5CEZ 104, W5MBC 70, W5MXQ 66, WA5LQZ 59, WA5OHH 55, WA5GYB 18, WA5QVN 17, W5EA 10, W5KC 8, W5PAI 6, WA5LGO 4, WA5OJG 4, WA5NYY 2, WA5KLF 1.

MISSISSIPPI—SCM, S. H. Hairston, W5EMM—SEC: W5JDF. The Gulf Coast Sideband Net has changed to 1830 CST on 3925 kc, daily and the Miss. Sideband Net now meets at 1915 CST on its new frequency, 3947 kc, daily. W5SIM is recently tickled now to be WA5SIM. K5MDX in Natchez, lost his quad in a storm and now has a Mosely TA-3640 up. He finally has been able to get his NCL-2000 on the air to beef up his *Drakeline* barefoot. The Natchez Club is cooperating with civil defense and has a teletype unit and a 29.6-Mc. f.m. unit installed in the club defense communication room. The net controls for the Mississippi Sideband Net have proven to be very faithful and of course the ever-present W5JHS does a tremendous job with the Gulf Coast Sideband Net. W5EMM is most proud of his new granddaughter. Traffic: W5BW 59, WA5JWD/5 10, WA5SIM 1.

TENNESSEE—SCM, Harry A. Phillips, K4RCT—Asst. SCM: Lloyd Shelton, WA4YDT. PAMs: WA4CGK, WA4FPF, WA4EWW, WA4CRU. RM: WA4YEM.

Net	Freq.	Days	Time Sess.	QNI	QTC	Mgr.
TSSB	3980	M-Sat.	2330Z	26	1522	175 WA4CGK
TPN	3980	M-Sat.	1145	30	1063	102 W4FPF
		Sun.	1300			
ETPN	3980	M-F	1040	22	493	86 WA4EWW
TCN	3980	Thurs.	0100	(Wed. night CST)		
TN	3635	Daily	0000	30	214	120 WA4YEM
TTN	7290	Daily	2100	30	401	105 WA4CRU

Appointments: WB4ANX as OBS, WA4CRU as PAM. WB4ELD reports lots of 2-meter activity in middle Tennessee on 145.35 nightly. According to a letter received by K4UMW from the Commissioner of the Dept. of Revenue, new automobile license plates will be issued to amateurs instead of the decals in the future. W4DIY is now K4AT. W4DCH is now W4NA. Mothers Day messages were handled by the Frye ARC at the Eastgate shopping center at Chattanooga. K4EKO is stockpiling baby food jars for small parts as a result of the arrival of a daughter Apr. 1. Approximately 60 hams turned out for a successful swapfest in Knoxville. WA4URA has suffered from lack of IMQ. I am happy to report that I represented 42% of the League members in the Delta Division and was loaded with suggestions from Tennessee at the Director-called meeting in Biloxi, Miss. W4HPN did very well in the FMT with an average error of less than 4 Hertz. Traffic: W4FX 231, W4OGG 220, WA4YEM 154, W4SQE 123, K4AT 98, WB4ANX 95, WB4ESE 91, WA4TFL 57, WA4YDT 57, WA4GLS 38, W4FPF 38, WB4FEC 37, WA4NEC 26, WA4CRU 15, K4MQI 24, WA4KHD 22, WA4CGK 21, WB4EHD 25, W4SGI 14, WB4DGI 13, WB4HYI 13, W4PRV 11, WB4FCE 10, K4UMW 9, K4PUZ 8, WA4RXH 7, WA4EWW 6, WB4BKI 5, WA4URA 2, WA4YFG 2.

GREAT LAKES DIVISION

KENTUCKY—SCM, Lawrence F. Jeffrey, WA4KFO—SEC: W4OVI. Appointments: WB4FOT as ORS, WA4GHQ as EC for Lexington, W4KKG as OPS, K4YZU as EC for Louisville, Endorsements: WB4AIN and W4CDA as ORS, K4KZII as OO.

Net	Freq.	Days	(GMT)	Mgr.
KKN	3960	M-F	1030	K4KIS
MKPN	3960	Daily	1230	K4TRT
KTN	3960	Daily	2300	WA4AGH
KYN	3600	Daily	2300/0200	WB4AZ
FCATN	50.7	T-W-S	0200	WB4BKG

Note that all Kentucky nets are on Daylight Time. Please try and get all reports to the SCM by the fifth of each month. WA4SMH has new s.s.b. equipment and a tri-band beam. WB4FAY set up a station at the Scout Campore near Owensboro. The following stations were known to be active during the tornado disaster at Falmouth, Ky. WA4YDO, K2VJE, K4DLG, W4RHZ, WA4AGH, K4YZU, WA4ERE, K4CSE, K4MAN and the QLEN control, W8VVL, W4JP.4, the UK station, was the call used at the site. An emergency drill was conducted by the Henderson group with the following taking part: K4SWL as NCS, W4C8N, W4NUQ, W4OGB, W4TBU, W9HAK, K4DJE, K4NNN, K9EKV, K9JRI, WA4RHO, WA4JNZ, WA4WTE, WB4FGE, K4RGL and K4MAN. WA4YOK reports that WA4CX also is VK8KP. Traffic: K4YZU 125, WA4KFO 110, WA4WSW 110, WB4AZ 108, WA4AGH 94, WA4WWT 74, K4MAN 71, WB4AIN/4 62, WA4VUE 62, WA4UAZ 49, W4JP/4 45, K4TRT 34, WB4IRG 28, WB4FAY/4 25, W4OVI 21, WA4SMS 21, K4EOE 20, WA4UHR 18, WB4RKG 17, WB4FGE 16, W4RTA 12, WA4UIH 10, WB4FOT 9, W4KJP 9, W4YOK 1.

MICHIGAN—SCM, Ralph P. Thetrea, W8FX—SEC: K8GOU. RMS: W8WFO, W8RTN, WA8ORR, A8KMQ. PAMs: W8JWF, K8JED, V.H.F. PAMs: W8CVQ, W8YAN. Appointments: K8AYM, K8CJQ, K8HPO, W8LUH, W8MID, W8RWK as ECs; K8HLR, WA8ZGF as OOs, K8HLR, WA8LY, WA8VBL as ORS; W8TWF as OPS; WA8MCQ, WA8VPU as OBS. Silent Keys: W8HIK, W8PDB, W8YFL. BPLers: K8KAIQ, WA8MCQ.

Net	Freq.	Time	Days	QNI	QTC	Sess.	Mgr.
QMN	3663	2200	Dy.	936	631	60	W8FWQ
WSSB	3935	2300	Dy.	990	181	30	K8WRJ
UPEN	3920	2230	Dy.	696	57	30	K8ZSM
PON-DAY	3935	1500	M-Sat.	248	116	26	WA8OGR
PON-CW	3645	2300	M-Sat.	133	41	26	VE8DPO
B/R	3930	2130	M-Fri.	785	93	22	W8ZBT
M6MTN	50.7	2300	M-Sat.	301	32	25	WA8LRC
LENAVEE 2	145.36	0100	Dy.	255	34	29	WA8WQU
NOON 50	50.41	1600	M-Sat.	188	00	26	WA8FXR

Michigan Council of Clubs officers are K8HKM, pres.; K8ETU, secy. New officers of the TASYLS are WA8CXF, pres.; WA8ARJ, vice-pres.; WA8YJ, secy.; K8LHF, treas. WA8KME and WA8MCQ plan an 8th area QRP newsletter. W8CUP can handle any "thumb" traffic. WA8VBL finds a 40-meter dipole with tuned feeders works well on 80. K8HLR is using indoor dipoles and 50 watts. W8WVG has a new tri-band vertical. W8DVB and K8DX made "extra." WA8YQ lost his 80/40 dipole in a windstorm. K8OIC swapped his NC-303 for a 2-meter transceiver. CU at the U.P. Hamfest, Aug. 3 and 4. W8YWF is recovering from surgery, as is W8NOH. W8OQH has a new SR-160. WA8MEE is getting married in Aug. WA8VGA/4 now is in Florida on 20-meter s.s.b. W8L finally is out of the hospital and home. K8MFO is now in the army. WA8GLL recently got married. WA8RZS now has W8LN's RTTY station. WA8NPH has an HA-1200 mobile with a bird cage on 2. K8ZYK now is on 160 mobile with a converted Gonset G76. Traffic: (Apr.) K8KMQ 432, WA8MCQ 307, WA8SQ 266, K8AINC 178, W8NOH 165, WA8LY 133, K8KRX/8 140, W8IWF 132, WA8OGR 115, W8OQK 108, WA8VBL 98, WA8CUP 82, W8IHD 70, W8RTN 70, K8ETU 60, W8IUC 57, K8ZJU 57, W8EU 54, W8FX 50, WA8ORC 48, W8BEZ 43, K8JED 43, K8HKM 39, W8UFS 39, W8TDA 36, WA8LRC 31, WA8KRI 30, W8YAN 27, WA8IAQ 26, W8VVL 24, K8HLR 20, W8CUP 16, W8SCW 15, W8AUTD 12, W8FWQ 12, WA8KME 10, WA8TSB 8, W8SS 7, W8DSE 6, W8OWG 6, W8TPH 6, K8VDA 4, WA8WHG 3, WA8EOW 2, W8HKT 2, W8AAM 1. (Mar.) K8HLR 75, K8HKM 69.

OHIO—SCM, Richard A. Egbert, W8ETU—Asst. SCM: Roger Barnett, K8DDG. SEC: W8OUU. RM: W8TML. PAM: K8UBK. V.H.F. PAM: WA8ADU.

Net	QNI	QTC	Sess.	Freq.	Time	Mgr.
BN	438	368	58	3580	2300Z & 0200Z	W8IMI
OSSBN	1834	930	57	3972.5	2245Z	K8UBK
O6MtrN	138	57	30	50.6	2300Z	WA8ADU

The Ohio Six-Meter Net is now a full-fledge section net. WA8ADU invites check-ins. The first Annual Joint Ohio Section Nets Picnic will be held July 27 at WRFD Picnic Park, north of Worthington. Details will be given

on any active net. W8CHT reports QCEW supplied emergency communications during the April tornado disaster at Newtonsville, Ohio, and Falmouth, Ky. K8DDG, K8EHE, W8ETU, W8GKN, W8KMI, W8MIL, W8PRF, W8PSN and K8TSS received Public Service Awards for participation in the Silver Bridge disaster in December. *Parma RC Bulletin* reports 6-meter code practice by W8R0K Tue. and Thurs. at 2330Z on 50.940. K8LFI, Lucas Co. EC, writes a column in *Ham Shack Gossip* (W8RZN, et.) which is a section of the ARAC plan. The entire plan will be presented in three issues. New officers elected at the March OCARC meeting are W8ACPT, chairman; W8UCX, vice-chairman; W8OUU, secy.; W8EMK, treas. All clubs and nets are urged to join the Ohio Council of Amateur Radio Clubs. Dues are five cents per member per year. Contact W8OUU for details. Your SCMI attended the Dayton Hamvention and held meetings with the Asst. SCMI, SEC, RM and PAM. *Concannon Enquirer's* Ham Call column by W8A0CA reports that W8TYF did some hullopping from Kentucky's Black Mountain on 2 meters. Best contact was Florida, nearly 700 miles. Westpark Radiops says the ARRL DX contest aggregate score was over 1.5 million points. Mt. Vernon RC's *Academy* tells us that the code and theory class is graduating 6. QCEW's *Listening Post* published dope on converting Motorola f.m. TR80D to 6 meters by W8CHT; also the conversion data for R19-TR1 f.m. receivers for 6 by K8JZA. The CARA is running a homebrew contest in two categories, Novice and others. K8WVZ reports that the Henry County RC has obtained ten police f.m. units to be converted to 6 meters for use in its RACES program. W8KDS is on active duty with the USAF in Vietnam. Lima Area ARC's new officers are W8RWK, pres.; W8ABL, vice-pres.; W8LEV, secy.; W8WEG, treas.; W8NPFY, act. mgr. K8EKG is the new Asst. EC in Massillon. W8AN got a new 35-w.p.m. code certificate. The old one was 20 years old. Van Wert ARC will hold its annual Picnic and Hamfest July 28 at Jubilee Park. As part of the SCMI job, I expect to visit as many of the clubs in the section as possible. Please invite me to your meetings, clubs. Continuance of leadership appointments is contingent upon discharging the duties prescribed by the appointment and upon regular reporting to the SCMI. Please make regular reports, either by radiogram or on Form 1. Check your certificates to see whether they still are current. Traffic: W8UPH 442, W8QZK 400, W8AUZ 250, W8SZU 233, W8MIL 227, W8APQL 183, W8NAL 159, K8ONA 157, W8F8X 153, W8GVX 151, W8UPI 134, W8OCG 128, W8ERD 116, W8QCT 112, W8CHT 110, W8MHO 110, W8EFB 98, W8SED 97, W8FGD 84, W8LAM 79, W8LRE 77, W8AUTX 66, K8UBK 62, W8MITS 61, W8QFK 58, W8DAE 57, W8OE 57, K8LGA 55, K8DDG 52, W8GOE 50, W8PPK 50, K8BYR 48, K8DHE 45, W8MUV 42, W8RWK 40, W8IWX 38, W8VNU 37, W8AHP 34, W8RPY 33, K8QYR 31, K8DMZ 29, K8VCW 27, W8ADU 24, W8HNP 22, K8WZI 21, W8SXI 19, W8PNP 18, W8WJR 16, K8LFI 14, W8QXQ 13, W8TV 10, W8KFP 8, W8IBX 6, W8YDB 5, W8WEG 4, K8DHI 3, W8ZHD 1.

HUDSON DIVISION

EASTERN NEW YORK—SCMI, George W. Tracy, W2EFC—SEC; W2KGC, RM; WA2VYS, PAM; W2LJG. Section nets: NYS on 3670 kc, nightly at 2400 GMT; NYSPTEN on 3925 kc, nightly at 2300 GMT; ESS on 3590 kc, nightly at 2300 GMT. Around the club circuit, the RPI Club, W2SZ, is repairing winter antenna damage and erecting a new 15-meter beam and tower. The New Rochelle Club had a speaker from Sonotone who discussed nickel-cadmium and other communications-type batteries. Nice to hear that the Mt. Vernon H.S. Club is back in full operation. The club's new officers include W2PULX, pres.; W2ZTV, vice-pres.; W2AFG, secy.; W2AXH, treas.; W2EY (ex-W2TER), trustee. April was Auction Nite at the Albany Club. The Westchester Amateur Radio Association featured W2BZS, who spoke on "Specialized S.S.B. Techniques." This club has a technical net (Wed. on 28.690 Mc, at 2000) for instructing members on the Advanced Class licenses. Congrats, W2MOI and W2MOJ are our new Advanced Class license holders. The Schenectady Club held "Home Brew Nite" with prizes awarded the winners in various categories. Nice to report that ORS WA2VYT is asst. manager of the Clearing House Net. Congrats, Dorcas. Since this is his last column, your SCMI takes this opportunity to thank all section members for their patience and cooperation over the years and offer every success to the new Section Communications Manager. By all means, keep him informed. Traffic: W2EAF 182, WA2VYS 164, WA2VYT 141, W2BHN 116, W2VJB 80, W2FOA 57, W2CVR 38, W2UC 30, W2ANY 22, W2URP 21, WA2WGS 9, W2RBG 7, W2EQU 14, W2SZ 3.

NEW YORK CITY AND LONG ISLAND—SCMI

Blaine S. Johnson, K2IDB—Asst. SCMI; Fred J. Brunjes, K2LDJ. SEC; K2OVN, PAM; W2EW.

NLI*	3630 kc.	1915 Nightly	WA2UWA—RM
NLI VHF*	145.8 Mc.	1940 M/TWTF	WB2RQF—PAM
NLI Phone*	374.2 kc.	1600 Daily	WB2ZEI—PAM
NLS Slow*	374.5 kc.	1845 Nightly	WB2UQP—RM
Clear Rise	3925 kc.	1100 M/TWTF	WA2QPT—Mgr.
Mic Farad	3925 kc.	1400 Ex. Sun.	K2UBG—Mgr.
Mic Farad	3610 kc.	0601 Nightly	K2UBG—Mgr.
All Svc	3925 kc.	1300 Sun.	K2AAS—Mgr.
NYSPTEN	3925 kc.	1800 Daily	K2AAS—Mgr.

Section Nets. All times shown above are local. WB2ZET visited K2US while at the v.h.f. shindig in Paramus, N.J. "What a day to graduate from good old high school," sayeth WB2DRW. *Field Day Sunday!* W2GKZ received a new TCC certificate for 1968. Wb2UQP helped WN2CYN get on the air. W2EW has the antenna farm back together again. ORS No. 14 has been held by W2DBQ for 37 years straight! New officers of the QCWA are W2K, W2CCD, pres.; W2ALS, vice-pres.; and W2BJL, director. W2PF repaired the 2-ft. antenna mast (on a Manhattan apartment roof) and the beam is a horizontal one again. WA2DNO (ex-W6UEU) is back on the air after a 27-year respite. K2DDK allows that April was exciting with scores of 1DX Q8Ls coming in, a good score in the FMT and First Place Award in the YLRL Second District's YL-QM C.W. Contest. W2UAL acquired a Swan 350, which is to figure in several new projects. K2DGI has OH2BZ as a summer guest from June through Aug. Congratulations to WA2QJU, who has been elected to Eta Kappa Nu, the national E.E. Honor Society. W2FCB has so many radials tacked onto the trusty old ground plane that it's beginning to take on the aura of Press Wireless! Talk about jumping out of frying pans, WB2AWX graduates from CCNY in early June and then gets married in too-late June. Hey, WA2EUS has 4 call areas, 9 states and 260 miles way up there on 432 Mc.! W2KWA has gone portable VEI for the summer. Congratulations to WN2PME, a new Novice in this land. WA2KSD has moved to Pittsburgh and we wish him the best as he adds to the voice of the WPA section. WB2QNL, reliable old OVS, still is digging away at M.T. even though the course is rough. K2HTX and W2HAE have gone 6- and 2-meter f.m. The Larkfield secy.-treas. is now back on the air with the call WA2FAK. WB2TDK went vertical on 2 meters. K2PHS hopes the clatter of little RTTYs won't prompt the NYL to move the whole shebang into the backyard! The Suffolk County RCs paper, *QTC*, picked W2TVN as an asst. editor and the paper increased by about three (well-written) pounds. Congratulations to K2OHK, WA2KKD and WB2ZZB, who passed the Advanced Class test! Also congratulations to W2DID who went Extra Class! Traffic: WB2ZET 411, K2UBG 167, WB2DRW 83, WB2QIL 77, W2GKZ 68, WB2RQF 59, WB2YHK 48, WB2UQP 32, W2EW 31, WB2AFK 27, WB2MZE 15, W2DBQ 10, W2EC 10, W2PF 8, WA2DNO 3.

NORTHERN NEW JERSEY—SCMI, Louis J. Amoruso, W2LQP—Asst. SCMI; Edward F. Erickson, W2CVW. SEC; WA2ASAI, RMs; W2BYE and WB2RKK. PAMs: W2PEV, K2KDK, WA2KZF, WA2TEK and WB2IYO.

ARPSO Section Net Schedules

Net	Freq.	Time	Days	Sess.	QVI	T/c	Mgr.
NJN	3695 kc.	7:00 p.m.	Day	30	520	369	WA2KTP
NJSN	3725 kc.	6:00 p.m.	M-F	5	31	19	WB2RKK
NJPTN	3928 kc.	6:00 p.m.	M-Sa	30	585	254	W2ZLI
NJPON	3928 kc.	6:00 p.m.	Sun.	4	78	49	WA2TEK
NJAN	50,300 kc.	8:00 p.m.	M-F	20	231	47	WA2KZF
PVETN	145,710 kc.	7:30 p.m.	Dy	30	429	322	K2KDK
ECTN	146,700 kc.	9:00 p.m.	Dy	30	288	284	WB2IYO

New appointment, WB2BKC as ORS. The list of endorsements for this month would take up too much space but many thanks for continuing on, gents. The dates for this year's N.J. QSO Party are Aug. 17 and 18. Full details next month. Can we cover all counties this year? Contact WA2CCF if you have portable plans. K2UKQ reports passing the Extra Class exam and he has a DXCC total of 313 311. W2BSC has a new Tri-Bander and is ordered the Warrior. WB2QJI is DXing on 15. K2ITY is in the 2-meter traffic nets. W2BRUM is on 6-meter NB f.m. using GE gear. K2BAM is moving to Elizabeth. WB2VFX has a new Swan 250. K2EIF has 95 confirmed for DXCC. The West Morris Radio Club is now operating on the low bands. K2ONT is on with an HW-16 and worked 18 for DXCC in 2 weeks using a dipole. WB2DAA received CP-20. W2CVW reports having trouble finding parts for his v.h.f. home-

brew genr. WB2ZSH has been appointed Deputy RO for RACES. W2EWZ completed QSO No. 21,000. WA2-WBZ and WB2CZN report passing the 2nd-class commercial exam. WB2SEZ got Extra and WB2VLC Advanced Class licenses. WN2YVK and WN2CWP passed the General Class exam. WN2CKU passed the General (Class exam and had his Novice career score at 46/42 for WAS and 29/11 for DXCC. WA2CCF's DXCC is up to 159. The Garden State "Expo" was a big success and I wish to thank all who assisted in making it a big one. We received many letters thanking the group for putting on such a fine show for the public. It may have been the first joint venture by the clubs in N.N.J. and the groups did an FB job. Again, many thanks. Traffic: (Apr.) WB2RKK 579, WB2SEZ 287, WB2VLC 248, K2KDK 181, WA2TBS 174, WA2ASM 137, WB2DDQ 108, WA2ZDA 104, WB2IYO 96, WB2ZSH 75, WB2NSV 67, WA2CFA 56, WA2NJB 56, W2EWZ 49, WB2ZAN 39, WB2DAA 36, WB2BKK 34, WB2TKP 31, WB2-WNZ 29, W2CWP 26, WA2TNA 23, WB2BK 22, W2-LQP, 20, W2CCGI 19, W2TFM 14, W2EYPP 14, WB2VE 12, WA2KZF 12, K2MFX 10, WA2GLI 7, WA2JWB 6, K2ITY 5, WB2TFC 5, WB2ZCI 4, K2JJS 3, W2BSC 2, WN2DRJ 2, WB2ZCI 2. (Mar.) WB2WNZ 12, W2BSC 6, WB2RUM 6, WB2QJI 1. (Feb.) WB2WNZ 16.

MIDWEST DIVISION

IOWA—SCM, Owen G. Hill, W0DBZ—Asst. SCM: Bertha V. Willits, W0LGG. SEC: K0BRE. PAM: W0NGS. RM: W0TJU. W0PZO is now la. 75 Phone Net Mgr. K0LYB has moved to the country and has a new 56-ft. tower with a six-element 4-hand beam. W0TYW has a new home-brew 4-1000 linear on 30 through 10 meters. W0QQB has his RTTY equipment in operation. Several Charles City amateurs have been preparing for Advanced and Extra Class licenses in a course taught by K0YVU and W0KUS. Reports were received from K0TDO, K0AZJ and W0MOW on the Feb. FMT. W0BDZ lost his Triband beam to one of those spring storms. W0AMLE (Kans.) is now operating at C.R., Ia. He also is an OO. WN0SWM is a new Novice in West D.M. TLGN is now operating Sun. at 0130Z (Mon.) on 3560 kc., slow speed. W0EKB reports 50-Mc. activity was very good in April. He also is getting set on 432 Mc. soon. K0TDO is constructing a central control unit for his station, one switch. W0-PFP also reports lots of activity on 50 Mc. and he heard some DX. W0EIT had a QSO with KC4USV, with a 5-9 report. Ham activity seems to be low, probably because of other activities of the summer months.

la. 160 Meter Net QNI 1855 QTC 6 Sess. 30
Ia. 75 Meter Phone Net QNI 1164 QTC 111 Sess. 25
TLGN (c.w.) QNI 98 QTC 24 Sess. 19

Traffic: (Apr.) W0LGX 900, W0CZ 315, W0LGG 90, W0AMIT 15. (Mar.) K0HPO 16.

KANSAS—SCM, Robert M. Summers, K0BXF—SEC: K0EMB. PAM: K0JMF. RMs: W0AMLE, W0JFV, V.H.F. PAMs: W0CCW, W0HAJ, W0LSH. A program called "Perspective" broadcast over radio station KSAC, Manhattan, Apr. 12, highlighted emergency and public service of amateur radio. Participants were W0-YWX, News Director K-State Network, W0JH, W0EHA and W0HLU. Officers of The Santa Fe Trail V.H.F. Club, Inc., Gardner, are W0JYK, pres.; W0PWE, vice-pres.; K0YNW, secy.-treas. The Wichita AREC group had a real test on Apr. 21 and 22 during Weather Watch and the later search for a downed aircraft. K0QBA, now portable 5 in Oklahoma will be moving to Kansas this summer. W0DHC is holder of an Old Timer's Club certificate. V.H.F. nets combined total was 46 sessions, 204 QNI, 7 QTC. The nets included the PI Net, AREC Zones 7, 11, 15 and club nets NCK and Coffeyville. W0CMU and WN0-TRO are both putting a fine signal into Central Kansas, as well as the new c.d. station at Cloud County. K0-GZP has a 40-meter antenna up now. QKS, sessions 54, reports QNI 355, QTC 115. K0TCG has a new Mohawk receiver. The Kansas WX Net had only 2 special WX watches in April with 40 stations participating. AREC Zones 7, 9, 11, 13, 14 and 15 report low-band net activity with a total QNI 290, QTC 15. KPON reports QNI 1060, QTC 207, QKN, 4 sessions. QNI 20, QTC 10; KPN, QNI 299, QTC 34; KSNB, QNI 769, QTC 158 in 27 sessions; EC Net, QNI 41, QTC 6; KWN, QNI 809, QTC 40. Traffic: (Apr.) W0LXH 204, K0JMF 194, W0AMLE 164, W0ALLC 126, W0LXA 124, K0HGI 115, W0ZJY 47, K0BFX 44, W0ONFP 44, K0EMB 38, K0LPE 35, W0NDZ 26, W0A9J 21, W0JFV 18, W0QOH 18, W0CCW 17, K0MRI 15, W0AVX 13, K0GH 13, W0AKDQ 8, WN0TAS 6, K0GZP 5, W0-KHN 2, WN0VED 1. (Feb.) W0AVX 118.

MISSOURI—SCM, Alfred E. Schwaneke, W0GS—SEC: W0BUL. W0KFQ, of Kirksville, is now a Silent

Key. He was an OT on MEN and MoSSB. WA0FLL renewed as QVS and OBS. W0BUL renewed as PAM. OPS and OBS. K0KJ passed the Extra Cl. exam. WA0JH passed the Adv. Cl. test. W0AKUH reports that radio classes held by the PHD ARC finished with 9 Nov. and Tech. Cl., 1 new Gen. Cl. and 1 new Adv. Cl. The new club call is WA0UGU. Other new Adv. Cl. are W0-UQP and W0AKUH. New Gen. Cl. in the PHD ARC are WA0RUV and WA0RTJ. W0DJ is ex-W0RDR. First results of radio classes at Ruskin High School ARC (W0ATKY) are WN0UHT, WN0UUD and sponsor-teacher, WN0TTV. Officers of the Ruskin HS ARC are W0OFO, pres.; W0SSAO, vice-pres.; W0APUL, secy.; WN0UHT, treas. The club now has a complete Heath SE/Line plus a Classic 33 beam and RTTY on v.h.f. A new Gen. Cl. in Marshall is W0VZK. New in Joplin is WA0TDD. W0APN will leave for the Naval Academy in June; W0APZI and W0ADGG have left for military duty. W0ADGG will be at Ft. Wood for basic. WN0SBP, who is trying to keep MSN going, needs some NCS help; 0300Z on 3715 daily. W0BUL received DXCC c.w./ph-114 and ph-108 certificates. K0-RPH has a new NCC-5. The following participated in the Feb. FMT: WA0FLL, W0AHTN, W0A0HV, W0-LVW, K0IKZ, K0ONL, W0RWG, W0RWH, W0ZKN.

Net	Freq.	Time	Days	Sess.	QNI	QTC	Mgr.
MEN	3885	2230Z	M-W-F	13	151	18	W0BUL
MON	3585	2400Z	Daily	30	199	162	K0YBD
MNN	7063	1800Z	M-Sat.	26	81	41	W0UD
MoSSB	3963	2300Z	M-Sat.	28	716	168	W0RTO
MoPON	3930	2200Z	M-F	22	277	130	W0HVJ
MTPN	3940	2200Z	M-F	26	264	77	W0EIM
QMO	7075	2100Z	Sun.	4	9	6	W0FKD
PHD	5034	2430Z	Mon.	5	109	8	W0KUH
MSN	3715	0300Z	Daily	31	28	19	WN0SBP

Traffic: (Apr.) K0ONK 1847, K0YBD 230, K0AEM 182, W0UUD 159, W0AHTN 114, K0RPH 88, W0ZLN 72, W0HVJ 68, W0ATL 61, W0BY 56, W0JH 54, W0GOZ 46, W0ADGG 33, W0ACXI 32, K0VVE 13, W0BUL 27, W0AFMD 20, K0ORB 18, W0EIM 13, W0APU 13, K0REV 12, WN0SBP 11, K0DEQ 8, W0GBJ 6, W0AKUH 6, W0BVL 3, W0AFL 2, W0-ITU 2. (Mar.) K0AEM 253, K0JPS 31. (Feb.) K0JPS 21. (Jan.) K0VVE 53.

NEBRASKA—Acting SCM, V. A. Cashon, K0OAL—SEC: K0OAL. Monthly net reports for Apr.: 52, Emergency Phone Net, W0AGHZ, QNI 1117, QTC 52, Nebr. Morning Phone Net, W0AJUF, QNI 1009, QTC 35, West Nebr. Phone Net, W0NJK, QNI 762, QTC 24, Nebr. C.W. Net (NEB), W0QMZ, early session, QNI 55, QTC 27; late session, QNI 55, QTC 27, Nebr. Storm Net, W0LOV, 2330Z session, QNI 726, QTC 72; OJ-OZ session, QNI 987, QTC 79, Cornhusker Teenage Net, W0OCW, QNI 268, QTC 85. Dead End Net, W0-MCX, QNI 145, QTC 2, 160-Meter Phone Net, W0-CBJ, QNI 150, QTC 2, W0MCCX advises that the Dead End Net has suspended operations for the summer. Nebraska amateurs were quite concerned over the illness of W0GHEZ. We all hope she is now back in good health. A new Novice is WN0UER. Nebraska clubs are requested to participate in the Nebraska Amateur Radio Hall of Fame program. Traffic: (Apr.) W0LOD 92, W0QMZ 75, W0OCW 65, K0JTW 40, W0HTA 33, W0LOV 32, K0JFN 31, W0AOMY 30, W0GIB 25, W0EGV 17, K0XY 17, W0OVL 17, W0GGP 12, W0GVJ 11, K0DGV 10, W0PCC 10, W0HOP 6, K0JPP 6, K0OAL 6, K0BYK 4, W0IBL 4, W0JLR 4, W0PIF 4, K0UDV 4, W0AJUF 3, W0NJK 3, W0EGQ 2, K0JFT 2, W0AJKN 2, K0ODF 1. (Mar.) W0GVJ 6.

NEW ENGLAND DIVISION

CONNECTICUT—SCM, John J. McNassor, W1GVT—SEC: W1RPT. RM: W1ZFM. PAM: W1YBH. V.H.F. PAM: K1SXF. Net reports for Apr.:

Net	Freq.	Days	Time	Sess.	QNI	QTC
CN	3640	Daily	1845	30	372	438
CPN	3880	M-S 1800	Sun. 1000	30	598	226
V.H.F. 2	145.98	M-S	2200	18	43	25
V.H.F. 6	50.6	M-S	2100	22	236	39

High QNI: CN—W1CTI, W1ZFM/1, W1AIGF, CPN—W1GVT 30, W1BDA, W1AIGF and W1YBH 25, K1YGS 24, K1EIC 23, W1AIEK and W1LUH 22, W1AIEJ 21, W1AHEW 20, W1AFXS and W1AIVN 18, W1AIFZ 17, W1YU and W1A9VU/1 16. SEC W1RPT requests monthly reports from all ECs and would appreciate resignations from those no longer interested. K1SXF is our new V.H.F. PAM. 2- and 8-meter traffic operators know he has been consistently active on both bands. Please contact him if interested in being NCS on the 2-Meter Net. W1A1CVV has been 6-Meter Net manager for

quite some time and more check-ins are welcome on 6 meters. W1PRT visited the Hamden ARC to explain the value and necessity of EC work. He would appreciate the assistance of your club, also. W1GVT attended a meeting of Murphy's Marauders at the W1ICP QTH. The limitless enthusiasm of this new group indicates it will be the top scoring contest club on the bands! Our Director, W1QV, presented an ARRL Charter to Murphy's Marauders at its recent meeting. Congratulations to: K1SXF, our new V.H.F. PAM; WA1GGN on Apr. BPL; WA1IVG and WA1GON on Advanced Class; WA1HVL on General Class; WN1JKL, WN1JKS and WN1JKL on Novice Class; Candlewood ARA on "Ham Fair." Traffic: (Apr.) W1EFW 420, W1VU 209, WA1HSN 229, WA1HEW 195, WA1GQN 193, WI1AR 142, W1AW 120, WA1EG 114, K1ROG 104, WA1FNJ 85, WA1GF 80, K1UDD 77, WA1FGN 74, WA1CYV 72, W1KAM 68, WA1FE 65, WA1GX 56, W1GVT 56, WA9QVU/1 56, WA1FVH 55, WA1GFW 45, WA1EHK 44, K1SXF 37, W1YBH 30, WA1GUD 27, WA1HWX 26, W1BDI 25, W1-CIT 22, W1QV 19, WA1HLP 18, K1LMS 16, K1YGS 15, WA1RDA 14, WA1FXS 12, W1CUT 11, WA1FU 10, W1RNB 8, K1CEC 4, WA1IVG 2, WB2HHZ/1 2, W1-WEW 1. (Mar.) K1CEC 2.

EASTERN MASSACHUSETTS—SCM, Frank L. Baker, Jr., WA1ALP—Our SEC, W1AOG, received reports from W1s J.F. J.V. R.F. W1s E.V.D. D.X.I. Silent Keys: K1ERC, W1HGH, W1BS, WA1BBY and W1BL, who was our State Radio Officer for C.D. W1s AVG, BGW, PLJ, WTE, B.S.X. DDO, EI.Q, M.X, OQ.F, K1s (QDR, SCO, and W2AZO/1) took part in the Feb. F.M.T. W1DOM is new awards custodian for the Mass. Chap. of the NAHC. Send SASE for the awards program. K1ZOU is working on modulated flames, in stereo flames. K1FJM is working on a mixer and amplifier for 6. He and K1ZSE are working on 2 APX6s. Ex-W1FWS is now W4CLR. WN1ISH is now General Class. The South Shore Club had an auction. WA1EVD built a transistor transmitter for 6 and a three-element portable beam. W1KBO has Extra Class. W1LYN visited his brother, K3GUP. New officers of the 128 Contest Club are W1-FJJ, pres.; K1DIR, vice-pres.; W1AX, treas.; W1BPW, secy. WN1JXN is now in Gloucester. WA1DJC made RCC. New officers of the Norfolk County RA are W1-PNT, pres.; K1EPL, vice-pres.; W1HTR, treas.; K1-IRV, secy. W1QV and W1ALP attended the club's annual banquet. At its 34th anniversary the T9 Radio Club elected W1TPY, pres.; W1KGH, vice-pres.; W1SX, treas.; W1MNK, secy. K1WPF is now RO and EC for Burlington. W1TQS writes from K1E6-Land that he will be living on the South Shore soon. WA1JGO/LA writes from Oslo, Norway, and is looking for DX on all bands. EMN had 30 sessions, QN1s 269, QTC 192. W1LE, ex-W1LV, is active on 80 c.w., 6 and Navy MARS. WN1DP is working lots of DX on 15 with a DX-60B and a dipole. WA1FHU, in our EMN, has a T4X. SB-200 linear and R4 receiver. W1OJM and K1PNB made the BPL. W1AEC had a booth at the YWCA Hobby Show. WA1FHU is trustee of W1KN. Tufts U. RA. W1-MX is getting on 432 and 1296. W1JDP is on 15-40-75. New officers of the M.I.T. Radio Society are K3ZDR, pres.; K3ODD, treas.; WA4TTC, stn. mgr.; WB2REB, set. mgr. WA1HVZ has a DX-40 Apache, Seneca. WA1DPX has an SB-110A on 6. W1RSY was given a retirement party for his 17 years serving the Mass. Civil Defense Agency. WA1FBH is an Asst. EC for W1RM in Newton. W1DYS is getting a Heath s.s.b. W1RM has a new antenna for 15-40. K1EMU is busy with the Scouts. W1ER visited his son in W4-Land. W1CFU will have an 813 on all bands. W1UVE visited in Florida. W1RNG is on 6 f.m. on the way to work. W1AVA is s.s.b. in the car on 40, working on c.w. to improve his first. W1TAU is taking a course in sailing and is building a rig with a 6HF5 for 160 and 15. W1NZV spoke on "The Quad" at the Welle-lev ARS. K1IDU spoke at the Masseset ARA on F.E.T. Converters. A group visited the Duxbury Coast Guard station. Appointments endorsed: W1s AEC and UIR as OPSS; W1s AEC, DAL and EAE as ORS; W1EAE as RM; K1s PNB, WPZ, N1Q, W1s B.V. SH and NZP as ECs; K1NLQ and W1DPL as OVSs; W1s UIR and U.L. as OPSS. W1-SMO and WA1PHU are new ORSs. The Capeway RC met at W1EYU's. The Whitman Club had a good auction. The 6-Meter Cross Band Net had 23 sessions, 169 QNTs, 4 traffic. K1ENS is in the hospital in Boston. The EMN had 13 sessions, 84 QN1s, 36 traffic. K4NS, ex-W1NS, wants to pass his 73 to all the old gang. W1CWR worked WA3ECP/1 on 2 from a Boston Hotel. W1K, ex-W1KEL, is Extra Class. Traffic: (Apr.) W1-OJM 535, WA1FYY 427, W1PEX 427, WA1HUM 229, K1PNB 188, WA1AD 170, WA1FSI 155, W1DAL 110, W1ENG 108, K1CAL 67, W1CWR 49, W1AEC 48, WA1-ETU 44, WA1FHU 36, W1EAE 35, WA1DPX 33, W1CO 25, W1MX 25, WA1DEC 21, W1AOG 16, K1-CIO 11, WA1ED 8, WA1AJN 4, K1OKE 4, W1JDP 3, WN1ISH 1. (Mar.) WA1FSI 100, WA1HUM 55, W1EAE 39, WA1GH 20, W1MX 13, W1KBN 12, WA1HVZ 7.

MAINE—SCM, Herbert A. Davis, K1DYG—SEC; K1QLF, RM; W1BJG, PAM; WA1FLG, Traffic nets: The Sea Gull Net meets Mon. through Sat. on 3940 kc. at 1700 local time; the Pine Tree Net on 3596 kc. c.w. at 1900 daily. The start of a new net, the State of Maine Public Service Net on 3940 kc. at 0830 Sun., is announced. This net is mostly for AREC, NTS and RACES but is open to all interested amateurs. There will be training, news, handling of traffic and so forth. W1HSO has built a QRP rig and plans on using it portable. It's nice to hear all the familiar voices of our southern exposure friends and to catch up on the news. Traffic: W1BJG 354, W1CU 142, W1NND 64, WA1FLG 63.

NEW HAMPSHIRE—SCM, Robert C. Mitchell, W1-SWX/K1DSA—SEC; K1QES, PAM; K1APQ, RM; K1-RCS. The GSPN meets at 0000Z Mon. through Fri. and Sun. at 1430Z. The NHEPN meets at 0000Z Sat. Both nets are on 3945 kc. while on 3685 kc. the c.w. net, W1-NHN, starts at 2330Z Mon. through Fri. Welcome to new appointee W1YAM as an Official Observer. WA1DKD is mobilizing to and from Texas on vacation. Welcome to new bams WN1JHH and WA1JWV. K1QES points out that the Belknap County AREC Net meets on 146.7 Mc. WA1EUF pons that the Manchester Radio Club, W1-HPM, just had its 30th anniversary. Speaking of statistics, the GSPN held its 1300th consecutive session as of Apr. 30. WA1HHZ has replaced the DX-40 with an Apache. WA1FSZ is building transistorized gear for 6 and 2 and would like to swap notes with other interested parties. Net reports show K1APQ and the GSPN with 769 check-ins, K1QES and the NHARECN 81 check-ins, while K1DWK shows 165 check-ins for old reliable MV-AREC. The recent FMT lists W1CWR, W1YMJ and SWL Robert Lindquist with excellent readings. K1IHK and his new quad are cleaning up the rare ones on 15 and 20 meters. Traffic: K1PQV 51, K1IHK 23, K1QES 5.

RHODE ISLAND—SCM, John E. Johnson, K1AAV—SEC; K1LIL, RM; W1BTR, PAM; W1TXL, V.H.F. PAM; K1TPK, R1SPN report: 30 sessions, 391 QN1, 110 traffic. Congratulations to W1JJZ, who is now W1HF located in Warwick. WA1EEJ went to the Conn. Phone and C.W. Net Dinner Apr. 6. He has been appointed Waterfront Director at Camp Mehan for the summer. K1NQG, the Fidelity RC, set up a station recently at the Midland Mill and, according to reports, the event was a success. The W1AQ Club of Rumford reports that WA1HM, WA1HXP, and WA1CCO have received their General Class tickets. The club held a clean-up so the building program could begin. Those helping were K1-AGA, K1PEL, K1LII, K1AMG and K1HMO. K1AMG did a banner job as chairman of the FD committee. The club held practice sessions with the hope of setting up with a minimum of inconvenience at the site. K1BDN visited the club recently and the membership was glad to see him. The NCR Club of Newport held another successful auction recently and was active on Field Day operating from Newport. Traffic: WA1EEJ 1000, K1N-QG/1 449, W1YKQ 161, W1BTV 120, WA1FRZ 118, K1-YEV 66, K1YVK 45, WA1CSO 42, K1TPK 18.

VERMONT—SCM, E. Reginald Murray, K1MPN—

Net	Freq.	Time	Days	QNI	QTC	Mgr.
Gr. Mt.	3855	2130Z	M-S	613	28	W1VMC
Vt. Phone	3855	1300Z	Sun.	121	—	W1UCI
VTNH	3685	2230Z	M-F	84	58	K1UZG
VTCD	3990½	1400Z	Sun.	39	14	W1AD
Carrier	3855	1300Z	M-F	352	3	W1KKD
VTSB	3909	2130Z	M-S	758	57	W1CBW
		1300Z	Sun.			

Welcome to new Novice WN1JHE (Barre) and new General WA1JGK (Arlington). The Lyndon Institute has a club call, WA1JGQ. The 2-meter f.m. repeater stations on Mt. Mansfield and Mt. Killington are doing a great job throughout the state and activity is increasing. The BARC is sponsoring International Field Day in Aug. Watch for the exact date and QTH. New officers of the CVARC are K1MPN, pres.; WA1FTV, vice-pres.; W1-CRW, secy.; K1MXQ, treas. Traffic: K1BQZ 311, K1-MPN 26, K1UZG 18, W1MRW 13, WA1GUV 10.

WESTERN MASSACHUSETTS—SCM, Norman P. Forest, W1STR—RM W1DWA reports for WMN (c.w.) on 3560 kc. daily, total traffic 76, 27 sessions, 7.3 hours operating time. PAM WA1EYF reports for WMPN 3913 kc., 21 sessions, 142 QN1 total traffic 57. The net will be discontinued until further notice because of lack of interest during the summer months. W1IC reports good attendance on the Central New England Net. This net operates on 3945 kc. Mon.-Sat. at 6:30 A.M. and reports 1264 QN1 and total traffic of 63 for Apr. The Wed. Night Net had 30 QN1 with traffic of 2. W1ZPB,

Mt. Hermon Radio Club, reports a fifth Novice license attained this school year. Also, the Connecticut Valley Net, v.h.f., 145.30 Mc., continues to attract a good number on Aon. at 9:00 P.M. The VARC newspaper, *The Oscillator*, has been awarded 2nd honors for the "Activities Coverage" and "Technical Articles" categories from the Amateur Radio News Service. WAIBRU, a member and editor, is to be congratulated on his fine efforts. WIZOC was awarded the first VARC Club certificate for Worked VARC at the May meeting. VARC is planning a picnic at Look Park July 14. Home Brew night seems to be taking hold as an interesting club activity. The HCRAL awarded prizes to WAHPN, W1-MTV and WAICTQ in separate categories for outstanding achievement. Also, Montachusets made a similar award to K1YLU at its Home Brew Night activity. Traffic: W1EOB 182, W1BVR 66, K1AEC 63, W1DWW 46, W1DWA 30, W1STR 29, W1EYF 28, K1WZY 26, W1HY1 14, W1HC 14, W1ZPB 14, K1LIV 5.

NORTHWESTERN DIVISION

ALASKA—Acting SCM, Albert F. Weber, KL7AEQ—SEC: KL7FNX, OBS: KL7CAH. We would like to say a big thanks to KL7GEF, our departing SEC, for a job well done. KL7FNX takes over as of now. KL7CAH reports the Sourdough Net will continue to operate at 0500Z. The newly-formed QRP Net is holding forth on 3715 Mon. at 0500Z and the best DX so far from the Fairbanks area has been KL7EVO's to Douglass, running less than 1/2-watt to a random length antenna. KL7AEQ hangs out there during the limited time he has for operating. WBKNC/KL7 has a Swan 250 and six-element beam up 50 feet, and is available for 6-meter skeds. His address is 320 Bently Drive, East, Fairbanks, Alaska 99701. It is reported that W7CNC is moving to Anchorage and will be operating 6. The Northland ARC will set up at Summit for its annual field exercise July 20 and will be working all bands. If interested in further details, contact KL7FLS. KL7GGV has a new SB34 awaiting the arrival of his General Class ticket. KL7-EWQ is organizing the Yukon 800 boat races this year. KL7RZ has been down Ketchikan way attending ACS school. KL7FLS's No. 1 son, KL7FLR, was home on two week's leave from the Navy and he and Bess's OM built up her 4-1000A linear. Traffic: KL7FLS 232, KL7-CAH 174.

IDAHO—SCM, Donald A. Crisp, W7ZNN—SEC: K7-THX. The FARM Net convenes on 3935 kc. week days at 0200 GMT. New FARM Net officers are K7ORA, chief net control, and K7KBX, net mgr. W7IUO worked WAS and received the section award for the 1967 C.W. SS Contest. W7JLS is a new Emergency Corps member in Lewiston. The Lewiston Emergency Corps provided communications for a Sports Car Race up Winchester grade. K7THX, WA7FFZ, WA7EWW, KL7FOZ, WA7-ETO and W7ZNN operated mobile and were stationed along the route of the race course and W7OWA provided a link into Lewiston. A family in Lewiston asked amateurs to help locate a lady vacationing near Chapala, Mexico, to inform her of a death in the family. Her exact location was not known. The lady was contacted after some difficulty. The message was relayed via W7-ZNN, WB6LYR, W6ZOM and ZE2YE. FARM Net report: 22 sessions, 88 traffic handled, 847 check-ins. Traffic: WA7BDD 117, WA7ETO 113, K7OAB 16, W7-GGV 13, W7ZNN 13, K7CSL 4.

MONTANA—SCM, Joseph A. D'Arey, W7TYN—SEC: W7RZY, RM: WA7DMA. Endorsements: W7OIO as OVS. George Hart, Communications Manager of the ARRL, will speak at a meeting of the Montana section hams. This dinner will be sponsored by the Butte Amateur Radio Club July 8. Several of the OVSs in Montana have been getting on 2-meter f.m. The Butte 2-meter f.m. frequency will be 146.760 Mc. W7PX, in Missoula, is now on 2. New officers of the Sidney Hi Sky Amateur Radio Club are K7SYY, pres.; W7BQE, secy.-treas.; K7SZE, trustee. New calls in the Bozeman area are W7NJLE and W7NJOA. The Bozeman group provided communications for the Junior Nationals Ski championships. W7NPV again showed up with a very fine report in the annual F.M.T. K7PGN is now W7FJR. We still need ORSs and OOs in the section. If you are interested in any appointment drop your SCM a note. Traffic: W7LBK 81, K7EGJ 24, W7RZY 14, K7ELW 2, W7QGJ 2, K7WRH 2.

OREGON—SCM, Dale T. Justice, K7WWR—RM: W7ZFH. PAM: K7RQZ. Section nets:

Net	Freq.	Time	Days	Mgr.
AREC	3875 kc.	0200Z	Daily	WA7AHW
AREC	145.35 Mc.	0230Z	Tue-Sat.	WA7DLE
OSN	3585 kc.	0130Z	Tue-Sat.	W7ZFH
BSN	3875 kc.	0930Z & 1900Z	Daily	K7IFG

WA7AHW reports for the AREC Net for Apr., sessions 30, check-ins 893, contacts 80, traffic 44, maximum number of counties 19. W7ZFH reports for the OSN for Apr., sessions 21, check-ins 120, traffic 50. New appointments: K7WVR as OO and K7DXV as EC for Klamath County. WA7EJZ is using a colinear antenna for 80 meters. WA7ICD and WA7JQJ have become General Class. New Novices in the Grants Pass area are WN7-JRT and WN7JQK. WN7JMY is on 2 meters with a Twoer. WA7HRG has a new Swan 500. The Josephine County 2-Meter F.M. Net meets at 0003Z Tue. on 146.76 Mc. WA7GCE reports 12 members in the license class meeting weekly. Her OM, WA7ELP, handles theory while she teaches code. The EARS Practice Net meets Tue., Wed. and Fri. at 9 P.M. local on 3743 kc. Listen for details on code proficiency certification. Don't forget the Bond Campout July 27 and 28 at Todd Lake. Traffic: (Apr.) K7RQZ 240, W7ZFH 118, K7NTS 65, W7ZB 58, K7WVR 35, WA7AHW 23, WA7EJZ 15, W7DEM 13, W7BNS 10, W7AIL 8, WA7BYP 7, K7RFO 7, W7WHY 5. (Mar.) WA7EJZ 10.

WASHINGTON—SCM, William R. Watson, W7BQ—SEC: W7UWT. RM: K7CTP. PAM: W7BUN.

NTN 3970 kc. 1830Z Daily QNI 857 Tfc. 312 Sess. 30
WSN 3590 kc. 0145Z Daily QNI 834 Tfc. 493 Sess. 30
WARTS 3970 kc. 0100Z Daily QNI 305 Tfc. 274 Sess. 20

The Washington State ARRL Hamfest, sponsored this year by the Yakima Amateur Radio Club, will be held the week end of July 13-14 at the Yakima Fairgrounds. WINJAI Communications Manager of ARRL is scheduled to speak at the Sat. night banquet. There will also be meetings of all Washington Section League appointees, ORSs, OPSS, OOs, OVSS, OBSs and EGS. The AREC will meet Sun. morning with SEC W7UWT. The now forming State Council of Amateur Radio Clubs will hold its first meeting Sat. afternoon. See the announcement in QST. Special commendation goes to WHDL for being among the top three OO stations in the country rendering a valuable service to the amateur fraternity. W7ABX received the Governor's Award for 26 years of OCD service. WA7DXI lost her antennas but bounced back with an award from the Weather Net group. K7JRE reports his XYL is now WN7JST. WN7-IUT is waiting for his General Class license to come through. The BEARS Club is pondering the site of a new club station. W7OS received honorary life membership in the Radio Club of Tacoma. W7BX now is in his 52nd year of ham radio. PAM, W7BUN totaled a high 122,500 in the '67 SS. W7PGY traveled to Newington for the Board Meeting. SCM W7BQ visited the Grays Harbor, Lake Washington and Bremerton Club meetings in May. W7LFA M.Ced the Skagit Hamfest. K7CTP is doing an FB job as secy. for the Northwest Technical Net Sun. 3 p.m. (4 P.M. summers) on 3970 kc., and pincheits for W7BQ. W7UW completed a photo trip to Hells Canyon. The Dial Twisters of Spokane is operating a new net on 3910 kc. W7EXM sends in an OO report and news of a new linear. Plans are underway for Washington Amateur Week Sept. 1-8, with the QSO Party the week end of Sept. 7-8. We regret the passing of W7SEM and W7DWG to Silent Keys. Traffic: (Apr.) W7BA 1487, W7DXZ 603, WA7DJI 627, W7ZIV 522, W7HMA 466, W7AXT 344, WA7DZL 310, W7PI 250, W7CTP 184, W7KZ 173, W7EYF 116, W7IEU 89, W7BTB 71, W7BP 66, WA7-HKR 66, WA7EYN 65, WA7EDQ 45, K7KPA 43, K7THG 43, W7GYP 36, W7APS 29, W7RBN 25, WA7IB 20, W7ZHZ 15, WA7DQB 14, K7YFJ 12, K7OXL 11, WA7-FKM 9, W7PGY 9, K7MGA 8, W7OEB 5, K7SUX 5, W7UW 5. (Mar.) W7AMC 6, K7EFB 2.

PACIFIC DIVISION

HAWAII—SCM, Lee R. Wicat, KH6BZF—WODX. pres. of ARRL and IARC, made his first sojourn to our beautiful Islands recently. Returning from an IARC Region III meeting in Sydney, Bob spent two wonderful days in the land of *Aloha* as the house guest of KH6J. Earlier a formal dinner was held at Honolulu's Pacific Club. Den-niston spoke to the leading amateurs representing their clubs, civil activities, MARS groups and ARRL field appointees. Ex-KH6EPW is now W6QY. W6YVZ called me when he was in town but unfortunately I wasn't home. KH6GHZ, ex-TA3MP and our able SEC Hawaii, is scheduled to show his slides of TA3MP at the next Aloha DX Club meeting. Those interested in obtaining more information on this club should drop a line to club secy. KH6GJW, P.O. Box 9471 Honolulu, Hawaii 96820. Ex-W9GBK/KH6 writes that he's now N0KKZ while in Turkey. Twenty meters continues to be the best band to DX from Hawaii with 15 a close second. KH6BB has been quite active on 15 meters and reports many DX stations on. The chief operator at KH6AJF is WB6TOP/ KH6 and he's doing a bang-up job as alternate NCS on the Marine Net. Seen mobiling locally is W9BFI/M/KH6.

Net	Freq.	Time (GMT)	Days
League Appointees	7.290 Mc.	0700Z	Wed.
Friendly Net	7.290 Mc.	2030Z	M-F
Pacific Interisland	14.330 Mc.	0830Z	M-W-F

Traffic: KH6GHZ 845, KH6BZF 11.

NEVADA—SCM, Leonard M. Norman, W7PBV—SEC: WA7BEU, W7YKN reports lots of 2-meter activity in the Reno Area with the repeater operational. W7EBP is working DX with a new beam and tower. WA7DUF and WA7DUG, both pilots, are in the Aerial Photo business. K7ICW, K7RKH and K7ZOK all report activity on u.h.f. W7TVE is active on 20 meters. WA7BJA, NCS of the Nevada Emergency Net on 3996.5 kc., is doing a very fine job. W7NGVX and W7NGXK still are meeting the postman for their General Class licenses. W7JLN is active in Lincoln County on all bands, fixed and mobile. W7PRM is active on 2-meter t.m. WA7CQS and WA7ESM are both Sears employees. W7YIC and W7YNE are looking at sailplanes. WA7DUF, WA7DUG, WA7GIV and K7TDG have RTTY gear. WA7BYQ, WA7DSP, WA7GXM, WA7JTH and K7ZOK are active on 6 meters. Nevada, the birthplace of WCARS-7255, has received many FB articles and write-ups in various publications, thanks to the FB job of its president, K7ZAU. W7JLV/K7UEW is looking for stations in joining a state-wide RACES Net. Traffic: W7BLF 12, WA7BEU 10, W7YKN 4, W7PBV 2.

SACRAMENTO VALLEY—SCM, John F. Minke, III, WA6JDT—ECs: WB6MND, K6RHW, WB6RSY, W6-SMU, WA6TQJ, RM: W6LNZ, ORSs: W6LNZ, WB6QZZ, WB6RSY, W6VUZ, WB6YTX, K6YZU, OPSs: WB6EAG, WB6MAE, W6VUZ, OBSs: WB6MAE, W6NKR, WB6-PHQ, OOs: W6DOR, W6GDO, W6ZJW, OVSs: WA6-CXB, WA6FWU, W6GDO.

Net	Freq.	Time	Days	Mgr. or NCS
NCN	3630	0200Z	Daily	WB6EVA
NCN/2 (slow-speed)	3630	0330Z	Daily	WB6HVA
SCEN	146.25	0500Z	Wed.	WA6CXB

WA6FWU reports that the Nevada County Net on 2 meters is now defunct. W6LNZ has been chasing DX on 10 meters in addition to his NCN duties. The El Camino and Marconi High Schools had stations on the air during open house during Education Week, equipped for 30 through 10 and 2 meters. Participants in the Feb. FMT were WA6CXB, W6KDJ and W6ZJW. WA6OIF is a newcomer to 160 meters. Your SCM would be interested to hear from amateurs or groups interested in 160 meters. So far, it appears that the Golden Empire ARS and the Nevada Co. ARC are the only ones. Will the additional frequencies we just obtained stir up some activity? W6BNK is now W6RJ. W6EOU joined DXCC and has applied for a 2-letter call. Traffic: W6LNZ 55, K6IYV 17, K6KRL 16, WB6QZZ 13, WB6MAE 10, W6NKR 10, WA6JDT 2.

SAN FRANCISCO—SCM, Hugh Cassidy, WA6AUD—SEC: W6WLV, WB6OGF reports 18K in the c.w. portion of the CD Party. A new EC in Humboldt County is W6BWV. WB6WAIB reports 6 meters is picking up. W6RQ made another fine score in the Feb. FMT with an average error of 4 parts per million. At again was mentioned in the ARRL Annual Report for the longest consecutive string of reports in FMTs, going on 14 years. WA6BYZ and W6KVQ made the BPL in Apr. The Tamalpais Radio Club had its Annual Sunday Breakfast at Taylor Park Apr. 21 with a good turnout in the fine weather. W6HST was back in the hospital in April for heart surgery. K6RAO handled the Field Day action for the Marin Club. WB6VOA is getting up a tower and tri-band for some high-frequency operation. Our new SEC, W6WLV, is looking for action and would like to hear from any person or club interested in improving emergency preparation. The K6GWE repeater group is trying to work the bugs out of its new solid-state control unit. Traffic: W6KVQ 857, WA6BYZ 191, K6TJW 78, W6WLV 67, WA6AUD 29, W6RQ 3.

SAN JOAQUIN VALLEY—SCM, Ralph Saroyan, W6JPU—it is with deep regret that I have to report the passing of two hams—W6GNR, who was killed in a one-car auto accident, and W6SSL, who had a heart attack. The 26th Fresno Amateur Radio Club Hamfest was a great success with over 500 in attendance. WA6DDR is mobile in his VV. WB6JQT is s.s.b. on 75. K7AUZ/6 is located at the Lemoore Naval Base. K6GSS is active on 6 meters. While attending the Fresno Hamfest, WA6-EDQ's hamshark was broken into and all of his equipment stolen. Anyone knowing of any Collins S/Line equipment for sale, cheap, please advise. W6JXY has a new BTI linear amplifier. W6JUK is recuperating from an eye operation. The Kern County Radio Club meets

the 2nd Wed. of each month at the USNTR. All are invited to attend. WB3ZVG and WA6SCE are teaching code and theory to Novices. K6URK has a new 15-meter beam. W7AAF/6 is now W6IPC. K6KOL has a bow-tie dipole on 80 meters. WA6DB says that check-ins are invited on the PCN Net, which meets 12-1 daily on 7120 kc. W7AAF/6 and W6UZX are running traffic at 150 w.p.m. with great success. Traffic: W6BHVA 358, W7AAF/6 335, W6ADB 216, W6ASCE 153, K6KOL 101, K6OZL 10.

SANTA CLARA VALLEY—Acting SCM, Edward A. Gribi, WB6IZF—Asst. SCM: Ed Turner, W6NVO, SEC: W6VZE, RM: WA6LFA.

Bay Area AREC Net, 3900 Sun., 1830G.
Northern California Net, 3630 Daily, 0300G.
Monterey Bay Emergency Net, 147.16 Tue., 0400G.
WA6LFA is trying to check into the AREC Net Sun. morning. W6OII was on vacation most of May. EC/OPS W6VK, Halfmoon Bay, is active in contests and reports the bands have been erratic. W6DEF is busy as usual with NCN, the Weather Net, QCWA and in the AREC and reports that W6KRS is back from a 7-week trip to the Orient on the SS *Cambera*. WB6WLIH is moving to Washington, D.C. W6RSY is QRL on RN6. W6AUC is busy with traffic from Guam and vacationing friends and maritime mobile. W6ZRJ, Pacific Division Director, is busy with many meetings and division business but took time to act as judge at the Foothills RC homebrew contest. K6DYX has a new KWM-2 and reports a new local net on 23.650 at 0230G Wed. with K6LY as NCS. W6RFT is QRL with school but spent a few hours in the April CD Party. W6BYV is handling traffic on NCN and RN-6. WB6IZF was on a business trip most of May but in his spare time was active in the West Coast Amateur Radio Service Net. Need to get a message to practically any city on the West Coast? Just check into the WCARS Net on 7255 kc. days or try 3952 at night. Your report didn't get in this month? Blame some of it on the mail service and not WB6IZF as this report is being prepared by W6NVO. Traffic: W6RSY 912, WA6LFA 243, K6DYX 187, W6YBV 126, W6DEF 107, W6VK 41, W6AUC 26, W6OII 16, W6ZRJ 14, W6RFF 8.

ROANOKE DIVISION

NORTH CAROLINA—SCM, Barnett S. Dodd, W4-RNU—Asst. SCM: James O. Pullman, W4FJMJ, SEC: WA4LWE, RM: K4CWX, PAM: W4AJT, V.H.F. PAM: W4EJZ. We are deeply sorry to report the death of former North Carolina SCM, B. Riley Fowler, W4RRIL, Morganton, N.C., on May 3, 1968. K4CJT recently received his Ph.D. in physics at NCSU and has accepted a position with Texas Instruments of Dallas. WB4BGL is now in his new QTH. W4KQL says, "After seven years of inactivity am back on using SB-101. My last QTH as an active was Winfield, Ala., and my call K4ZXX at that time." W4KWC says he is in the process of upgrading his antenna "farm." Heartiest congratulations to all nets and their members for a job well done in *Operation Election*.

Net	Freq.	Time	Days	QTC	Mgr.
THEN	3923 kc.	0030Z	Daily	176	W4ZTC
NCN (L)	3578 kc.	0200Z	Daily	91	W4CFN
SSBN	3938 kc.	2330Z	Daily	50	WA4LWE

Traffic: (Apr.) W4EVN 272, W4RWL 203, WB4RGL 88, W4ZCC 84, W4FDV 68, W4AVNV 54, W4ACFN 52, W4-2LK 51, K4CWX 37, W4AKX 31, K4VGB 31, WB4JH 24, W4KQL 24, W4BNU 21, W4FJM 20, K4YCL 17, K4EO 16, W4AGMC 16, W4AKWC 6, W4ARVI 2, K4-TTN 2. (Mar.) W4LWZ 95, W4AVT 20.

VIRGINIA—SCM, H. J. Hopkins, W4SHJ—SEC: K4-LMB, PAM: W4OKN, RMs: WA4EUL, K4MLC, W4UQ was elected chairman of the Eastern Area NTS Staff which met at Syracuse in late Apr. WB4DOY has acquired a linear amplifier and a keyer; the latter enables him to check into the c.w. nets. W44PXX, now operating as K42PX, listens for Virginia amateurs on 14.210 kc. daily between 1100 and 1400 GMT. He will be returning to the section in Dec. K4CG continues to handle volume message traffic from and to overseas points, daytime traffic operators may find them on 14.337 at 1600 GMT and 7240 at 1800 GMT. W4OP and K4KNP are the Official Bulletin Stations for phone and c.w., respectively. Listen for them on or near the net frequencies. WB4GTG claims his recent phone operation was not by choice but caused by a broken keyer. There are no more W4 two-letter calls available; W4S2T applied and received K4DC. Virginia nets meet daily on these frequencies and times: 3630, 1830 to 1930 EDT; 3935, 1800 and 2200 EDT; 3835, 1900 EDT. Traffic: (Apr.) K4CG 815, K4KNP 391, WB4FTD 292, K4DC 236, W4NTC 221, WB4GAN/4 213, W4YZU 169, W4EUL 167, WB4DRB 164, WB4GTG 142, W4UQ 118, W4ZM 116, WB4CVY 89,

EIMAC

3-500Z's used in Drake's linear amplifier for 2 kW PEP at 3.5-30 MHz

The R. L. Drake L-4B linear amplifier shown here uses two of EIMAC's new 3-500Z zero-bias triodes in grounded grid circuitry to achieve 2-kW PEP SSB input and 1-kW dc input on CW, AM, and RTTY. Drive power is 100 watts PEP and 75 watts CW, AM, and RTTY.

Drake chose EIMAC 3-500Z's because these rugged, compact, high-mu power triodes are ideal for grounded grid operation. They can provide up to 20 times power gain in a cathode driven circuit. And the two tubes have a total plate dissipation rating of 1000 watts.

For more information on EIMAC's line of power tubes for advanced transmitters, write Amateur Services Department, or contact your nearest EIMAC distributor.

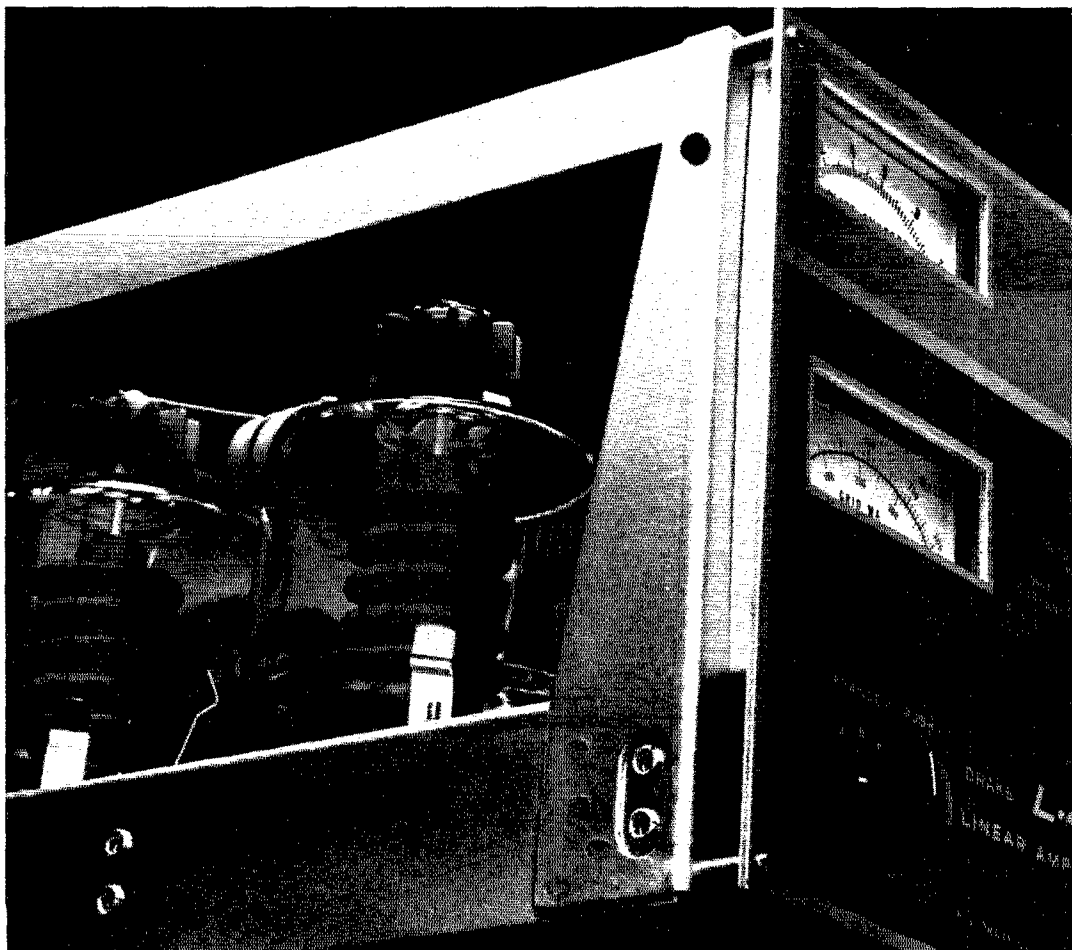
3-500Z TYPICAL OPERATION*

DC Plate Voltage .....	.2500 V
Zero-Sig DC Plate Current** .....	.130 mA
Single-Tone DC Plate Current .....	.400 mA
Single-Tone DC Grid Current .....	.120 mA
Two-Tone DC Plate Current .....	.280 mA
Two-Tone DC Grid Current .....	.70 mA
Peak Envelope Useful Output Power .....	.500 W
Resonant Load Impedance .....	.3450 ohms
Intermodulation Distortion Products	-33 dB

*Measured data from a single tube

**Approximate

EIMAC
Division of Varian
San Carlos, California 94070



EIMAC

3-400Z's used in prototype 6-meter linear amplifier for 2 kW PEP at 50 MHz

The prototype Swan linear amplifier shown here uses two EIMAC 3-400Z triodes in grounded grid circuitry to achieve two kilowatts PEP input at 50 MHz. Drive power is less than 100 watts PEP. The prototype amplifier features a tuned cathode circuit for low intermodulation distortion, and uses a pi-network plate tank circuit. The new linear may be driven with modern six-meter SSB transceivers, and offers real operational economy at 50 MHz.

Swan chose EIMAC 3-400Z's because these compact, high-mu power triodes are ideal for grounded grid operation. They can provide a power gain as high as 20 in a cathode-driven circuit.

For more information on EIMAC's line of power tubes for advanced transmitters, write Amateur Services Department, or contact your nearest EIMAC distributor.

3-400Z TYPICAL OPERATION

(Minimum IM Distortion Products at 1 kW PEP Input)

DC-DC Plate Voltage.....	2500 V
Zero-Sig DC Plate Current*.....	73 mA
Single Tone DC Plate Current.....	400 mA
Single Tone DC Grid Current.....	142 mA
Two Tone DC Plate Current.....	274 mA
Two Tone DC Grid Current.....	82 mA
Peak Envelope Useful Output Power.....	560 W
Resonant Load Impedance.....	3450 ohms
IM Distortion Products.....	-35 db**

* Approximate

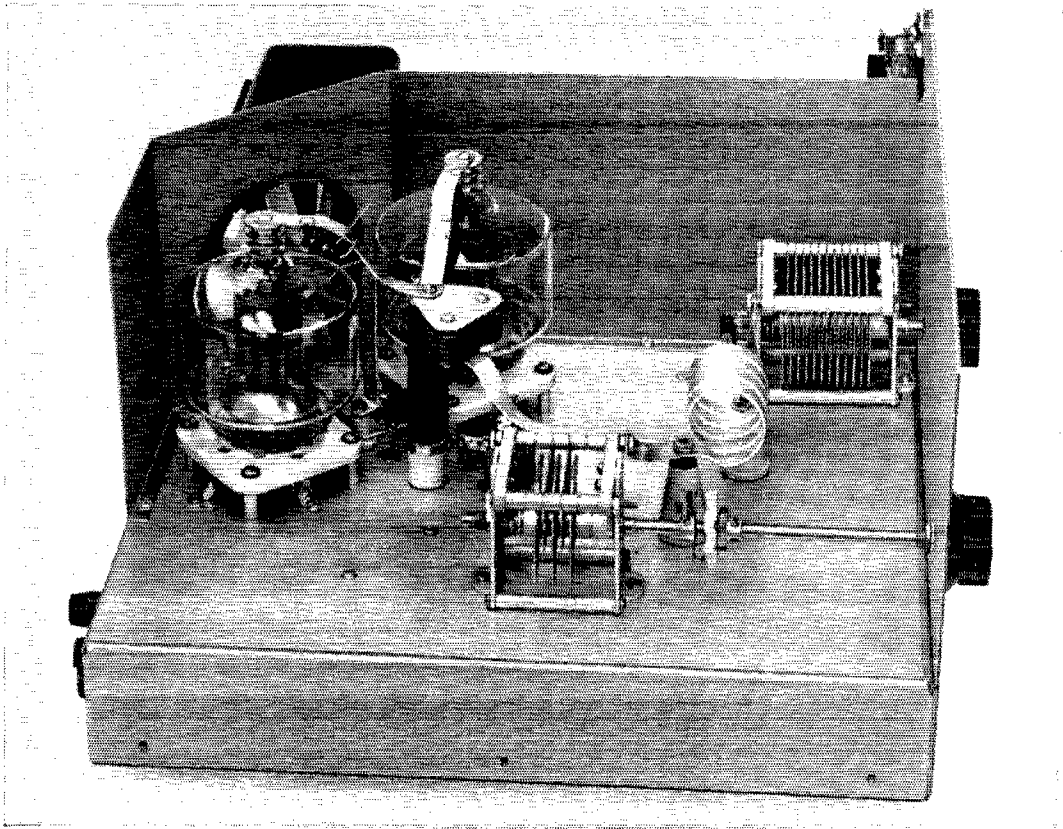
** -35 db or more below one tone of a two tone test signal.

We have a new brochure entitled "Linear Amplifier and Single Sideband Service." Write for your copy.

EIMAC

Division of Varian

San Carlos, California 94070



KH'SS 84, W4OKN 64, W4ILE 58, K4MLC 47, WB4DOY 39, K4VCY 29, WB4BFB 28, W4RHA 28, K4TSJ 28, WB4GTS 24, WA4PBG 24, W4TE 21, W4KX 20, WA4BOO 14, WB4FLT 14, K4ASU 11, WB4GVT 11, W4SHJ 7, W4MK 6, WA4WQQ 4, W4UJ 3, WB4GYV 2, WN4HUE 2, W4WG 2, W44YRH 2, WB4DQF 1. (Mar.) WB4DQF 2, K4LMB 1.

WEST VIRGINIA—SCM, Donald B. Morris, W8JM—SEC: W8IRN, RMs: K8MYU, K8TFP. PAMs: K8CHW, W8YD, WVN (c.w.) meets at 0000 GMT daily on 3570; WVN (phone) at 2330 GMT daily on 3890. The following stations are active at the W. Va. Tech. club station, W8ABZ: W8ACPY, W8AEQG, WN2EXH, W8AFJA, W8OPAL, W8ASPO, W8APWR, W8AUFEX, W8A8UY, W8NYCG, W8N8ACG, W8A8HE, W8ARQB received WACWV No. 48, W8A8ED now is operating as ZL3ADC on 28,690, K8CRM/LA is on 21,050 and W8BT, ex-W8PQQ, operated as ON4 on a tour of duty, W8DUV now is secy. of the West Virginia State Radio Council and W8DUW is building a 1-kw. amplifier and electronic keyers, W8AFIE schedules his daughter, W8FID, at WYU. The WVN C.W. Net reports 30 sessions, 171 stations and 93 messages and the Phone Net reports 30 sessions, 971 stations and 162 messages. It is with regret that I report the passing of W8A8UM and W8HTU. W8ANDY received an ARRL Public Service award for emergency communication at the Point Pleasant bridge disaster. W8YSB was active in the Intercolligate Rifle Match communications, W8CLX is installing 29.6 f.m. gear in an excellent location for state-wide coverage. Traffic: (Apr.) W8SQO 213, K8MYU 130, W8AHZ 95, W8ARQB 67, W8YSB 61, W8IIZA 59, W8ACKN 36, W8AWCK 36, W8ANDY 33, W8CCK 21, K8BIT 20, W8DUV 19, W8JM 18, W8KMZ 7, W8WEJ 7, W8AYOF 7, W8IRN 6, W8ACKN 5, W8YD 5, K8MQB 4, W8ATWR 4, W8AWX 4, W8ALFZ 3, K8CHW 2, W8AFIE 2, K8CFT 1, W8DJP 1, K8KRW 1, W8NCD 1, W8ANRV 1, W8A8XI 1, W8ASPO 1, K8QQS 1, K8QYG 1, W8UPH 1, W8WVM 1, K8ZDY 1. (Mar.) W8A8POS 47.

ROCKY MOUNTAIN DIVISION

COLORADO—SCM, Richard Hoppe, K0FDH—Asst. SCM: Albert E. Hankinson, WA0NQL. SEC: W0SIN. PAM: W0CXW. Congratulations again go to the Columbine Net for leading all other sectional nets in both QNI and QTC. We are all sorry to hear that the net manager, W0GDC, has been ill, however, we all wish him a speedy and complete recovery. WA0RLQ, W0LEK, WA0CHT and a few others helped with keeping track of the 1918 De Havilland plane flight from California to the Smithsonian Institute in commemoration of the 50th year of Air Mail service. W0EXR, W0YJN and W0NTT have all been helping missionaries in Bolivia, Ecuador and Columbia to keep in touch with their families and friends in the Colorado area. Traffic honors, note that this month's top honors are going to the XYLs. Traffic: K0ZSQ 841, WA0MNL 133, W0KAU 115, W0UAT 106, W0LRN 99, W0SIN 47, K0DCW 30, K0ECR 28, W0LEK 27, W0LRW 25, K0IGA 9, K0AINQ 8, WA0JTB 5.

NEW MEXICO—SCM, Kenneth D. Mills, W5WZK—WA5MCX has moved to Los Alamos. K5CQH spoke about the TVI committee at the Albuquerque ARC meeting. Your SCM also made a presentation at the meeting. K5EQC was chief chef at the Mesilla Valley ARC Banquet and Hamfest. Close to 150 attended. An extremely good time was had by all. Put this one on your calendar for next year. DL5MG, ex-W5LVR, will have the two-letter call W5FZ when he comes back to the states from Germany next year. Walt wants a schedule with a New Mexican. Write or contact me for his address. W5QDF is Net Control for the Bonanza Net on 145.44 at 2000 MDT Sun. All nets have moved to Daylight Saving Time. Traffic: W5MYM 23, W5DMG 14, W5NUT 7, W5JNC 6, W5BWV 4, W5MIY 3, W5QNK 1.

UTAH—SCM, Gerald F. Warner, W7VSS—SEC: W7WKF. RM: W7OCX Traffic Nets:

BUN	Daily	7272 kc.	1830Z
UARN	Sat.-Sun.	3987.5 kc.	1400Z

Daylight Saving Time has again affected all nets in the Utah section except the FARM Net. See the above listing for correct net meeting times. W7OCX attended the ARRL Board Meeting to represent the Rocky Mountain Division. Director Smith, W0BWW, was unable to attend. A new ORS and OBS appointee is W7EM. Amateur radio again will provide communications for the annual Friendship Cruise, held in eastern Utah's rugged Colorado River country. Traffic man K7HLR is now living in Utah, having moved to Clearfield from Idaho. I hope to see you at the Division Convention at Cheyenne, Wyo.,

in late June. Traffic: W7EM 167, K7HLR/7 85, W7OCX 76, K7SOT 30, WA7BME 22, W7VSS 9.

WYOMING—SCM, Wayne M. Moore, W7CQL—SEC: K7NQX. RM: WA7CLF. PAMs: W7TZK, K7SLM. OBSs: K7SLM, K7NQX. Nets: Pony Express, Sun, at 0800 on 3920; YO, daily at 1830 on 3610; Jackalope Mon. through Sat. at 1215 on 7260; Wx Net, 0630 Mon. through Sat. on 3920. K7WRR visited Wyoming in Apr. and is now located in Orem, Utah. The University at Laramie now has its old call back and is on the air using W7OBE. K7RFL has moved to a new QTH in Sheridan. W7SDA has a new transceiver and is on the air more than ever. Don't forget the State Hamfest July 27-28 at Togwotee Lodge, west of Dubois. K7SLM came home from vacation with a new transceiver. The Casper Club has started a program of study for the Advanced and Extra Classes of license. WA7CLD and WA7CLE (the Gray twins) were recent stars in the Casper High School play. Another new voice from Casper—WA7HFJ. Traffic: K7NQX 500, K7DEJ 83, W7ADNZ 83, K7ITH 75, W7TZK 65, W7YVW 54, WA7EDC 49, K7VWA 22, K7YPT 14, WA7BDI 10, W7NKR 10, K7QJW 6, K7WRS 7, WA7EGK 3, K7JED 3, K7HHW 1.

SOUTHEASTERN DIVISION

ALABAMA—SCM, Edward L. Stone, K4WHW—SEC: W4FPL. PAM: WA4EEC. RM: WA4EXA. Another fine Birminghamfest is now history, but many will never forget the most happy occasion. W4ASW, W4WJX, K4TNS and K4WHW were presented with the BARC awards. W4USM was presented the award for the highest section scores in both phone and c.w. in the Sweepstakes. K4WHW received the V.H.F. SS award. WA4WA0 and W4GRG received the DX Contest awards for phone and c.w. The Huntsville ARC received the Field Day trophy and the club trophy for the top SS club score. The North Alabama DX Club was presented the Club DX award. WA4UP was presented with the Annual Citizenship award by the Birmingham Club. W4YXS has joined the Silent Keys, along with K4NSC. All Alabama nets are operating on CDSST, so if you have trouble locating them try one hour earlier than the winter months (GMT). Traffic: (Apr.) WA4AVM 166, WA4FYO 143, WA4EEC 103, W4SNV 80, WA4UXC 53, K4AOZ 52, WB4EKJ 39, WA4VEK 32, K4WHW 26, K4B8K 24, WA4KU 24, K4HJM 23, WA4ROP 17, WA4AZC 15, WA4NW 15, K4KJD 13, WA4MTG 13, W4FPI 12, WA4SNU 11, WB4ENX 8, W4DGH 7, K4KMG/4 3, W4YER 3. (Mar.) WB4BLX 5.

CANAL ZONE—SCM, Russell E. Oberholtzer, KZ5OB—KZ5s were active in Field Day. KZ5PN is on the air with a new FTDX 400 transceiver. Don't forget to get your self-addressed stamped envelopes or monetary deposit in to the new QSL Manager, Gloria, KZ5GS, Box 107, Balboa, Canal Zone. Traffic: KZ5AA 281, KZ5FU 135, KZ5OA 134, KZ5WH 124, KZ5OB 84, KZ5FX 13, KZ5EM 6.

EASTERN FLORIDA—SCM, Jesse H. Morris, W4MYB—Asst. SCM: William G. Blasingame, Jr., WA4NEV. SEC: W4HYT. Asst. SEC: W4FP. RM C.W.: W4ILE. RM RTTY: W4RWAL. PAM 75M: W4OGX. PAM 30M: W4SDR. V.H.F. PAM: W4ABMC. With the coming of spring traffic reports have dropped off. W4BKC reports that the Orlando Hamfest was a great success in spite of the set-backs that seemed to pop up. It was nice seeing so many of the gang again. WA4TJS has moved to Lake Wales and will soon be on 2 through 80 meters. He is building a homebrew 2-meter transmitter. W4ILE reported that 25 people attended the QFN Breakfast at the Orlando Hamfest. Also congratulations are in order for his XYL, Angie, who is now WN4JJE. Look for her on the Novice bands. W4ILE has completed the second edition of the Florida Traffic Handlers Routing Guide. It is truly a work of art and a "must" for any traffic man in Florida. Copies may be obtained from Florida Ship. WB4BMR reports that there are now 6 amateurs in Hendry County and 5 of these are AREC members. The Beaches Amateur Radio Society is continuing its classes for General, Advanced and Extra Class licenses. Several of those who appeared before the examiner recently have been successful in obtaining a higher class license. Florida experienced some good openings on 2 meters recently between Jacksonville and Miami. Several of the f.m. stations had good QSOs. K4YSN reports that a number of f.m. 2-meter rigs are being installed in cars in the Miami area. The South Florida FM Assn. now has its repeater working. 146.340 input and 146.760 out. Traffic: WA4SCK 943, W4DFU 404, WA4NEV 342, W4KTS 324, WA4FGH 248, W4FP 153, W4P4LW 145, WA4HED 123, W4BEPD 121, W4ILE 105, W4LSR 101, W4DVO 85, WA4OHO 84, WA4NBE 81, WB4DDO/4 80, W44TWD 78, W4SMK 77, W44FJA 60, W4FP 53, K4SLNE/4 52, W4FHZ 47, W4ZAK 44, W8BZY/4

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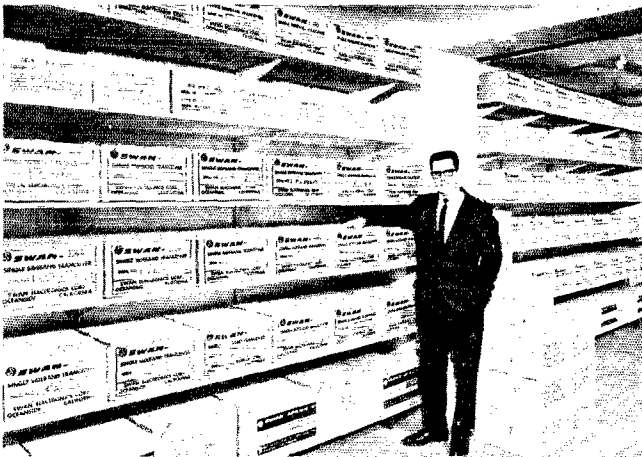
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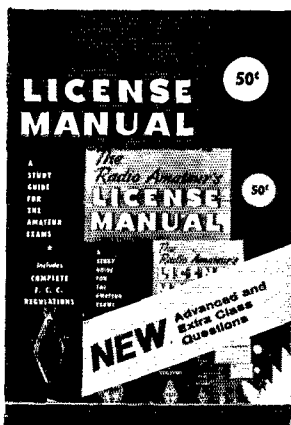
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43. K4IEX 42, WB4GUH 41, WA4CIQ 38, K4COO 38, W4EHW 37, WB4OSP 34, W4IAD 28, W4JGX 28, WA4-PWF 25, K4LEC 22, K4BLM 21, WA4EYU 21, K4LPS 18, W4BKC 17, W4KHY 14, W4TJM 14, W4PBK 13, K4SJJ 12, W4SON 12, W4YXP 11, WA4TJS 9, W4VPO 7, K4-EBE 5, WB4BMR 2.

GEORGIA—SCM, Howard L. Schonher, W4RZL—SEC: W4DDY, Asst. SEC: WA4WQU, RM: W4CZN, PAMs: WA4WQU, K4HQL, W4HYW participated in the Florida QSO Party, K4TQU is on 6 with a G-50, K4HQI is on 6 and 2 RTTY, WA4ARK/4 is on 6, W4BTW and WA4JCI are flying to hamfests, W4BGK licked TVI on 6.

Net	Freq.	Days	Sess.	QNI	QTC
G5N	3595	0000 & 0300 Dy.	60	185	165
GFN	3718	2300 Dy.	30	181	30
G5SN	3975	0100 Dy.	Not reported		

WB4EMF, in addition to activities as net manager of GTN, is organizing a Ga. Teenage Net for Mon., Wed. and Fri. on 3925 kc. WA4LLI says no station was active in Columbus to handle his report. Shame on me! K4TXK has a seven-element HB beam on 2. W4PGU's golf score is higher than his traffic total. WB4FMJ reports the 6-meter band is on the upswing with openings to Tex., Okla., Miss., Colo., S. Dak., Ohio, Fla., Cuba and South America. WB4FNS has a Swan 250, K4HQL also reports 6-meter excellent with openings to 4, 5, 6, 7, 8, 9, 0, as well as LU3, CO2 and CO5. W4PGU once more holds an Advanced Class ticket. W4DDY is now s.s.b. with a Swan. Traffic: (Apr.) W4FOE 222, W4CZN 172, WA4RAV 102, K4JFY 59, W4FDN 54, W4PIM 43, WB4EMF 23, K4-TXK 23, WA4LLI 21, WA4RH 16, K4BAI 13, WN4IES 13, W4PGU 3, (Mar.) W4PGU 2.

WESTERN FLORIDA—SCM, Frank M. Butler, Jr., W4RKH—SEC: W4IKB, PAM h.f.: W7BNR/4, V.H.F.: W4UUF, RM: W4BVE. Section nets:

Net	Freq.	Time	Days	Sess.	QNI	QTC
WFPN	3957 kc.	2200Z	Daily	30	705	59
QFN	3651 kc.	2230/0200Z		60	—	—

Pensacola: W4AXP was in Baptist Hospital for several weeks, but is doing better now. WA5KAK/4 was appointed ORS. WA4EPI reports good progress toward Extra Class and First Class Phone. K4DOT took part in the recent FMT. W4FRJ has a new IIX-100, W4UUF worked Havana, Cuba, on 2 meters, plus several states, during the Apr. band openings. Fort Walton: WB4CFQ and W4MMX passed the Advanced Class exam. The remote receiver for the WA4EVU repeater was moved to the Destin water tank, about 180 ft. high. W4UXW brought back several mobile rigs from the Orlando Hamfest to boost 2-meter f.m. activity in the area. WB4EQU and WB4CFQ have theirs going. K4QVL went high power with a Swan 500, trading his SB-34 to WA4YH, Chipley: W4IKB is up to 14 countries on 20-meter RTTY. Marianna: We were saddened to learn of the passing of WA4-DED. He was an untiring worker for the ARPS and ARRL, and will be sorely missed on WFPN, Tallahassee: WA4EQG got his all-s.s.b. WAS and WAC awards. W4GAN, the XYL of W4JGD, is active on the Fla. Mid-day Traffic Net. Cross City: K1PFW/4 is transferring to Mississippi, but W7NQY/4 is taking his place. Traffic: WB4DHz 128, W7BNR/4 119, WA5KAK/4 66, WB4GYX 40, W4JGD 28, W4IKB 10.

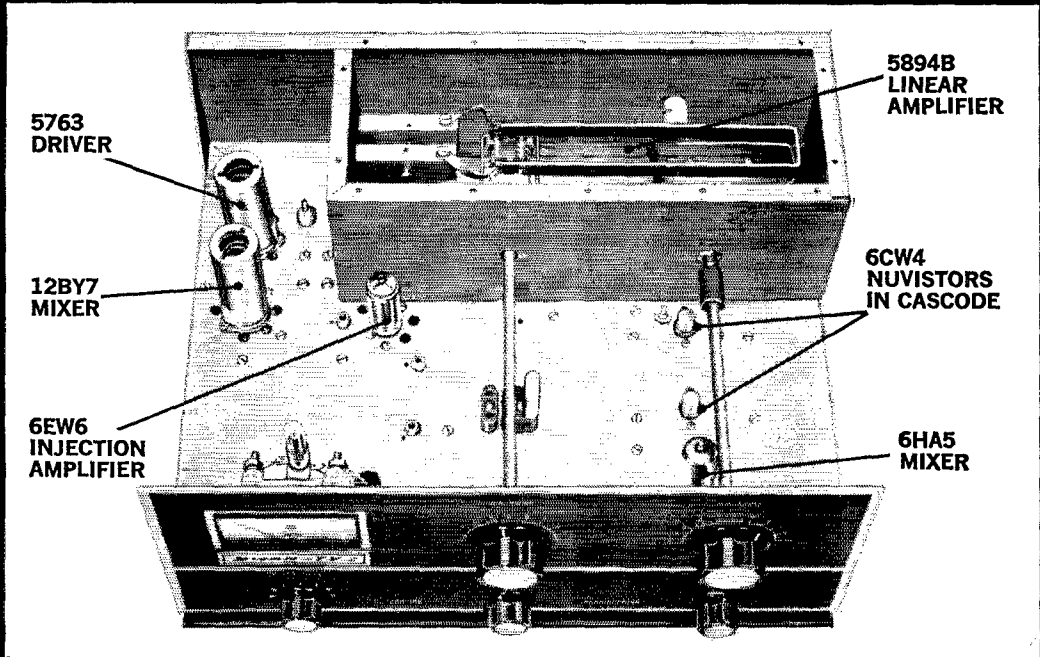
SOUTHWESTERN DIVISION

ARIZONA—SCM, Floyd C. Colyar, W7FKK—PAM: W7CAF, RM: K7NHL. The ARRL Southwestern Convention is being held in Phoenix Aug. 30, 31 and Sept. 1. At the convention you will hear lectures by many authors of technical articles, view the latest amateur equipment and meet in person the many amateurs you have contacted. Please set aside the above dates and plan to be in Phoenix for this wonderful event. From past experience, assurance is guaranteed that it will be an event that you will long remember. W7QHC and W7FKK have returned from Lisle, Ill., where they were students in DATA courses at the Bell System's Center for Technical Education. We wish to thank OBS K7MTZ for the fine way he transmits the Bulletins on both s.s.b. and c.w. We have received many fine comments. Keep up the good work. Lou, K7NHL reports the TWN now meets at 0200Z and 0430Z daily on 3570 and 7070 kc. Congratulations to WA7FD on passing the Advanced Class exam. Traffic: K7NHL 214, WA7FD 104, K7MTZ 86, W7FKK 16.

LOS ANGELES—SCM, Donald Etheredge, K6UMV—SEC: K6QPH, Asst. SEC: K6AVQ. The following stations were credited with earning BPL for the month of Apr.: WB6GGL, W6NLF, WB6BBO, WA6KZI and K6-ASK. WB6OLD reports a new quad addition to his

2 METER SINGLE SIDEBAND

144-148 mc 240 WATTS P.E.P. INPUT



THE NEW SWAN TV-2 TRANSVERTER

A receiving and transmitting converter for the 2 meter band, designed to operate with Swan Transceivers, models 250, 350, 350-C, 400, 500, and 500C.

SPECIFICATIONS:

14 mc intermediate frequency is standard. Thus, when operating the Transceiver from 14 to 14.5 mc, the Transverter functions from 144 to 144.5 mc. Additional crystals may be purchased and switched in for other portions of the 2 meter band, such as 144.5-145, and 145 to 145.5 mc. Three crystal positions are available.

Alternately, the TV-2 Transverter may be ordered for an I.F. in the 21, 28 or 50 mc bands, if desired. Of course, for use with a Swan 250 six meter transceiver, the Transverter must be ordered for 50 mc. Otherwise, the standard 14 mc I.F. is recommended since bandspread and frequency read-out will then be optimum. The Transverter can easily be adjusted in the field for a different I.F. range, if required.

A 5894 B Power Amplifier provides a PEP input rating of 240 watts with voice modulation. CW input rating is 180 watts, and AM input is 75 watts.

Receiver noise figure is better than 3 db, provided by a pair of 6CW4 nuvistors in cascode.

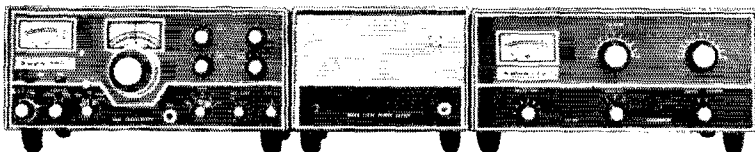
Only a Swan Transceiver and Swan AC power supply, Model 117-XC, are required. The power supply plugs into the Transverter, and the Transverter in turn plugs into the Transceiver. Internal connections automatically reduce the power input to the Transceiver to the required level.

Tube complement: 5894B Pwr. Amp., 5763 Driver, 12BY7 Transmit Mixer, 2N706 crystal osc., 6EW6 Injection Amp., 6CW4 1st rec. amp., 6CW4 2nd rec. amp. in cascode, 6HA5 rec. mixer.

The Swan TV-2 may also be operated with other transceivers when proper interconnections and voltages are provided. A separate Swan 117-XC power supply will most likely be required.

Dimensions: 13 in. wide, 5½ in. high, by 11 in. deep.
Weight: 13 lbs.

\$265



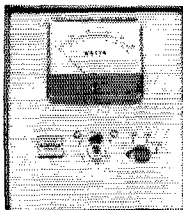
MODEL 250 \$325
MODEL 350C 420
MODEL 500C 520

MODEL 117-XC
AC POWER SUPPLY .. \$105

MODEL TV-2
144 mc TRANSVERTER



SWAN
ELECTRONICS
Oceanside, California
A SUBSIDIARY OF CUBIC CORP.



Absorb and measure r-f power to 1,000 watts

- Nine models (120, 250, 500, and 1000 w; 2 to 1000 MHz)
- Multiple power ranges
- Wide 500-to-1 dynamic range
- Large meter with expanded scale
- "Twist-Off" connectors for fast field changes

Four power ranges, selectable by a front-panel switch, speed and simplify r-f power measurements on 50-ohm systems at levels up to 1000 watts. Nine models in the Sierra 401A Series cover frequencies from 2 to 1000 MHz.

Wide dynamic range and expanded meter scale simplifies measurement of low-level signals. You can read to 2 watts on the 1000-watt scale, to 1 watt on the 500, to 0.5 watt on the 250. With one wattmeter, you could measure output of both low-power portable and base transmitters. A simple field adjustment calibrates the 401A with factory precision.

Sealed cast-aluminum housings (no bellows, no air vents) check coolant leakage. Non-carbonizing silicone outlasts conventional oil dielectric under repeated heat cycling. No external power or water connections needed.

Prices: \$195 (120 w), \$275 (250 w), \$325 (500 w), and \$450 (1000 w), with Type N or UHF connectors. All models accept Sierra "Twist-Off" connectors, available in eight types, for fast, convenient field changes.

FREE 1968 Sierra "Power Generation and Measurement Equipment" catalog on request. Mail coupon today!



PHILCO-FORD CORPORATION
Sierra Electronic Operation
Menlo Park, California • 94025

Sierra, 3885 Bohannon Dr., Menlo Park, Calif. 94025

Please rush complete data on Model 401A Series R-F Termination Wattmeters, including prices and ordering information.

Please send FREE 1968 "Power Generation and Measurement Equipment" catalog.

Name _____

Company _____

Address _____

City _____ State _____ Zip _____

equipment capabilities. K6EA reports being/AM aboard the *Hawaiian Rancher* at this writing. WB6VZD has a "telephone relay," tribander and an FCC certificate added to his station for the month. WB6SXY reports his wife is awaiting her amateur call after passing the test. W6GEN reports working on FET converters for the 50- and 144-Mc. bands. K6QPH added an XYL to his station on Apr. 1. Congratulations, Al! WB6KPN is now the proud holder of an Extra Class license. New Officers of the W6LS Club are WA6RQQ, pres.; WB6OSC, vice-pres.; WN6ZAL, secy.; WB6MIZL, treas.; WB6QZF, activities. WB6YPT, along with K6AEH and WB6OEZ, recently provided communications with a group of mobile stations for the "Pre-Olympic Bicycle Races" at Griffith Park. W6FGQ is now active on 144-Mc. RTTY. Newly-elected officers of the Marina ARC include WA6OWM, prexy; K6ARB, vice-prexy; WA6RIO, secy.-treas.; WA6EYJ, WA6KZF, WB6TNG, WB6WAA, WB6WHT, directors. More Los Angeles area amateurs who now hold two-letter calls are (old call/new call): W6PYN/K6AU, W6FHI/K6BA, W6ECM/K6CS, W6LED/K6CW, W6UXW/K6DJ, W6QWG/W6FP, W6ZPX/W6FQ, W6VEB/W6FU, W6CAJ/W6IG, W6PZ/W6IT, K6SXR/W6NR, W6BSY/W6PM, W6MIUB/W6QC and W6ZXL/W6ZD. A recent member of the K6BPC crew is WA6AWL. Other members of the So. Cal. V.H.F. RC recently supported the Loyalty Day Parade with communications from mobile members. W6AIN is now a member of the SPCD crew in San Fernando. W6TXJ is now WA6CXY also, as a second station license. Traffic: WB6GGL 878, W6MIF 783, WB6BBO 720, W6GYH 437, W6QAE 355, W6AKZI 307, K6ASK 174, K6CDW 161, K6LJ 158, W6QEO 117, WB6YHD 70, WB6SCK 57, W6DQX 53, W6HHG 45, WB6OLD 34, WB6GKG 29, W6FD 25, K6KA 24, K6CL 23, WB6TMC 22, W6AM 16, W6MNI 15, K6EA 10, WB6VZD 10, K6UMV 9, WB6SXY 8, W6TXJ 7, W6TN 6, W6HUJ 5, WB6AEL 4, W6DGH 4, WB6OUD 3, WB6SLG 2, W6RCV 1.

ORANGE—SCM, Roy R. Maxson, W6DEY—K6LL now is settled in Mesa, Ariz. W6PQA advises there is not much time to QNI while working nights. WA6ROF, SEC, in the Apr. CD Party made 43,470 points (158 QSOs and 54 sections). W6BUK/OO, in Hemet, still is working on antenna poles and waiting for parts for transmatch. W6FB and his XYL attended the QCW Dinner in L.A. and had as visitors WA6VOR and W6HCD. WB6TLF, OKS, is studying for the Advanced Class license. WB6YFX, Autonetics ARC, has remodelled operating positions with provision for MARS, General, v.h.f. and Novice. New equipment includes TX-4B, TR4-B, KWM-2, 32S3, 2 each Henry 2-K, per S. H. King, vice-pres. W6QAT has a new QTH. Orange County RACES has a new communications van with emergency power plant trailer and has a 6-meter, 24-hour f.m. repeater in operation. The AREC, with WB6QYK as NCS, and WA6YWN, W6QAT, K2ARJ/6, WA6TSU, W6DEY, W6WRJ and others furnished communications for the CIF tennis matches, a yearly event. K6JTT, K6JSN and other local amateurs assisted in the Newport, Calif., to Ensenada, Mexico, Boat Races. Traffic: (Apr.) WB6TYZ 275, WA6ROF 228, W6BRVM 68, K6IME 46, W6ELW/6 19, W6WRJ 15, WB6TIF 3. (Mar.) WB6ULE 6.

SAN DIEGO—SCM, James E. Emerson, Jr., WB6GMI—WB6OLR, secy.-treas. of the San Diego DX Club, reports other officers are K6SDR, pres., and K6VZA vice-pres. The May meeting was held at the home of W6OME, where 5R8AS presented a talk and slides on the Malagasy Republic. One of our long-time OOs recently had his call changed from K6ENX to W6PT. W6SE is now on the air with a 2-watt c.w. rig, completely solid state. The receiver uses a 9-volt battery while the transmitter has a 12-volt supply. The May meeting of the V.H.F. Club featured K6KX as guest speaker, while W6BKZ spoke at the Palomar Radio Club. The ARC of El Cajon holds an informal c.w. net nightly at 2100 local on 21.180 and plans to hold a picnic July 14. WB6KSA has taken over the duties of Radio Officer for the S.D. County C.D. He, therefore, had to resign as net manager of the S.D. Co. ARPS. This position will be assumed by K6EDA. WA6KHN reports 165 AREC members in our section, with 10 emergency nets active. W6VNQ reports that W7DZX visited him in Apr. and helped run his TCC skeds. W6QJW fought the mechanical battle of installing his mobile rig in his new car and won. K7RWI/6 now has a 6-Land call to use on SCN. WA6DEI. Locals heard in the Apr. CD Party were K6CAG, WA6KHN, W6YRF and WB6GMM. This was K6CAG's last party for a while, as he goes to sea in July. Effective July 1 WB6LKW will become the treas. for the North Shores ARC, as W6SK joins the ranks of the retired. Traffic: K6BPI 9248, W6VNQ 507, W6EOT 348, K6CAG 215, W6LRU 185, WB6UMT 177, WA6QAY 119, W6YDK 60, W6QJW 37, K6HAV 14, W6YKF 11, K6YRF 10, K7RWI/W6DEI 7, WB6GMI 6, WA6KHN 6.

GOTHAM'S AMAZING ANTENNA BREAKTHRU!!

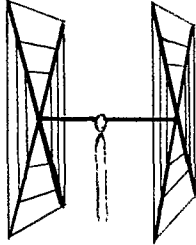
How did Gotham drastically cut antenna prices? Mass purchases, mass production, product specialization, and 15 years of antenna manufacturing experience. The result: The kind of antennas you want, at the right price! In QST since '53.

QUADS

Worked 42 countries in two weeks with my Gotham Quad and only 75 watts . . . W3---

CUBICAL QUAD ANTENNAS

— these two element beams have a full wavelength driven element and a reflector; the gain is equal to that of a three element beam and the directivity appears to us to be exceptional! ALL METAL (except the insulators) — absolutely no bamboo. Complete with boom, aluminum alloy spreaders; sturdy, universal-type beam mount; uses single 52 ohm coaxial feed; no stubs or matching devices needed; full instruction for the simple one-man assembly and installation are included; this is a fool-proof beam that always works with exceptional results. The cubical quad is the antenna used by the DX champs, and it will do a wonderful job for you!



10/15/20 CUBICAL QUAD SPECIFICATIONS

Elements: A full wavelength driven element and reflector for each band.

Frequencies: 14-14.4 Mc.; 21-21.45 Mc., 28-29.7 Mc.

Dimensions: About 16' square.

Power Rating: 5 KW.

Operation Mode: All.

SWR: 1.05:1 at resonance.

Boom: 10' x 1 1/4" OD, 18 gauge steel, double plated, gold color.

Beam Mount: Square aluminum alloy plate, with four steel U-bolt assemblies. Will support 100 lbs.; universal polarization.

Radiating elements: Steel wire, tempered and plated, .064" diameter.

X Frameworks: Two 12' x 1" OD aluminum 'hi-strength' alloy tubing, with telescoping 7/8" OD tubing and dowel insulator. Plated hose clamps on telescoping sections.

Radiator Terminals: Cinch-Jones two-terminal fittings.

Feedline: (not furnished) Single 52 ohm coaxial cable.

Now check these startling prices — note that they are *much lower* than even the bamboo-type:

10-15-20 CUBICAL QUAD	.....	\$35.00
10-15 CUBICAL QUAD	.....	30.00
15-20 CUBICAL QUAD	.....	32.00
TWENTY METER CUBICAL QUAD	.....	25.00
FIFTEEN METER CUBICAL QUAD	.....	24.00
TEN METER CUBICAL QUAD	.....	23.00

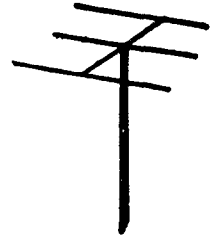
(all use single coax feedline)

How to order: Send check or money order. We ship immediately upon receipt of order by railway express, shipping charges collect.

BEAMS

The first morning I put up my 3 element Gotham beam (20 ft) I worked YO4CT, ON5LW, SP9ADQ, and 4U1TU. THAT ANTENNA WORKS! WN4DYN

Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history! Each beam is brand new! full size (36' of tubing for each 20 meter element, for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; 7/8" and 1" aluminum alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.



2 E1 20	.....	\$16	4 E1 10	.....	\$18
3 E1 20	.....	22*	7 E1 10	.....	32*
4 E1 20	.....	32*	4 E1 6	.....	15
2 E1 15	.....	12	8 E1 6	.....	28*
3 E1 15	.....	16	12 E1 2	.....	25*
4 E1 15	.....	25*			
5 E1 15	.....	28*			*20' boom

ALL-BAND VERTICALS

"All band vertical!" asked one skeptic. "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty, using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: VE3FAZ, T12FGS, W5KYJ, W1WOZ, W2ODH, WA3DJT, WB2FCB, W2YHH, VE3FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YS1MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3KT. Moral: It's the antenna that counts!

FLASH! Switched to 15 c.w. and worked KZ51KN, KZ5OWN, HC1LC, PY5ASN, FG7XT, XE2I, KP4AQL, SM5BGK, G2AOB, YV5CLK, OZ4H, and over a thousand other stations!

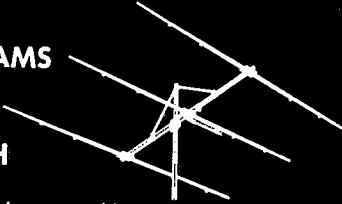
V40 vertical for 40, 20, 15,	
10, 6 meters	.....\$14.95
V80 vertical for 80, 75, 40,	
20, 15, 10, 6 meters\$16.95
V160 vertical for 160, 80, 75,	
40, 20, 15, 10, 6 meters	...\$18.95

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ANTENNAS

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MONOBEAMS FOR MORE DX PUNCH



Cush Craft Monobeams combine superior electrical and mechanical features with the best quality materials and workmanship.

A28-3	10 meter, 3 element, boom 10'	\$31.95
A28-4	10 meter, 4 element, boom 18'	42.95
A21-3	15 meter, 3 element, boom 12'	39.95
A21-4	15 meter, 4 element, boom 22'	59.95
A14-2	20 meter, 2 element, boom 10'	49.95
A14-3	20 meter, 3 element, boom 20'	77.50



THE BIG WHEEL HORIZONTALLY POLARIZED 360° GAIN ANTENNA

2 Meter #ABW-144	\$11.95
2 Bay Stacking Kit	3.95
4 Bay Stacking Kit	11.75

VHF-UHF COLINEAR ARRAYS

Lightweight High Gain Antenna Systems

CL-116	2 meter, 16 element	\$17.50
CL-216	1 1/4 meter, 16 element	14.50
CL-416	3/4 meter, 16 element	11.50

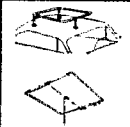
32 & 64 Element Stacking Kits Available



MOBILE/FIXED SQUALO

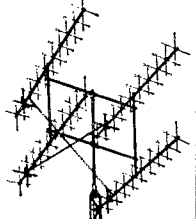
Squalo is a full half wave, horizontally polarized, omni-directional antenna.

ASQ-2	2 meter, 10" square	\$ 9.95
ASQ-22	2 meter stacked	16.95
ASQ-6	6 meter, 30" square	13.95



VHF/UHF YAGIS

Combine all-out performance with optimum size for ease of assembly and mounting at your site. They can be mounted vertically, horizontally, in pairs, or quads.



A144-11	2 meter	11 element	\$14.95
A144-7	2 meter	7 element	11.95
A220-11	1 1/4 meter	11 element	12.95
A430-11	3/4 meter	11 element	10.95
A144-20T	2 meter	Multi polarized	29.50
A50-3	6 meter	3 element	15.95
A50-5	6 meter	5 element	21.50
A50-6	6 meter	6 element	34.95
A50-10	6 meter	10 element	54.95
A26-9	6 & 2 meter	10 element	29.95

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SANTA BARBARA—SCM, Cecil D. Hinson, WA6OKN—SEC: K6GV. WA6CPM turned in a frequency measuring error of only 2.8 parts per million during the recent contest. WB6UAX was runner up during the same test. WA6ICX is active in Oxnard with a 75A-4 and 100V on 10, 15 and 20 meters. Also active, and a newcomer to Oxnard, is WA5RBU/6. W6ORW has revamped his station and built new RTTY gear. K6TOE reports on activity within the Estero ARC as follows: W6LB and WA6DDQ are among the retired. W6BNF has a kw. on 7 Mc. The Estero Club raised just under \$200 in an old copper collection. The address of the Estero ARC is P.O. Box 272, Morro Bay. K6CS, of Thousand Oaks, called to report a new club forming in Newbury Park. Those interested should contact W6IDU. The Simi Valley ARC meets the 2nd and 4th Wed. of each month at the Security First Bank. K6GV is el presidente. The mailing address is P.O. Box 266, Simi. WA6THG, in Santa Barbara, passed the Advanced Class exam. Among the most active in Lompoc/Santa Maria is WB6BWZ, the EC for that area. Traffic: W6ORW 10, WB6DPV 9, W6UED 6.

WEST GULF DIVISION

NORTHERN TEXAS—SCM, L. L. Harbin, W5BNG—Asst. SCM: E. C. Pool, W5NFO. SEC: W5PYL. PAM: W5BOO. RM: W5LR. Thanks for the efforts of K5BIQ in securing the service of Mr. Glenn Scott, public relations man for the Southwestern Bell Tel. Co., in a very fine program presenting the picture telephone and Laser. I was not able to attend but I have seen Glenn's demonstration on other occasions and I know the program was enjoyed by all who attended. This program was presented at the KC ARC in Apr. New officers of the KC Club are WA5JJJ, pres.; K5BIQ, 1st vice-pres.; WA5QOJ, 2nd vice-pres.; W5TWW, secv.; K5PAW, treas. WA5NSJ is in charge of the Field Day operations and has appointed the necessary personnel to handle the operation. W5EUY, the University of Texas ARC, is very active in the ICCN in passing news of the various college campuses and is interested in getting other college clubs to take part in this network. Stories that appear in the campus newspapers are relayed to other clubs that may be interested in the local happenings. This is an RTTY network and interested clubs should and are invited to check in on it. As many of you have heard, W5QKF has resigned as West Gulf Division Director and has been elected vice-pres. of the League. I regret that he has resigned as director but want to congratulate him on being elected as a vice-pres. As all know, Doc has done a wonderful job as Director and our good wishes are extended to him in his new job. Traffic: WA5AQG 38L WA5QQR 164, WA5TYH 87, W5QOZ 9, W5LR 7, K7NCG/5 7, W5BNG 5, W5MSG 2.

OKLAHOMA—SCM, Cecil C. Cash, W5PML—SEC: WA5AOB. RM: W5QMJ. PAMs: W5MFX, K5TEY, WA5JGU, K5ZCJ. New officers of the Edmond Club are WA5TAS, pres.; WA5NRJ, vice-pres.; K5CBA, secv.; WA5NUM, treas. K5QAK, the daughter of our Division Director, W5UYQ, has moved to Dallas. W8VDA/5 has finished at Okla. State U. and is moving to W6-Land. Congratulations to the Northeast Oklahoma Radio Amateur Club, now affiliated with ARRL. WA5FVJ, Garfield County EC, held a 2-meter transmitter hunt Apr. 28. K5CAY came in first, even ahead of WA5OUD, with W5QMJ holding a ten-element beam out the window. There is more talk about the Emid 2-meter relay. 7Q7EC is back with O.S.U. after a 5-year field trip in Africa with the O.S.U. extension service. Congratulations to ex-W5YU, now W5GC; also K5DZY and K5INB for upgrading to Extra Class and K5SKE to Advanced. Net reports:

Net	Sexs.	QNI	QTC	Freq.	Time (Z)
OPEN	4	194	3	3850 kc.	1300
OPON	22	252	104	3920 kc.	2200
STN	26	779	147	3850 kc.	2230
OLZ	22	68	112	3682.5 kc.	0000
SSZ	18	52	40	3682.5 kc.	0245
O.C.6 Mtr.	6	49	6		

All nets moved up one hour with CDST.

Traffic: K5TEY 2518, K5VOZ 855, K5DLP 503, W5PML 556, W8VDA/5 178, W5QMJ 92, WA5QIQ 76, WA5JGU 68, WA5KZA 88, WA5MYF 64, WA5AOB 43, WA5KFT 35, W5MFX 34, WA5IMO 31, K5SWL 21, W5PKL 19, WA5DZP 11, K5CAY 8, K5CBA 7, K5WPP 7, W5UYQ 3.

SOUTHERN TEXAS—SCM, G. D. Jerry Sears, W5AIR—SEC: K5QQG. PAM: W5KLV. RM: W5EZY. New appointees: WA5LXZ as EC Upton County, WA5KHE as EC Nacogdoches County, WA5GZX and K5HGB as ORS and OPS. Endorsements: WA5MXY, W5TFW, W5NGW, K5HMF, WA5KIV and WA5KHE. EC K5HMF is ready for the hurricane season with emergency power

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Marine Communications at its very best!



12 CHANNEL—50 WATTS
MODEL 401
by RF COMMUNICATIONS

For distances under 50 miles, VHF-FM is good! That's been adequately demonstrated time and again in public safety and commercial land mobile systems. For marine applications, VHF-FM has the positive advantages of high usable channel capacity and clear communications. What makes the RF-401 so special is the simple fact that it has been designed from the ground-up to be the finest marine VHF-FM that present state-of-the-art can provide. This no-compromise approach means that 401 owners get all of the performance they pay for.

If history repeats itself, others may attempt to copy this new RF Communications offering. But no one can duplicate the *integrity of design and support* behind every 401.

We know it's good. And previous users of our product know it's good. Send for our new 12-page brochure which gives all the details. Then you too will know!

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ABSOLUTELY NEW TRI-EX W-51

**FREE STANDING
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operational after minor repairs. EC K5GDH reports the Rebels now have a fully-equipped trailer with 2 through 80 meters powered by a 5-kw generator and plenty of antenna equipment. WA5QKE advises the North Texas Traffic Net now is the Texas Traffic Net. The South Texas Emergency Nets held their annual meeting at Kerrville and elected the following officers: K5JKV, the first YL to hold the NCS office, PAM W5KLV, secy.-treas.; EC W5FBI, alternate NCS; WA5FVH, PRO W5LMU took first place in the transmitter hunt with W5AIR second and W5BRC third. WA5KHE and WA5KIV report that W5HAJ operated at the Stephen F. Austin State College Carnival with 75 traffic contacts during the initial club opening. PAM W5KLV says W5SC got into the PA Systems at the HemisFair. EC W5TFW advises that his 2-meter i.m. is working fine now and that W5IWA is back on the air with a Swan 500C. W5HYD has a new NC-200. OO W5NGW is busy with the El Paso Club bulletin which says that K5TML is in Korea as HL9TB. New members of the El Paso ARC are K1NCH and WA5QFL. W5ABQ sent in a report on a 1926 issue of Form 1. Traffic: WA5-1NZ 263, K5GDH 243, WA5QKE 242, W5QJA 135, W5AG 81, W5BGE 72, K5HZR 64, K2EJU/5 56, W5ABQ 41, W5KLV 21, W5TFW 19, WA5GXZ 8, W5AIR 4, K5HMF 3, WA5KIV 1.

CANADIAN DIVISION

ALBERTA—SCM, Harry Harrold, VE6TG—SEC: VE6FK, PAM APSN; VE6ADS, ECs: VE6SA, VE6SS, VE6XC, VE6PL, VE6AFQ, ORSS: VE6BR, VE6ATH, VE6ATG, OPSs: VE6HM, VE6SS, VE6ATH, VE6AFQ, OOs: VE6HM, VE6TY, OBSS: VE6HM, VE6AIF. The bands are hot and heavy with comments of the 40% increase in amateur license fees. We hope that all have expressed their feelings with the Minister of Transport and your local MPs. Don't forget to help the AMA all you can on the long week ends of July and Sept. All reports are to be directed to AMA, Edmonton. Don't forget to do your part in Field Day. Hope to see you all at the International Hamfest July 20 and 21. It has been decided that APSN will remain on its present sked of 0130Z every night and the same frequency of 3770 kc, with no changes for the summer. Congratulations to all who passed the Advanced Class exam and hope to hear you on phone now. VE6AOO retires in June. Traffic: VE6HM 50, VE6FK 17, VE6XC 12, VE6FS 6, VE6AOO 4, VE6ARU 2, VE6HN 1, VE6KP 1.

BRITISH COLUMBIA—SCM, H. E. Savage, VE7FB —Kamloops boasts of VE7BHW, VE7BTP and VE7-AWN, all now Class A. East Kootenay ARC's officers are VE7ADI, pres.; VE7BKW, secy. The clubs 2-meter relay station will be operating as soon as the snow leaves the mountain. Fort George RAC reports that VE7BIM is EC and SM3YC/VE7 departs Prince George. The Beaver Valley ARC's "Dry-run Field Day" looks like it will be joining the "Alpine Club." VE7BDN is off for the sand lots and fishing holes. BCEN Net Manager VE7ASY has moved to Penticton and reports the BCEN is on at 0200 GMT and the BCEN at 0300 Daylight Saving Time. The slow Speed Net is increasing in membership. VE7-BJT reports he is engaged and come Sept. will be a husband. VE7AOA is having antenna and rig problems. K6-YCX/VE7 reports in from Qualicum Beach. VE7BHH will be RTTY soon and is looking for information about RTTY groups. VE7ZK is our newest ORS and is very active on BCEN. VE7VA is busy with a survey crew. There will be no BCARA Picnic this year. The International Hamfest in July will be held in the State of Washington. The North and West ARC repeater is working fine, as is the URC repeater. Traffic: VE7ZK 161, VE7-BHH 86, VE7BLO 83, VE7AC 38, VE7BLS 19.

MANITOBA—SCM, John Thomas Stacey, VE4JT—Reports for March were so few that a column could not be written. VE4FQ, VE4IA, VE4RD, VE4II and VE4SW operated a station at the Manitoba School's Science Fair under the call VE4RD/4 and placed third in the General Science section. The Winnipeg DX Club is now an ARRL affiliate with VE4BJ as pres. The Winnipeg 2-meter crew, with VE4HI and VE4HK at the helm, are trying to get a repeater going for the summer. VE4MP has retired as chairman for MAARC and his successor is VE4-QL. VE4UM mourns the demise of its Mandrauder and anticipates low activity until repairs can be made. VE4EI is experimenting with 2-meter mobile and reports reasonable success. Would suggest that you look at the expiration date on your appointment certificate and ship it along if it needs endorsement. Clubs are invited to send their bulletins for incorporation into this column. ATN still is in need of Winnipeg stations. Net reports: Mar. phone sessions 31, QNI 742, QTC 10, C.W. sessions 30, QNI 197, QTC 78. Apr. phone sessions 30, QNI 611, QTC 17, C.W. sessions 30, QNI 131, QTC 88. Traffic: (Apr.) VE4NE 45, VE4JT 25, VE4RD 22, VE4XN 14, VE4OI 13, VE4GN 12, VE3FQ 7, VE4JA 4, VE4QJ 4, VE4QK 4,



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 10 meters — 28.5 — 28.7 mHz

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FREQUENCY STABILITY: Less than 100 Hertz per hour after 5 minute warm-up.

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VE4CR 2, (Mar.) VE4EI 58, VE4RW 34, VE4JT 31, VE4NE 21, VE4FO 16, VE4LG 16, VE4YC 14, VE4XN 6, VE4GB 4, VE4QJ 4, VE4TE 4, VE4EX 3, VE4FV 3, VE4RO 3, VE4JA 2, VE4QF 2, VE4QK 1.

ONTARIO—SCM, Roy A. White, VE3BUX—The Belleville and Kingston Clubs held a joint auction with VE3BEO and VE3BUX as auctioneers. VE3AHU spoke on the aims, etc., of RSO. One of the most informative and best attended meetings was the V.H.F. Night put on by the Ottawa ARC. Slow-scan TV also was on the program. The Lakehead ARC was right in there at the Annual Sportsmans Show under the call VE3ZCD/3. VE3EFW is wiring up a new SB-101 and VE3EBS is studying Dutch, Russian, French and Finnish. VE3CEB is now VE3PW. VE3EDW graciously donated a receiver and transmitter to the CNIB in Port Arthur. VE3GK advises the Canadian Radio Teletype Group (CARTG) will hold its 8th World-wide RTTY Sweepstakes Oct. 5 and 6. London's Annual "Do" at the German-Canadian Club was an unqualified success and congrats to those responsible. VE3CP and VE3CFR did their usual bang-up job. Your SCM was present and really enjoyed it. There was lots of activity with the "Oxfam" walk in Apr. We haven't heard how many miles VE3FWS covered. VE3BS was one of his sponsors at 10¢ a mile. VE3DMU, of Ottawa, was as busy as a one-armed paper-hanger and he and the other boys there did Oxfam proud. VE3AAU reports great activity in the CD Party. VE3BBQ has kindly offered to do the May write-up while your SCM is in California. The Nortown ARC had a good meeting with VE3BSR giving the boys the lowdown on antennas. The club also had a homebrew night. Twenty meters has been good lately with some excellent DX reported and quite a bit of 2-meter activity in the Oshawa area. VE3RR and his XYL are heading for Europe on vacation and VE3EXW, a strong c.w. addict, has been posted to Germany. The boys feel that the increase in license fees from \$2.50 to \$10.00 is particularly hard on the young fellows trying to get started, on the blind hams and on those with fixed incomes. Representations still are being made to the Minister of Transport. Traffic: VE3BD 102, VE3DBG 59, VE3BLZ 51, VE3GMQ 40, VE3FGV 20, VE3AFA 12.

QUEBEC—SCM, J. W. They, VE2OJ—SEC: VE2ALE, RM: VE2DR, PAM (v.h.f.): VE2AGQ, PAM (h.f.): VE2BWL. April saw great activity for amateur radio covering the Plaisted Polar Expedition and VE2AUII, with VE2FY, did a great job. They not only kept in constant daily contact with the expedition, but handled traffic from the expedition to friends and relatives. Some very interesting points were brought up recently, such as VE2CP, an ORS since 1919 and still one of our very active net men; VE2BG, an OPS since 1934 and still the mainstay of the Professional Loafers Net each morning and evening; VE2EC has been an ORS since 1947 and has never missed a monthly report to his SCM in all that time; VE2DR has held ORS since at least 1947 and still is our most ardent net man. Our AREC is holding its own with 67 more registered members than a year ago. Don't forget the AREC Net meets each Sun. at 6 P.M. local time on 3730 kc. phone and c.w. Its net manager, VE2AGQ, will be leaving our country shortly. It is reported that the Quebec area is second only to California in the number of active 2-meter repeaters each with great activity. Traffic: VE2DR 110, VE2OJ 104, VE2BVI 75, VE2AJD 74, VE2BRD 59, VE2ALE 51, VE2ADE 22, VE2EC 20, VE2DCW 19, VE2CP 16, VE2CK 4.

SASKATCHEWAN—SCM, Gordon C. Pearce, VE5HP—Our farming hams have had quite a spring-cold weather with not too much moisture. Let us hope that the summer months bring ideal conditions for a real good crop. We have noticed these past months the large number of new hams joining our ranks. We welcome them into a great hobby. Noted also, are the ones who have taken off for greener pastures—to the West. Our thoughts go also to the coming move of VE5LM to Vernon and district. The new publication, *From Spark to Space*, by the Saskatoon Amateur Radio Club, will be off the press by July 1 or shortly before. A tremendous amount of work has gone into this fine book of amateur radio history and we suggest that you get your reservation in for a copy before the supply runs out. Traffic: VE5LM 13, VE5OF 11, VE5BO 10, VE5OG 5, VE5LQ 4, VE5BD 2, VE5EQ 2, VE5IL 2, VE5QN 1.

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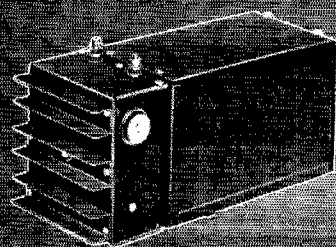
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50	30	48
100	48	70
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400	1.30	2.10
500	1.60	2.80
600	1.90	3.00



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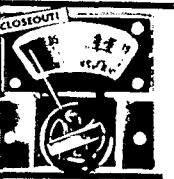
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100	7c	1000	29c	2000	1.25
200	8c	1200	42c	3000	1.50
400	10c	1400	55c	4000	1.95
600	15c	1600	69c		

Actual Size

1 AMP MICROMINIATURE SILICON RECTIFIERS

PIV	Sale	PIV	Sale
50	7c	600	20c
100	9c	800	25c
200	12c	1000	39c
400	17c		

2 AMP SILICON RECTIFIERS

PIV	Sale	PIV	Sale
200	12c	1000	45c
400	16c	1200	59c
600	19c	1400	69c
800	29c	1600	89c

SILICON POWER STUD RECTIFIERS

PIV	3A	6A	12A	55A
50	.06	.16	.20	.50
100	.07	.22	.25	.75
200	.09	.30	.39	1.25
400	.16	.40	.50	1.50
600	.20	.55	.75	1.80
800	.30	.75	.90	2.30
1000	.40	.90	1.15	2.70

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PIV	Sale	PIV	Sale
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100	25c	800	69c
200	39c	1000	89c
400	45c		

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PIV	Sale	PIV	Sale
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200	9c	1000	32c
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Higher Class License Examinations

(Continued from page 67)

Answers to license quiz: Q1 — A; Q2 — C; Q3 — D; Q4 — B; Q5 — E; Q6 — E.

A number of readers have asked us to show how the numerical answers to questions requiring them were worked out. Here they are, through Part IV (there were no such problems in Parts II and III):

Part I, March QST:

Q. 1 — The required impedance ratio is 2000 ohms to 50 ohms; that is

$$\frac{2000}{50} = 40 \text{ to } 1$$

However, the question asked for the turns ratio, which varies as the square root of the impedance ratio. The square root of 40 is 6.3.

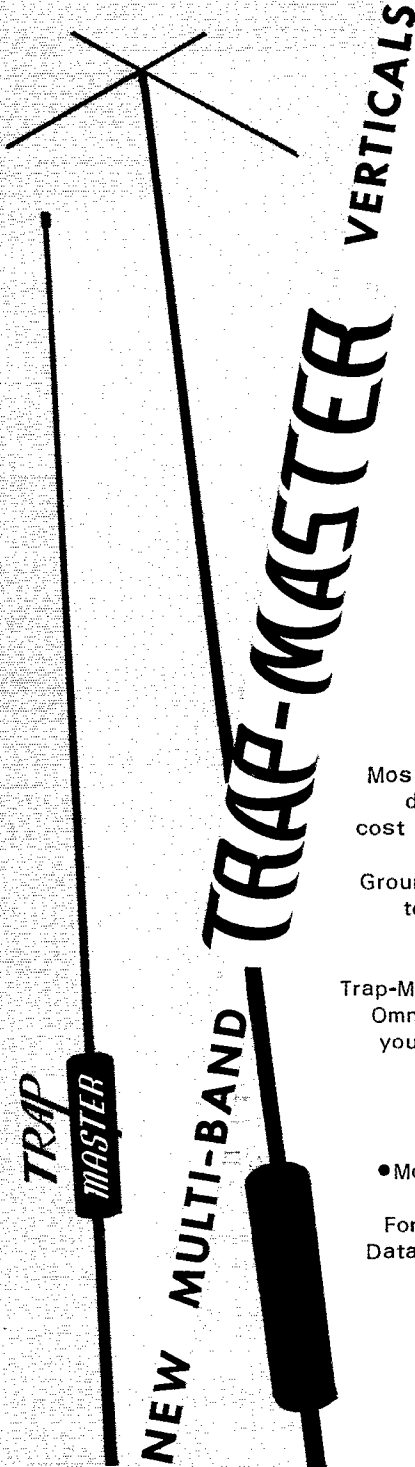
Q. 2 — The time constant in seconds is equal to the capacitance in microfarads multiplied by the resistance in megohms, or $T = RC$. Transposing,

$$R = \frac{T}{C}$$

Substituting the values given,

$$\frac{3 \text{ (seconds)}}{0.1 \text{ (}\mu\text{f.)}} = 30 \text{ megohms.}$$

Q. 3 — The reactances were given at 1000 c.p.s. The inductive reactance is proportional to frequency, and since the specified frequency (500 c.p.s.) is one-half 1000 c.p.s., the inductive reactance is 125 ohms. The capacitive reactance is inversely proportional to frequency, so at 500 c.p.s. is twice 250, or 500 ohms. The reactance of the series circuit is equal to the difference, and is therefore



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$$500 - 125 = 375 \text{ ohms.}$$

Since the capacitive reactance is larger, the net reactance is capacitive.

Q. 4 — The shape factor, 2.3, is the ratio of the bandwidth 60 db. down (8 kc. or 8000 c.p.s.) to the bandwidth 6 db. down. That is,

$$\text{Shape factor} = \frac{60\text{-db. BW}}{6\text{-db. BW}}$$

both bandwidths being expressed in the same units (c.p.s., in this case). Transposing,

$$6\text{-db. BW} = \frac{8000 \text{ c.p.s.}}{2.3} = 3480 \text{ c.p.s.}$$

Part IV, June QST:

Q. 1 — The deviation ratio is the maximum frequency deviation divided by the maximum audio frequency, and in the problem this ratio is 2 to 1. That is, the maximum frequency deviation is 2×3500 , or 7000 c.p.s. In frequency modulation this is the deviation at full (maximum) modulation regardless of the audio modulating frequency, so the answer is 7000 c.p.s. no matter what the modulating frequency.

Q. 3 — For 100 percent modulation the modulator would have to have a sine-wave output of 90 watts ($\frac{1}{2}$ 180 watts, the input to the Class C amplifier). As its actual output is only 60 watts, the sideband power is 60/90, or $\frac{2}{3}$ what it would be at 100 percent modulation. Since the modulation percentage varies with the square root of the sideband power, so the permissible modulation percentage is the square root of $\frac{2}{3}$, or 0.816, multiplied by 100. Alternatively, the formula given in the answer to the second question in Part IV may be used. Transposed, this is

$$m^2 = \frac{2P_s}{P_c}, \text{ or}$$

$$m = \sqrt{\frac{2P_s}{P_c}}$$

Substituting,

$$m = \sqrt{\frac{2 \times 60}{180}} = \sqrt{\frac{120}{180}} = 0.816$$

In percentage, this is 81.6 percent.

Q. 4 — The problem states that the highest demodulated audio frequency in the output is to be 3000 c.p.s. Since the lower sideband is to be transmitted, the corresponding sideband frequency must be 3000 c.p.s. lower than the carrier frequency. Thus the carrier is 3000 c.p.s. above it, and since the lowest frequency passing through the filter is 9000 kc., the carrier frequency therefore is 9003 kc.

Q. 5 — There is no absolute answer to this question, since the exact value of plate current depends on several factors enumerated in the answers to FCC sample questions considered in Part IV. The current certainly would not reach the p.e.p. value, and probably would not go as high as $\frac{1}{2}$ p.e.p. On the other hand, it would very probably be more than 50 ma. since the resting current is 35 ma. The most probable value is 100 ma.



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FTDX-400

Latest arrival on the American scene, Spectronics presents the FT dx 400. Yaesu engineers have looked into the future to provide the present day amateur with a complete station in one package.

The usual "accessories" are standard equipment in the FT dx 400. Features built-in power supply, dual calibrators—100KC and 25KC, break in CW with sidetone, fully adjustable VOX system, four switch selected crystal controlled transmit channels in addition to VFO positions, and varactor controlled clarifier offers receiver offset tuning capability.

Remember, all these extras are included in this new imported transceiver. Check the specs and ask your local dealer for a demonstration dx trip with the FT dx 400.

\$599.95 including power supply and all accessories except speaker.

SP-400 matching speaker \$14.95

DEALER INQUIRIES INVITED

SPECIFICATIONS

FREQUENCY RANGE: 3.5-4Mc, 7-7.5Mc, 14-14.5Mc, 21-21.5Mc, 28-30Mc (3 more 500KC receiver bands can be added).

FREQUENCY STABILITY: Less than 100 c/s drift in any 30 minute period after warm up.

ANTENNA IMPEDANCE: 50 to 120 ohm unbalanced.
MAXIMUM INPUT: 500W P.E.P. SSB, 440W CW, 125W A.M.

CARRIER SUPPRESSION: —40db

SIDE BAND SUPPRESSION: —50db (at 1,000 c/s)

DISTORTION PRODUCT: Down at least 25db

AUDIO BANDWIDTH: 300-2,700 c/s

RECEIVING SENSITIVITY: 0.5uV, S/N 20db (14Mc SSB)

SELECTIVITY: 2.3Kc (—6db), 3.7Kc (—55db)

IF AND IMAGE RATIO: More than 50db

AUDIO OUTPUT: 1 watt @ 5% distortion

OUTPUT IMPEDANCE: 8 ohm, 600 ohm

TUBES AND SEMICONDUCTORS: 18 tubes, 9 transistors and 33 diodes

POWER SOURCE: AC 117 volts, 50/60 c/s

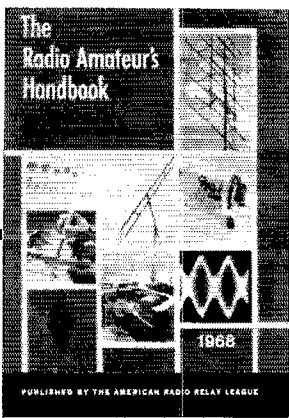
DIMENSIONS: 15¾" wide x 6¼" high x 13¾" deep

WEIGHT: 50 Pounds



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**AMERICAN RADIO RELAY
LEAGUE**

NEWINGTON, CONN. 06111

Operating News

(Continued from page 102)

BRASS POUNDERS LEAGUE

Winners of BPL Certificate for April Traffic:

Call	Orig.	Recd.	Rel.	Del.	Total
K6BPI	4980	2089	1990	189	9248
W3CUTL	332	1297	1201	73	2903
K5TEY	9	1331	1174	4	2518
K4ONK	56	895	884	12	1847
W7BA	13	739	676	59	1487
W50BD	28	604	604	0	1236
K3MYS	35	608	564	11	1218
K3NSN	6	591	591	0	1188
K9IVG	6	579	532	9	1126
W4LEJ	49	497	424	30	1000
W45CK	35	492	432	4	943
W6RSY	44	441	365	62	912
W0LCX	15	480	400	5	900
W3VR	98	399	371	16	884
W8EGL	4	437	414	23	878
W6KVQ	5	426	426	0	857
KH6GHZ	237	431	113	64	845
K0ZSQ	11	415	0	415	841
W3EML	21	434	332	0	787
W6MLF	241	273	264	5	783
W3FGQ	15	399	288	61	763
W36BO	5	346	262	59	730
W7DZX	2	356	312	6	698
W47DXL	27	308	266	26	627
W8ZUVB	314	178	112	15	619
K5DLP	11	291	286	5	593
W3COTP	40	284	254	14	592
W82RK	19	283	274	3	579
W49MHU	30	276	247	43	566
K7NQN	24	269	0	267	560
W5PML	18	269	263	6	556
W10AM	5	265	260	5	535
W7ZTW	28	266	224	4	522
W9AOW	42	239	220	14	515

More-Than-One-Operator-Stations

K5VOZ	855	0	0	0	855
K1CG	36	427	205	147	815
W6VNG	13	278	216	0	507

BPL for 100 or more originations-plus deliveries

W48MCQ 197	W3MPX 120	W41GGN 111
K6ASK 171	W46BYZ 119	W84FDT 111
K8KMQ 150	W86FYZ 117	W3CID 110
W84GAM/4 144	W43FT 115	KL7FLS 108
W86UHT 44	K1PNE 113	W41FZ 107
K5GDH 140	W43HL 113	W43HHU 106
W3TN 139	K3WET 112	W4ZZDA 101
W43HDI 128	W46KZI 112	W86HVA 100

More-Than-One-Operator-Stations

K1NQG/1 441	W4DFU 383
-------------	-----------

BPL Medallions (see July, 1968, p. 99) have been awarded to the following amateurs since last month's listing: K3NSN, W49MHU, K0YBD.

The BPL is open to all amateurs in the United States, Canada and U.S. Possessions who report to their SCM a message total of 500 or a sum origination and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL form.

25 Years Ago

(Continued from page 88)

new to counter panzer attacks. Radio plays an important part in their operations and Clinton B. DeSoto, W1CDB has a piece on the training center at Camp Hood, Texas. As usual Clint's articles of this nature are accompanied by many official photographs, showing not only the strictly military phases but also the radio instruction centers.

. . . Don Mix, W1TS tells how to rebuild the popular TR-4 so as to use non-priority tubes. He finds that one can replace the HY75 and the HY615 with a 6V6 and 6J5, although some socket changes have to be made. Mix mounts the new sockets necessary right over the old ones by means of pillars. Changes are necessary in the coils, as well, due to the differences in tube characteristics.

. . . William Davidon, W2OKY, describes a negative resistance oscillator with some advantages over previous designs. This all brings to mind the old "pliodynatron" circuits developed by G.E. in the early '20s. Such circuits are said to enjoy a high degree of stability and relative freedom from harmonics.

. . . B. C. Barbee, W2MMX tells us how to build a 250 watt transmitter using 6L6 type tubes, two of

ROHN, as the largest tower manufacturer in the United States, provides outstanding commercial quality equipment for amateurs. We're best known

in this field for our crank-up, fold-over and #25G towers. Like all our big commercial towers, they're hot-dipped galvanized after fabrication according to EIA specifications. We also make commercial hardware and accessories amateurs use, too, and it's all designed with an understanding of your needs, particularly in the area of quality. And don't overlook our constant search for new ideas, processes and products — just for you. Keep an eye out for the ROHN name. It's well worth your while.

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- 1) Completely assembled and tested video amplifier plug-in circuit board with a 10-transistor 6 MHz bandwidth amplifier and keyed clamp with adjustable pedestal and sync mixer.
- 2) Completely assembled plug-in sweep circuit board with 8 transistor and 5 diode horizontal and vertical sweep generators and amplifiers featuring excellent linearity and more than enough drive for 1" vidicons.
- 3) Excellent quality deflection yoke and focus coil with beam alignment magnets and raster positioning adjustment. Also included is the vidicon tube clamp and target connector.
- 4) Camera tested vidicon excellent for amateur use and matched to the deflection assembly above.
- 5) Good quality F1.9 or better achromatic lens with matching lens mount.

Note: All items are brand new except vidicons which we guarantee will work with the parts kit supplied when assembled according to the schematic and adjusted according to normal procedure. Since step-by-step instructions are not available, we recommend this kit only to those who can follow a schematic.

Due to the low price and limited quantity, we cannot sell the above components separately.

When our present stock is exhausted, it will cost at least \$160.00 to repeat this offer. Order now to avoid disappointment.

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them. They take a lot of punishment, of course, but many old timers are used to this sort of thing, when one boasted that the plate of his 210 was operated close to the dripping point. Something to build and have on hand for the "Year V".

. . . George Grammer WIDF continues his series on "Elementary A.C. Mathematics." This time it is parallel circuits. All sorts of parallel combinations are dealt with, using vectors, a little trigonometry and lots of easy to acquire know-how.

. . . Quite a few letters from correspondents all complimenting Clint DeSoto for his instructive stories on "Who Killed the Signal." — *WIANA*

Silent Keys

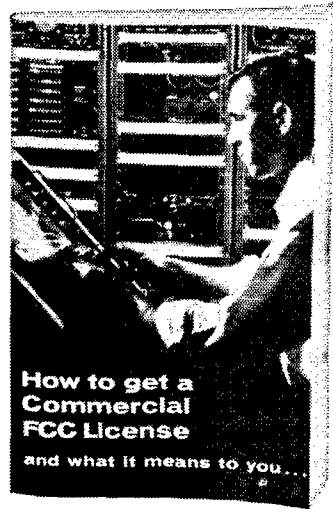
It is with deep regret that we record the passing of these amateurs:

K1AH, Albert G. Francis, North Quincy, Mass.
W1AUR, Harold Riley, Fayette, Maine
W1ABEY, Raymond E. Hadley, Waltham, Mass.
W1BS, Carl J. Johnson, Quincy, Mass.
K1ERC, Karl T. Kempton, Rockland, Mass.
W1HGH, James H. Hankins, Arlington, Mass.
W2KPU, Leo Germain, Brooklyn, New York
WB2LBL, Margaret Schultz, East Patterson, N. J.
K3EJQ, Charles F. Swartz, Quakertown, Pa.
K3JDF, Merrill F. Green, Baltimore, Maryland
K3KKL, Charles R. Zaionz, Watag, New York
W3QBX, Joseph S. Miller, Irwin, Pennsylvania
W4BFU, John D. Andrews, Montgomery, Alabama
W4BG, John P. White, St. Petersburg, Florida
W4CN, James E. Marshall, Louisville, Kentucky
W4DIZ, John J. "Jack" Aaron, Marietta, Ga.
WB4FIC, Billy R. Givens, Dunmor, Kentucky
W4LZB, Harry C. Miller, W. Palm Beach, Florida
W4MAK, Floyd H. Busch, Louisville, Kentucky
W4RRH, B. Riley Fowler, Morganton, North Carolina
W5IEQ, Carl L. Dawson, Oklahoma City, Okla.
W5KITZ, Leroy E. Chapman, Frederick, Oklahoma
W5NWT, James W. Mayfield, Norinan, Oklahoma
W5TJL, Jack Crow, San Antonio, Texas
W6AP, Horace H. "Pat" Crow, Fresno, California
W6PBE, Jim Stirling, Belmont, California
W6SKR, Earl F. Tracy, San Francisco, Calif.
W6UNF, Lyle Slaughter, Culver City, Calif.
W7ABB, Melvin "Mel" Barber, Enterprise, Ore.
W7DEA, Lawrence Anderson, Yuma, Arizona
W7DWG, Edward R. Gibson, Bremerton, Wash.
W7SEM, Herbert E. Campbell, Sumner, Wash.
W8BNP, Arthur L. Puffer, North Kingsville, Ohio
W8FIW, Lawrence Dugle, Cincinnati, Ohio
W8FJM, Paul C. Pennell, E. Palestine, Ohio
W8HIK, Howard Rash, Detroit, Michigan
W8JNC, Clare E. Ernst, Alger, Michigan
W8PDB, Manley M. Phetteplace, Pontiac, Mich.
W8PSR, R. E. Ramey, Huntington, West Virginia
W8SXU, Jack R. Goldie, Midland, Michigan
W9CUS, Walter A. Pritchard, Milwaukee, Wisconsin
W9CYH, Harold L. Steinke, Chicago, Illinois
W9EKF, Ben W. Strachen, Ava, Illinois
K9EOS, Leonard E. Johaneck, Manitowoc, Wis.
W9PTI, J. G. "Jack" Doyle, Milwaukee, Wisconsin
W9HMC, William R. Briggs, Metamora, Illinois
WA9LRP, Melvin Bookman, Cornell, Illinois
K9MVF, Philip E. Wilson, Knoxville, Illinois
W9OVV, Leander Krickl, Wood, Wisconsin
W9UCN, Harry Roscoe, Chicago, Illinois
WA6KRY, Alfred N. Cochran, Lexington, Nebr.
PY1JB, Antonio P. de Souza e Silva, Rio de Janeiro, Brazil
VE3IA, Eric Farquhar, Burlington, Ontario, Canada

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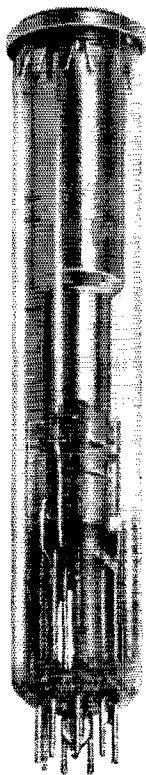
Occupation _____ Age _____

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The price: these tube types sell as high as \$147 (distributor cost). Here's what you can buy them for: Hitachi 7735-A vidicon—\$34.50 • Toshiba 7038-H vidicon—\$29.50 • Hitachi separate mesh vidicon 8507—\$74.50 • Replacement vidicon for Sony and Panasonic 7262—\$29.50.

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Happenings of the Month

(Continued from page 80)

FCC amateur rule which currently does not allow previous holders of licenses above the grade of Novice to apply for Novice licenses.

84) On motion of Mr. Griggs, after discussion, unanimously VOTED that the v.h.f. repeater petition filed with the Federal Communications Commission recently by the Buffalo Amateur Radio Repeater Association, is referred to the VHF Repeater Advisory Committee for study.

85) At this point, announcement was made of committee appointments by the President as follows:

Membership and Publications Committee	Mr. Spencer, Chairman Mr. Michel Mr. Gmelin
Public Relations Committee	Mr. Haller, Chairman Mr. Griggs Mr. Dannels
Merit and Awards Committee	Mr. Groves, Chairman Mr. Bolvin Mr. Foster
Finance Committee	Mr. Eaton, Chairman Mr. Chapman Mr. Compton
Planning Committee	Mr. Crossley, Chairman Mr. Clark Mr. Thurston

86) On motion of Mr. Groves, unanimously VOTED that the General Manager is hereby authorized to pay expenses for the operation of ARRL Committees during the year 1968, but not to exceed amounts as follows:

Finance Committee.....	\$2000
Planning Committee.....	1500
Membership & Publications Committee.....	1000
Public Relations Committee.....	500
Merit & Awards Committee.....	400

87) Whereupon, on motion of Mr. Groves, the Board adjourned, *sine die* at 3:00 p.m.

88) (Time in session as a Board 11 hours, 36 minutes; as a Committee of the Whole, 40 minutes; total direct authorizations, \$67,100.00)

JOHN HUNTOON
RICHARD L. BALDWIN
Secretaries

MINUTES OF EXECUTIVE COMMITTEE MEETING

No. 321

May 2, 1968

Pursuant to due notice, the Executive Committee of The American Radio Relay League, Inc., met at the Headquarters offices of the League in Newington, Connecticut, at 3:10 p.m. May 2, 1968. Present: President Robert W. Denniston, W0DX, in the Chair; First Vice President W. M. Groves, W5NW; Directors Charles G. Compton, W0BUO, Gilbert L.



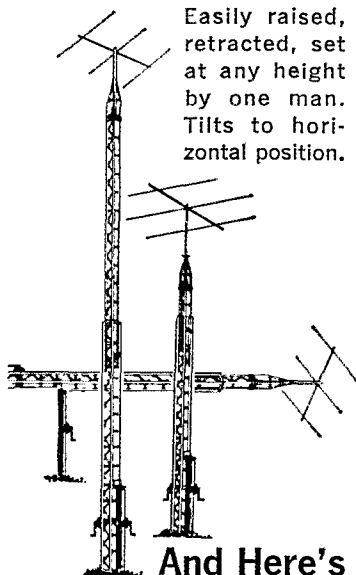
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MODEL	MAX. HGT.	MIN. HGT.	DESCRIPTION		PRICE
HD-40	40	23	LOW COST TOWER FOR SMALL 2 EL. QUADS AND POPULAR VHF BEAMS ONLY.	WITH BUILDING MOUNT WITH WONDER GROUND POST	\$ 159.00 208.00
RBS-40	41	25	POPULAR MODEL FOR 3 EL. TRIBAND BEAMS AND 3 EL. QUADS.	WITH BUILDING MOUNT WITH WONDER GROUND POST	247.50 320.00
RBX-40	42	27	EXTRA HEAVY DUTY TOWER FOR STACKED ARRAYS AND VERY LARGE ANTENNAS.	WITH BUILDING MOUNT WITH WONDER GROUND POST	351.00 503.50
RBS-50	51	30	POPULAR MODEL FOR 3 EL. TRIBAND BEAMS AND QUADS.	WITH BUILDING MOUNT WITH WONDER GROUND POST	321.00 438.00
RBX-50	52	32	VERY HEAVY DUTY TOWER FOR STACKED ARRAYS AND LARGE BEAMS.	WITH BUILDING MOUNT WITH WONDER GROUND POST	424.00 571.50
6046	60	26	LOWER COST TOWER FOR SMALL 2 EL. QUADS AND VHF BEAMS ONLY.	WITH BUILDING MOUNT WITH WONDER GROUND POST	292.00 364.50
RBX-60	60	26	STANDARD DUTY TOWER FOR 3 EL. TRIBAND ANTENNAS AND QUADS ONLY.	WITH BUILDING MOUNT WITH WONDER GROUND POST	480.50 596.50
CRX-60	60	26	HEAVIER DUTY VERSION OF ABOVE BUT WITH REINFORCED FOR LARGER BEAMS.	WITH BUILDING MOUNT WITH WONDER GROUND POST	615.00 838.50
RBZ-66	66	33	EXTRA HEAVY DUTY FOR STACKED ARRAYS AND VERY LARGE BEAMS.	WONDER POST FOR CONCRETE ONLY	1259.50
RBX-70	72	31	STANDARD DUTY TOWER FOR 3 EL. TRIBAND ANTENNAS AND QUADS ONLY.	WONDER POST FOR CONCRETE ONLY	871.50
RBZ-75	75	35	EXTRA HEAVY DUTY FOR STACKED ARRAYS.	WONDER POST FOR CONCRETE ONLY	1426.00

Here's The Size Tower You Need:



E-Z WAY TOWER MODELS	SUGGESTED ANTENNAS FOR TOWER MODELS			
	MOSLEY	HY GAIN	TELREX	SKYLANE
HD-40 6046	A-3106 S-401 TA-32 Jr.	TH-3 Jr.	10M-518B 20M-207CM	10/15 2 EL. QUAD
RBS-40 RBS-50 RBX-60 RBX-70	A-203C S-402 TA-33/40	DB-24 TH-3	7C-99D 40M-217M 20M-317B 10M-636	3 EL. QUAD
CRX-60	A-320 TA-36	TH-6	15M-532 20M-326B 40M-214 DB-30C TM-30C	4 EL. QUAD Short Boom
RBX-40 RBX-50 RBZ-66 RBZ-75	TA-20-40	205B	20M-646 40M-335	4 EL. QUAD

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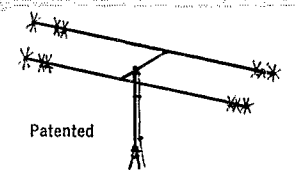
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The time proven B-24 4-Band antenna combines maximum efficiency and compact design to provide an excellent antenna where space is a factor. New end loading for maximum radiation efficiency. No center loading.

Model B-24
Net \$59.95

Bands	6-10-15-20 Meters
Power Rating	2000 Watts P.E.P.
El. Length	11'
Turn. Radius	7'
Total Weight	11 lbs.
Single Feed Line	52 ohm
SWR at Resonance	1.5 to 1.0 max.

MULTIBAND COAXIAL ANTENNA for 6-10-15-20 METERS

Needs no ground plane radials. Full electrical 1/2 wave on each band. Excellent quality construction. Mount with inexpensive TV hardware. Patented.

Power Rating	2000 Watts P.E.P.
Total Weight	5 lbs.
Height	11'
Single Feed Line	52 ohm
SWR at Resonance	1.5 to 1.0 max.

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Crossley, W3YA, and Noel B. Eaton, VE3CJ; and General Manager John Huntton, W1LVQ. Also present were General Counsel Robert M. Booth, Jr., W3PS, and various directors and vice directors of the League.

On motion of Mr. Crossley, affiliation was unanimously GRANTED to the following societies: American Red Cross Emergency Radio Club, Jamaica, New York; Austintown Fitch Amateur Radio Club (H. S.), Youngstown, Ohio; The Central Florida Groundwave Club, Orlando, Florida; Columbia Amateur Radio Club, Trail, B. C., Canada; Fort George Radio Amateurs Club, Prince George, B. C., Canada; Greenbrier Valley Amateur Radio Association, Lewisburg, West Virginia; Ioseco Amateur Radio Club, Tawas City, Michigan; Jefferson County Amateur Radio Association, Brookville, Pennsylvania; Land Rovers Amateur Radio Club, Clifton, New Jersey; Massapequa Amateur Radio Club, Massapequa, New York; Naperville Community Amateur Radio Club (H.S.), Naperville, Illinois; Northern Illinois DX Association, Inc., Arlington Heights, Illinois; Robert M. LaFollette Amateur Radio Club (H. S.), Madison, Wisconsin; Rowan Amateur Radio Society, Salisbury, North Carolina; Whitman Amateur Radio Club, Inc., Whitman, Massachusetts; Wood Dale Amateur Radio Club, WA9SIP, Wood Dale, Illinois.

On motion of Mr. Crossley, in confirmation of earlier mail action, unanimously VOTED to approve the holding of a Kentucky State Convention in Louisville on August 30-31, 1968, and a Roanoke Division Convention in Greensboro, North Carolina, on September 28-29, 1968. The Committee noted the request of the Southeastern Division Director Charles J. Bolvin, W4LVV, for approval of a Florida State Convention in August, 1968, sponsored by the Platinum Coast Amateur Radio Society, but withheld formal approval pending receipt of necessary application papers.

Director Roemer O. Best, W5QKF, and Vice President Groves reported favorably on progress of plans for the National Convention in San Antonio on June 7-9.

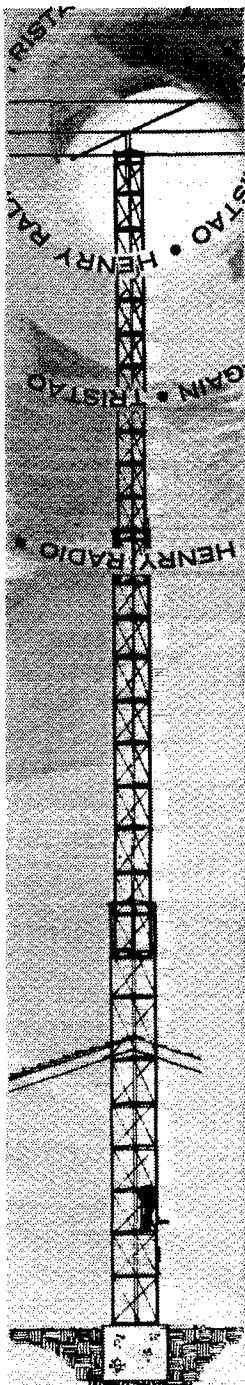
On motion of Mr. Compton, unanimously VOTED that Life Membership is conferred upon the following members:

- Christine E. Haycock, WB2YBA
- Leo W. Honea, W0GE
- Jacob S. Kamborian, Jr., W1USP
- Donald R. Kelly, W7NXJ/GM5AFF
- H. Gordon King, WB4BAP
- Raymond W. Loewy, WA5PPD
- John H. Mackinaw, W1OHB
- Maurice Mansfield, W9PUM
- Alexander A. McKenzie, W2SOU
- Paul R. McKinnie, W6EQB
- James H. Peters, VE3GIK
- Earl W. Tonjes, W4NG
- George C. Wetmore, W3DPM
- Gordon R. Zuchegna, W1VWP

On motion of Mr. Compton, unanimously VOTED that the Committee ratifies its earlier decision, reached by telephone, to employ the firm of Cooper, White & Cooper, of San Francisco, California, with Edward Peck, K6AN, as co-counsel, in vigorous defense of the action by Dr. Donald A. Miller, W9WNV, in the U. S. district court of California, for defamation.

There being no further business, the Committee adjourned, at 4:30 P.M.

JOHN HUNTON
Secretary



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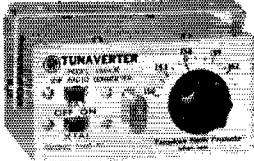
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(Continued from page 92)

K2ACQ, New York, with partial success. Ted says 15 or 30 second calling sequences are a must for long-haul tropo because of rapid signal build-up and fading. Sequences of a minute or more may leave many peaks wasted.

K8DEO, Cedarville, Ohio, keeps his interest in 432 by working K2ACQ for state number ten. He has recently completed a W1QWJ kilowatt amplifier, and is looking for contacts into W0. K8DEO's frequency is 432.095. K9AAJ, Quincy, Illinois, has taken down his 96-element e.m.e. array and is replacing it with 20 elements in hopes of some satellite work. Lee's 144 and 432 arrays share the same mast and are tiltable. And at Haddon Heights, N. J., W2BLV, who tops the second call area with 13 states on 432, vows more activity on our lowest u.h.f. band to add to his already impressive totals.

1215 MHz reports center around the moonbounce (e.m.e.) activity at the Crawford Hill V.h.f. Club, W2NFA. At deadline last month, details of the April 13-14 (GMT) tests were incomplete. Here are some of the highlights in a report from W2IMU. Contacts were completed on April 13 between W2NFA and HB9RG, Switzerland; G3LTF, England, and WB6IOM. On the 14th, contacts were again made with G3LTF and WB6IOM. Partial contacts were made both days with K6MYC. G3LTF used a 17-foot dish, cross-dipole fed with 150 watts input. HB9RG's station included a 17-foot dish and 300 watts output, and WB6IOM fed a 10-foot dish with 500 watts from eight 2C39s. Equipment problems besieged the W2NFA effort and the anticipated 200 watts output may have been only 70 watts. Most of the problems were with the feedline and associated connectors, jumpers and relays.

Undaunted, the Crawford Hill group intends further 1296 e.m.e. tests and suggest a standardization of polarization for future tests. They propose circular polarization to avoid Faraday rotation fading, with the propagated signal right-hand, transmitting, and left-hand receiving. This uses the IEEE definition: a wave traveling away from the observer and rotating clockwise is defined as a right-hand circularly polarized wave. K6MYC discussed the problems of Faraday rotation in last February's column, page 80. If a polarization standard can be agreed upon, station systems will be compatible with one another. The club also suggests that future active amateur satellites employ circularly polarized antennas for the same reasons.

W4API was one of many who built the VE2HW signal source described in the April column. But Andy points out an error in the schematic, the crystal tap point on L1 was omitted. It should be two turns from the crystal end. Andy apparently had trouble locating the suggested 2N706 transistors, but Polypaks and Radio Shack have them at five for \$1. The crystals are available from JAN Crystals in Fort Myers, Florida for \$1.50. W4API says the circuit works well and that drift is negligible. Other stations in the Washington, D.C. area reported active on 1296 by W4API include W3NG, W3AHQ, W4EXS, W4UBY, and K4SUM. W3AIR, W3TUZ and W3RE are expected on soon. Most of the antennas are 32-element collinears with A1 and A3 modes favored.



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The Clipboard — a Simple Experimental Circuit Breadboard

(Continued from page 29)

$\frac{5}{8}$ -inch square grid. The clips used were $\frac{3}{4}$ inch long and $\frac{5}{16}$ inch wide. Although larger sizes were available, the clips chosen proved to be fully adequate and permitted a more compact layout. In the interests of standardization and economy, the double-ended clips were made by mounting two clips under the same screw. All the clips were mounted with 6-32 \times $\frac{3}{8}$ -inch round-head machine screws, and a No. 6 solder lug was put under each nut on the bottom side of the board. The use of No. 6 internal-tooth lock-washers between the clips and the phenolic board would probably prevent the clips from rotating during assembly of the Clipboard.

The sockets used take either the in-line or the in-a-circle transistor leads. Of course, if the transistor leads are not cut short, any configuration may be used. If you plan on experimenting with tetrodes or transistors with a separate shield lead, you will need to improvise, or to use sockets with four contacts and provide an additional clip for connections. Most transistor sockets that mount with a retainer spring are not suitable for use in $\frac{1}{8}$ -inch material, so I used sockets with a molded-in mounting plate (Elco 3301) and fastened them to the board with 3-48 round-head machine screws and nuts.

Although the photos show a d.p.s.t. switch for power supply control, it is recommended that three power lines be made available and that a 3.p.s.t. switch be used. Note that the ground connections are not switched.

The legs are $1\frac{1}{4}$ -inch ceramic standoff insulators which were fastened to the board with 8-32 binding-head machine screws. Although no hanger is shown on the board, one is recommended to permit storage of the assembly on a wall or pegboard.

Applications for the Clipboard are limited only by the experimenter's imagination. Although I have used the Clipboard at broadcast frequencies and for digital circuits operating at 500 kHz., it is basically a low-frequency device. There is no shielding, and circuits run side-by-side for several inches. In the case of a small operational amplifier, it was necessary to use stiffer stabilization than would have been required with better packaging of the circuit.

A word of caution on the heat sink under the power transistor: the one shown in the photos was used with a power transistor that switched about one ampere, and it was adequate for that purpose. A Class A amplifier handling significant power might require a better sink.

The cost of the entire board not including the power transistor was under \$7.00, and it took one evening to build, once the materials were at hand. I hope you get as much fun and satisfaction from your Clipboard as I get from mine.

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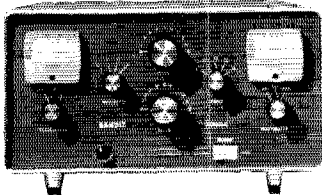
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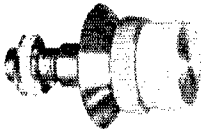
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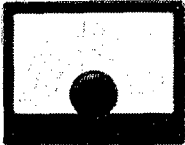
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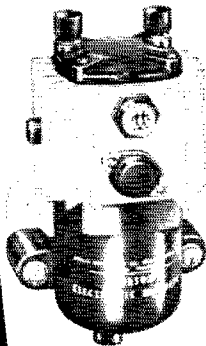
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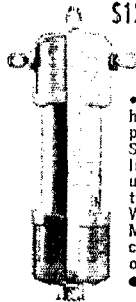
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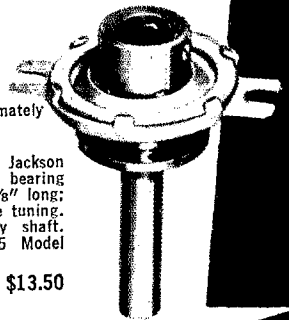
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Where Did The Signal Go?

(Continued from page 16)

m.u.f., the less the attenuation. For example, you may find that both 20 and 10 meters are open to a particular DX location. As a general rule — although there are many variables that can get into the act — the 10-meter signals will be much stronger than those on 20. The reason is that 10 meters is closer to the m.u.f., so the signal absorption is less.

The Institute for Telecommunication Sciences (ITS) of the Environmental Science Services Administration (ESSA) publishes monthly charts showing m.u.f. predictions over the world; these are available from the U. S. Government Printing Office, Washington, D. C. 20402, at 25 cents for a single issue or \$2.75 for an annual subscription (12 issues). Instructions for use of the charts are given in "Handbook For CRPL Ionospheric Predictions Based On Numerical Methods Of Mapping," also available from G.P.O., for 40 cents.

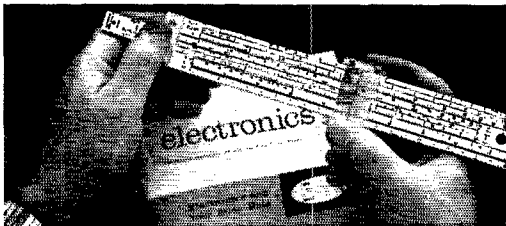
As we mentioned above, the m.u.f. has been known to go as high as 70 Mc. during the peak of the sunspot cycle. Under these conditions (or when the m.u.f. rises above 50 Mc.) the 50-Mc. band is open for DX contacts. Normally, this band is not open for ionospheric contacts, but on occasion the necessary amount of ionization can occur in the E layer ("Sporadic-E" ionization) and contacts in the 1000- to 2000-mile-range, or shorter distances, can take place.

On the 2-meter band and higher, the majority of contacts are short range, with consistent work possible up to about 50 miles, depending on the terrain and antennas used. Contacts via the E layer have taken place on this band but they are rare. More frequent are long distance contacts via "tropospheric" openings. Such openings depend on atmospheric conditions that exist from a few thousand feet to several miles above the earth. Under favorable conditions signals will be refracted back to earth, permitting long-distance contacts. These openings usually occur when there is a temperature inversion, a layer of cold air over a layer of warm air.

Still another type of propagation that is frequent on this band is an "aurora opening". When there is an aurora borealis over the polar latitudes, signals tend to "bounce" off the aurora curtain, permitting long-distance contacts.

One phenomenon that wasn't mentioned was the solar flare. You may someday turn on your receiver and not hear a single signal — or, even worse, be listening to a crowded band and all of a sudden have your receiver go almost completely dead. Before you start packing the receiver up to ship it back to the manufacturer, wait a bit. While not common, a sudden disturbance on the sun can completely wipe out ionospheric communication, or degrade signals to the point where you *think* something is wrong with the gear. Wait a while before making any drastic decisions — the band will come back!

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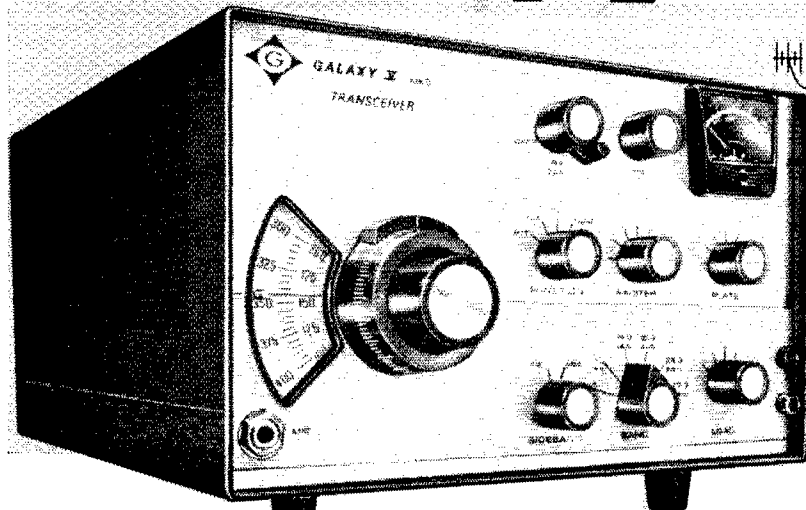
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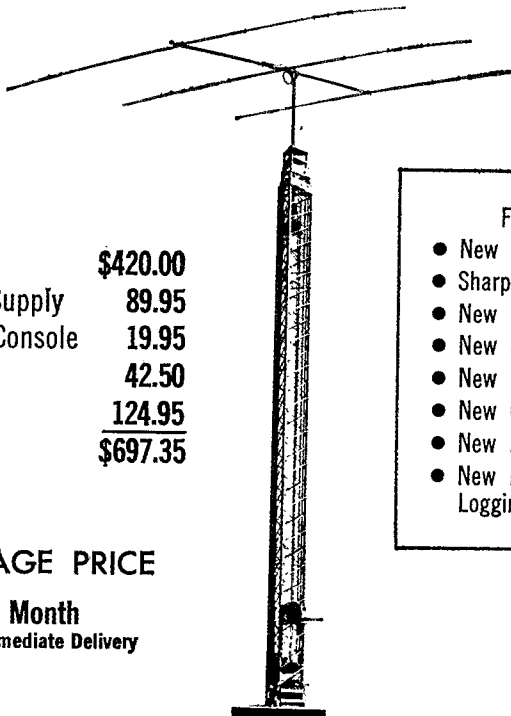
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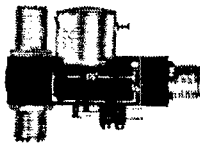
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(Continued from page 53)

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The September 14, 1968 (GMT) test will be open to all. Full rules will appear in August 1968 *QST* Operating News.

Good luck!

QST

Sweep-Tube Amplifier Design

(Continued from page 35)

antenna. The TV antenna was 6 feet away from one end of the 80-meter half-wave antenna.

At 800 watts input (c.w. conditions) an output of 500 watts was easily obtained, indicating an overall efficiency of 62.5 percent. This compares favorably with the performance of the WA4KFO-W9GFS four-tube amplifier described in their technical paper. They used a pi-section output tank. This amplifier, Fig. 1, uses a tapped plate tank to obtain the right load resistance. Either method works well provided the right constants are chosen.

During tests with a two-tone signal a p.e.p. input of 1200 watts was established. The peak-envelope output power was approximately 700 watts (WA4KFO obtained slightly more), resulting in an efficiency of roughly 60 percent. It can be seen from this that a sweep-tube amplifier of this kind is capable of giving a worth-while boost to signals from medium-power transmitters. A "barefoot" exciter with 100 to 200 watts p.e.p. input might produce a marginal signal under some conditions. By adding a 1200-watt sweep-tube amplifier (p.e.p. input), the signal level should rise 8 to 11 db., a worthwhile increase when the going gets rough.

The circuit of Fig. 1 is wired for use with transceivers of the Heath HW-12 variety. That is to say, a relay is used to provide a switch-through feature so the amplifier can remain in standby when not needed, yet the transceiver can be operated through it.

A final word of warning! Sweep tubes are not designed for continuous operating at these power levels. Do not attempt to use them as a.m. linear amplifiers except at *extremely* low power levels. In tuning up, dip the plate current *quickly*. Tune-up should always be done at very low power — 50 to 100 watts output — limiting the key-down time to no more than 20 seconds. After initial tuneup the power can be increased to its peak value and the tuning *quickly* touched up. The forward-power reading on an s.w.r. indicator is helpful for optimizing the final adjustments.

The hints should help prospective builders of sweep-tube amplifiers to avoid some common pitfalls. The rules apply to all TV sweep tubes that are suitable for use in linear amplifiers, and there

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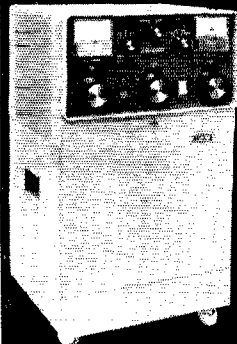
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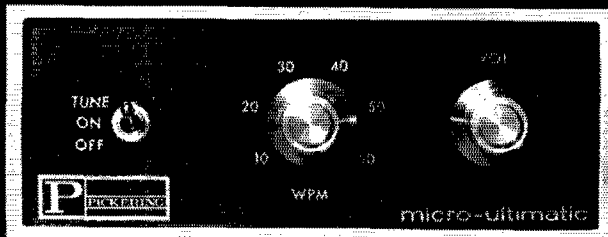
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Digital Logic Devices

(Continued from page 21)

stage. Some flip-flops are so constructed that they become automatic counters if the S and C inputs are ignored entirely. The user must rely heavily on the published data to settle all of the "perhaps" and "sometimes" which have appeared in this article.

Of course, there is a lot more to this game than has been covered here. The author hopes that gathering all these loose ends into one article will serve as a guide and reference to those creative homebrew brethren among us who otherwise might be confused by all these new words in our old ham radio world. QST

How's DX?

(Continued from page 98)

W2VOZ W4GTS mentions W6KNH's skeds with HV3SJ, 21,290-kHz. s.s.b. at 1600 GMT Continental comment courtesy club newshawks: SA15PW vacationed in June as YU7LAE with an FT-100 and dipole. . . . CT1QFP was an Oporto Engineering College special in April and May. . . . WB6FCE dropped into HV3SJ for 600 guest QSOs, visiting jovially with 11s HCJ MGM OVL, WX and others. W6VPV, he says, has the big California signal in Italy. HB8AG, sole Liechtenstein ham resident, appears on 21,266 kHz. around 2030 GMT. . . . PA0VDV, a VERON DX press staff member for eleven years, leaves Holland for three years in Curacao and vicinity.

ASIA — ZC4AK's Mick gives us the Cyprus picture via W4AJJ, "This RAF club station's three operators work mostly s.s.b. on 10, 15 and 20 meters. Among other actives, ZC4RB works Stateside regularly on 20 phone, and is very keen for 40, 80 and 160 ZC4GM likes 20 sideband or c.w. with a KW-2000. ZC4TK occasionally operates c.w. but ZC4AC, another club station, is fairly inactive. We at ZC4AK have our own personal gear but we've tapped RAF resources for a KW-2000, KW-600 linear (100 watts p.e.p.), 40-ft.-high TA-33 jr., ground-plane and 80-ft.-high multiband dipole." Mick, John and Mike are with RAF's mountain rescue team stationed at Akrotiri. ZC4AK signed ZC4RAF in April-May Royal Air Force 60th Anniversary doings. . . . KBUZZ writes from Thailand that he's about to join HS8s DR and TM on 20 as HS3ZZ. "We can be heard around 14,170 kc. between 1500 and 2400 GMT." W6HDO tolls ARRL's WIDE, "Got on 20 s.s.b. as HS1BD the other night and quickly ran into PK8YIM." At this writing HS stations still are incomunicado for W/Ks due to IPU/FCC ban status. . . . KR6NR discloses, "On November 2-3, 1968, Okinawa Amateur Radio Club will sponsor a KR6 Contest to give the world an excellent opportunity to work Okinawa on c.w. and phone from 10 through 80 meters." We'll supply specifics in a later "How's" Participation particulars will also be forthcoming for the Fifth VU/4S7 DX Contest due September 7th-8th (c.w.) and 14th-15th (phone) "Revan, TAIRT, is the first YL operator in Turkey," reveals K1EPI. "An HW-32 is on the way to her. She's 20 and quite attractive." Quick, Jeeves, the Istanbul bearing! K6UMW finds sideband contest ace JA2CWX preparing a move to Seattle after completing engineering studies in Japan. Orientations via the clubs press: CR9AH stays in Hong Kong but CR9AK may be workable. . . . 9K2BJ favors 15 phone

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with his T4-X, R4-B and 14-AVQ. . . . 9N1s BG and MM give each other a chance for Nepal on 20 sideband. . . . AP2AR expects early arrival of s.s.b. apparatus. . . . XW8AX anticipates a three-year Laos DX career. . . . The last of the once legion VS9s is VS9MB, an RAF Maldives effort on 15- and 20-meter code and voice around 1030 and 1630 GMT. . . . JA1HRU was behind JY1HRU's mike and key in April. . . . KA2s DO and LS are now prez and veep of the Far East Auxiliary Radio League. New or renewed FEARL memberships are claimed by KAs 2GW (WB6SLF), 2HD (W3WZN), 2OM (K6ASX), 2RM (K7VCX) and 9AA (WA1DSN).

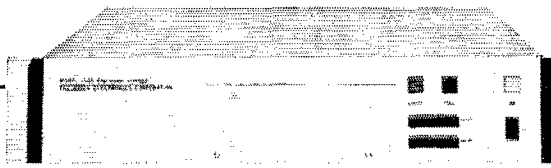
AFRICA—601GB keeps Somalia available on 14,230 or 21,370 kc., according to QSL helper W1YRC. . . . W4GTS hears W4FP1 scheduling 9U5GB almost daily on 21,275 kc. at 1730 GMT, the latter with carrier. . . . ZE1WPC, staffed by ZE1s CL JE and others, operated from the site of the 15th World Ploughing Contest near Salisbury in April-May. If you QSOd this one and five other ZEs between 0000 GMT, April 26th, and 2400, June 30th, you ought to check with WPC Award, P.O. Box 2377, Salisbury, for specs on a dandy diploma. . . . In a similar activity, CR7FLM hailed from the Agricultural, Commercial and Industrial Fair of Mozambique in Lourenco Marques under LREM sponsorship. . . . Africa tidbits via aforementioned clubs literature: ZD7s DI on ten sideband, GS on 15 and 20 c.w., and KH on 20 s.s.b. still offer St. Helena. . . . Libyan DX diehards are 5As 3TP, 14,050-kHz. c.w. at 2200 GMT, and 4TZ on 20 voice. . . . 9X5MW goes back to Belgium this month, logs and all. . . . ZD8Z (W6BHY) helps clear paths for 9U5SK's QRP and dipole around 21,260 kc. at 1930 GMT or so.

OCEANIA—“Ed of KH6EDY is due for rotation back to the States in June or July,” notes W6EYM. “As yet no ham operator has been ordered to replace him at the Kurc Island USCG Ioran station. Ed's HW-32 keeps him on 20 meters where operation is devoted to traffic handling and as much DXing as he can squeeze into off-duty hours.” . . . PK8YIM enjoys 20-meter voice work with a home-made 20-watt 6146 rig rockbound on 14,152 kHz. and an old BC-312 receiver at Bogor, western Java. . . . “I'll be KA2LJ again this summer,” reports KH6LJ, “then hopefully a VR2 for a while before going to Harvard in the fall as KH6LJ/1 or K1PND.” . . . W1YRC writes, “VK9KS of New Guinea, active at 0700-1300 GMT on 15 and 20 meters as time and conditions permit, will make business trips to the Solomons in the near future. Depending on circumstances he will try to operate from VR4-land.” . . . “Have an SB-101 on the air from my Volkswagen,” says W4AMP/KH6, foiling Navy restriction on gear in quarters at his post. “I also operate club station KH6UL on week ends.” Don formerly signed KL7BPK. . . . W6EAY helps W7FFF/mm (ex-ZD8BB), making Pacific runs aboard *Canada Bear*, accumulate electronics goodies for the KG6NAS gang. . . . Dust off your western rhombics for the VK/ZL/Oceania DX Test due on the first two week ends of October, lads, details coming.

HEREABOUTS—Aw shuckins, two new “countries” I didn't quite make it, judging from a Washington *Star* clipping considerably forwarded by WSZR/4. Abalonia and Taluga were land-fill nations due to appear on Cortes bank, a navigational hazard 110 miles off San Diego, until promoters were foiled, at least temporarily, by legal objections filed by Unele Sam. . . . VP2GAK of Grenada Amateur Radio Club seeks ways and means to increase single-sideband activity down his way. Gear is scarce because of import obstacles. . . . “I don't work 'em all but I sure give 'em a try,” declares giant-killer W2ICO, collecting plenty of juicy with 35 watts and an indoor wire on 15 and 20 c.w. . . . “There's so much DX waiting to be worked on General bands I find no time to write Jeeves about it,” enthuses ex-WN1ION with 66 c.w. countries in his first six days as WA1ON. WA1HVL is another recent Novice grad who closed his WN log after 38/32 countries worked/confirmed, WAC, WAS and a thousand gratifying QSOs. . . . WA1FHU says W0ERV/mm, lately working 40 c.w. from the mouth of the Amazon, returns from a year-long voyage to India. . . . On the 13th-14th of this month you'll find portable Sevens vigorously pushing Wyoming QSOs near 14,020, 14,240, 21,040, 21,280, 23,040 and 28,580 kc. thanks to Utah DX Association and K7ZIA. . . . CM7RA, PL8RA, KA8RA, OH5RA, VK2RA and 9Y4RA confirmed a hard-won “RA-WAC” for W2RA. . . . WB2OZW relays OX3FS's four-watt offer to schedule Yanks interested in real QRP fun on 20 c.w. . . . W4UF, one of hamdom's most expert YL DX practitioners, enjoys revived long-haul interest with a new beam and tower down Florida way. . . . Frustrated this spring by transportation impossibilities, XE2YP & Co. hope for productive Revilla Gigedos developments by October. . . . K4JLD (ex-606BW) keeps in touch from Rat Isle's KL7GFN club station. . . . WA6GYR departs OX5AQ and XP1AA this month. . . . Check with Mexico's LMRE for data on fancy sheepskins awarded for sufficient contacts with XE and 4A brethren this year after March 21st. . . . W6s DOD and KG, *Fusme* Foundation's dynamic DX duo, expect to fire up from new East Bay quarters this month.

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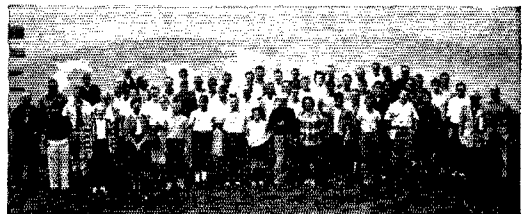
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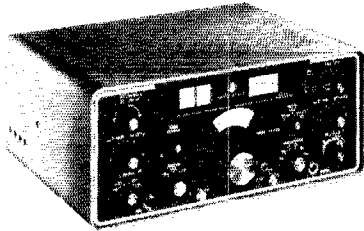
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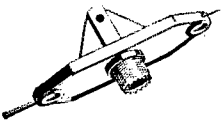
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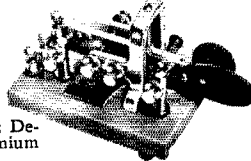
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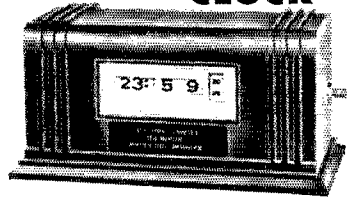
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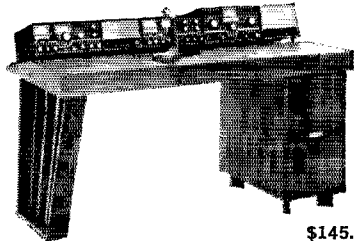
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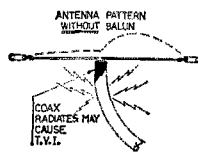
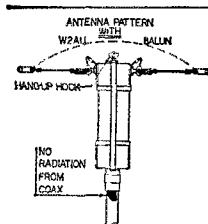
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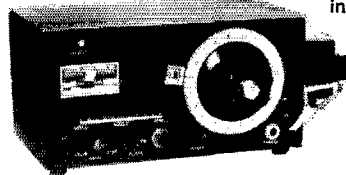
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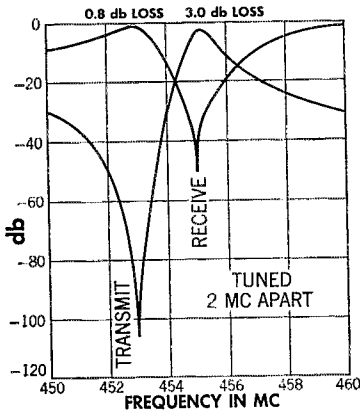
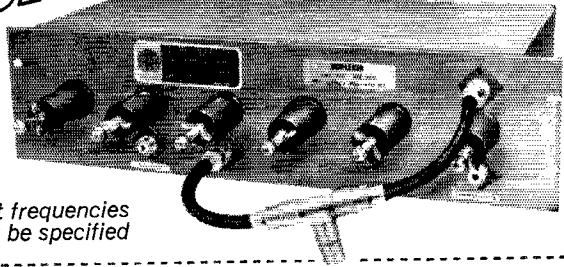
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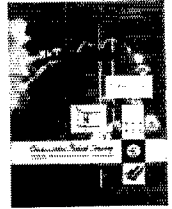
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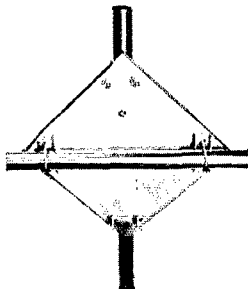
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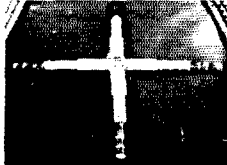
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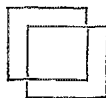
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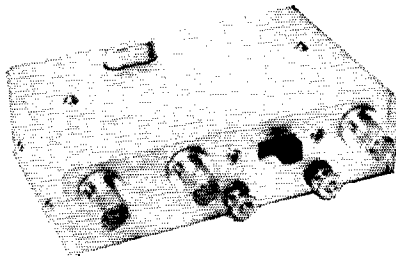
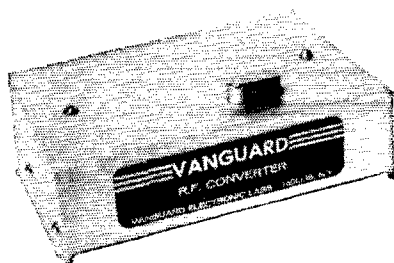


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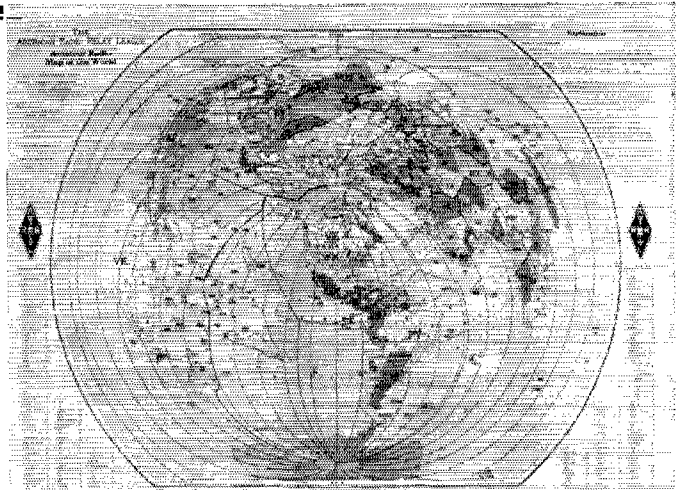


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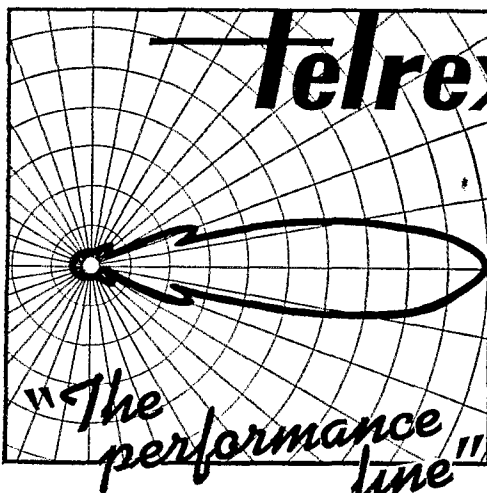
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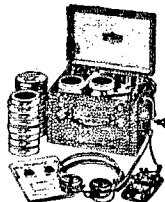
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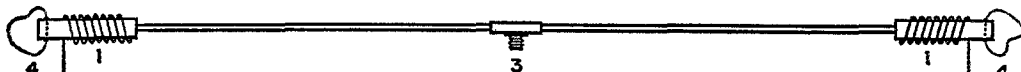
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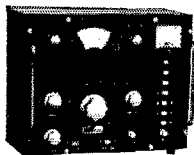
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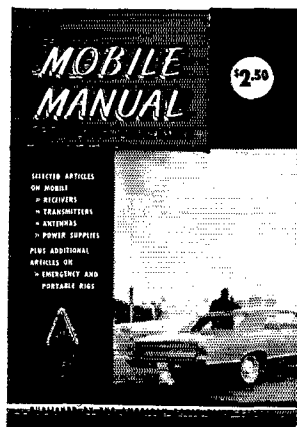
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OSLS 3-color glossy 100, \$4.50. Rutgers Vari-Typing Service. Free samples. Thomas St., Riegel Ridge, Milford, N.J. 08848.

OSLS-100 3-color glossy \$3.00; silver globe on front, report form on back. Free samples, Rusprint, Box 7575, Kansas City, Mo. 64116.

ORIGINAL EZ-IN double holders display 20 cards each in plastic. 3 for \$1.00 or 10 for \$3.00 prepaid and guaranteed. Free sample to Dealers or Clubs. Tepabco, John, K4NMT, Box 1987, Gallatin, Tenn. 37066.

PICTURE OSL cards of your shack, etc. from your photograph. 500, \$12.00, 1000 \$15.25. Also unusual non-picture designs. Generous sample pack, 20¢. Half pound of samples 50¢. Raum's, 4154 Fifth St., Philadelphia 19140.

OSLS: 3-color glossy 200, \$6.99 postpaid. Samples, 10¢. Gates Print, 317 11th Avenue, Juniata, Altoona, Penna. 16601.

QUALITY OSLS: Samples 25¢ (refundable). R. A. Larson Press, Box 45, Fairport, N.Y. 14450.

OSLS's. Free samples, attractive designs. Fast return. W7IIZ Press, Box 2387, Eugene, Ore. 97402.

OSLS. Kromkote glossy 2 & 3 colors, attractive, distinctive, different. Choice of colors 100-\$3.00 up. Samples 15¢. Agent for Call-D-Cals, K2VOB Press, 240 West Kinney St., Newark, New Jersey 07103.

OSLS! WAGWAY Press, 15008 Orchid Ave., Poway, Calif. 92064.

OSLS by KIFF, \$2.00 for 100. Others at reasonable prices. Samples 25¢ deductible. KIFF OSLS, Box 33, Melrose Highlands, Mass. 03177.

RAISED Lettering OSLS. Ace Printing, 6801 Clark Ave., Cleveland, Ohio 44102.

OSL cards. Finest quality. Economical prices. Fast service. Free samples. Little Print Shop, Drawer 9848, Austin, Texas 78757.

OSLS, 100, \$1.25 and up, postpaid. Samples, dime. Holland, R3, Box 649, Duluth, Minnesota 55803.

OSL Free samples! CBM Printers, 5161 N. Hopkins, Milwaukee, Wis. 53209.

RUBBER Stamps. Return mail delivery, postpaid. Basic price, \$1.00 first line, 50¢ for an additional line. Request type style chart. Fulton Rubber Stamps, Route 216-A, Fulton, Maryland 20759.

RUBBER Stamps. Four lines with call letters, \$1.50 postpaid. Finest quality, fastest service. Sherman's Stamps, Box 234, Natrona Hts, Penna. 15065.

PATTERSON Printing will continue the OSL SWLS XYL OMS cards service of the late Mr. Warren Rogers, K0AAB. All of Mr. Rogers distinctive and original designs available (plus new ideas and styles from time to time). Send dime for sample assortment to John Patterson, 961 Arcade St., St. Paul, Minn. 55106.

OSLS. Big catalog, 10¢. Filmcrafters, Box 304, Martins Ferry, Ohio 43935.

ATTENTION: New two-letter call amateurs and other hams: Your call letters engraved on executive desk stand. White letters on mahogany plastic plate 1 3/4" x 6" mounted on polished acrylic base. \$3.25, check or m.o. Lefor, W1DB, P.O. Box 164, Ridgefield, Conn. 06877.

BADGES. Engraved laminated plastic 1" x 3". Call and your first name, also for "XYL" and "Jr. Op", \$1.25 each, prepaid. Club badges designed. K6PBE, Box 1307, Alhambra, Calif. 91802.

NAMEPLATES. Call Letters, wall pressure-sensitive, \$2.00; desk type, \$2.50. Kronenberg, 1492 High Ridge Road, Stamford, Conn. 06903.

COMPLETE Station package: SX-117, HT-44, tubes, antennas, test equipment. Zachary Botwinick, WB2QLU, 253-42 87th Dr., Bellerose, New York 11426.

WANTED: Military, commercial, surplus, airborne, ground, transmitters, receivers, test-sets, especially Collins Airborne. We pay cash, and freight. Ritco Electronics, Box 156-0567, Annandale, Va. Phone: 703-560-5480 collect.

WANTED: 2 to 12 304TL tubes. Callanan, W9AU, 625 West Jackson Blvd., Chicago, Ill. 60606.

HT-44 and A.C. Supply \$250.00; SX-117, \$225.00; SR-42 and VFO \$150.00. All like new, W4MVC, 10 Carlen Ave., Asheville, N.C. 28804.

MANUALS for surplus electronics. List 15¢ S. Consalvo, 4905 Roanne Drive, Washington, D.C. 20211.

HAM'S Spanish-English manual \$3.00 Ppd., Gabriel, K4BZY, 1329 N.E. 4th Ave., Fort Lauderdale, Florida 33304.

TUBES, test equipment, transmitters or receivers. Any and all types bought for cash or trade on new or used ham gear. Air Ground Electronics, 64 Grand Place, Kearny, New Jersey 07032.

1916 QSTs needed for personal collection. Price secondary. Ted Dames, W2KUW, 308 Hickory Street, Arlington, New Jersey 07032.

FOR Sale: SB-101 and SB-200. Wanted, kits to wire. Heath preferred. 12% of cost, some in stock. Professionally wired, Lan Richter, K3SUN, 131 Florence Drive, Harrisburg, Penna. 17112.

WE buy all types of tubes for cash, especially Eimac, subject to our test. Maritime International Co., Box 516, Hempstead, N.Y.

JOYSTICK Variable frequency antenna systems solve space problems. Available immediately. SWL Guide, 218-S Gifford, Syracuse, N.Y. 13202.

CASH Paid for your unused Tubes and good Ham and Commercial equipment. Send list to Barry W2LNI, Barry Electronics, 512 Broadway, N.Y., N.Y. 10012, Tel: (212) WALKER 5-7003.

GOODIES. Cash for Teletypewriters, parts. List. Tyetronics, Box 8873, Ft. Lauderdale, Fla. 33312.

WANTED: Tubes and all aircraft and ground radios. Units like 17L, 51X, 618T or S. R388, R390, R39C. Any 51 series Collins unit. Test equipment, everything, URM, ARM, GRM, etc. Best offer paid. 22 years of fair dealing. Ted Dames Co., 308 Hickory St., Arlington, New Jersey 07032.

HAM Discount House. Latest amateur equipment. Factory sealed cartons. Send self-addressed stamped envelope for lowest quotation on your needs. H D H Sales Co., 170 Lockwood Ave., Sanford, Fla. 32070.

INTERESTING Sample copy free. Write: "The Ham Trader," Sycamore, Illinois 60178.

WANTED: For personal collection: Learning the Radiotelegraph Code, Edition 4; How to Become a Radio Amateur, Edition 9; The Radio Amateur's License Manual, Edition 2, 11, 12, W1CUT, 18 Mohawk Dr., Unionville, Conn. 06085.

RTTY gear for sale. List issued monthly. 88 or 44 Mhz toroids, five for \$1.50 postpaid. Elliott Buchanan & Assoc., Inc. Buck, W6PVC, 1057 Mandana Blvd., Oakland, Calif. 94610.

WE'RE Trying to complete our collection of Callbooks at Headquarters. Anyone have extra copies of Government Callbooks 1922-1925 and Radio Amateur Callbooks 1928-1934? ARRL, 225 Main St., Newington, Conn. 06111.

TUBES, test equipment, transmitters or receivers. Any and all types bought for cash or trade on new or used ham gear. Air Ground Electronics, 64 Grand Place, Kearny, New Jersey 07032.

WANTED: Model #23 Teletype equipment. R-388, R-390A, Cash or trade for new amateur equipment. Altonics-Howard Co., Box 19, Boston, Mass. 02101.

SELL: CO. OST, Handbooks, old radio magazines, any quantity. Buy old radios, gear and publications. Erv Rasmussen, 164 Lowell, Redwood City, Calif. 94062.

NOVICE Crystals: 40-15M, \$1.33, 80M, \$1.83. Free list. Nat Stinnette, Umatilla, Fla. 32784.

TOROIDs, 88 mh uncased, 5/\$2.50. Postpaid. Humphrey, WA6FKN, Box 34, Dixon, Calif.

WANTED: Military and commercial laboratory test equipment, Electronicratt, Box 13, Binghamton, N.Y. 13902.

SAVE. On all makes of new and used equipment. Write or call Bob Grimes, 89 Aspen Road, Swampscott, Massachusetts, 617-390-2530 for the gear you want at the prices you want to pay.

MICHIGAN Hams! Amateur supplies, standard brands. Store hours 0830 to 1730 Monday through Saturday. Roy J. Purchase, W8RP. Purchase Radio Supply, 327 E. Hoover St., Ann Arbor, Michigan 48104. Tel. NORMandy 8-2622.

RTTY Channel filters, octal mounted, 3125/2975, \$5.95 pair. Special filters for TTL-2, SASE for information, 88 Mh. toroids, uncased, 5 for \$2.50. Herman Zachry, WA6JGI, 3232 Seiby Ave., Los Angeles, Calif. 90034.

TR-4, \$480.00; AC-4, \$83.00; DC-3, \$123.00; R4-B, \$360.00; T4XB, \$360.00; MS-4, \$175.00; RV-4, \$83.00; L-4B, \$580.00; W-4, \$43.00; factory-sealed boxes, fully guaranteed, Mel Palmer, K4LGR, Box 10021, Greensboro, N.C. 27404. Tel: 919-299-8767.

1000 PIV 1.5 amp, epoxy diodes, includes by-pass capacitors and resistor, 10 for \$3.75 and U.S.A. Fully guaranteed. East Coast Electronics, 123 St. Boniface Road, Checktowago, N.Y. 14225.

ESTATE Liquidation. SSAE brings list quality equipment. Parard Engineering, 284 Route 10, Dover, N.J. 07801.

HO-110 receiver, \$135.00; Johnson converter 6-2 meter, \$35.00; Seneca VHF-1 transmitter, \$95; Heathkit scope Model OM-3, \$35.00; Eico modulator, driver model 730, \$45.00. Howard Roberts, 635 Jayne Blvd., Terryville, L.L., N.Y. 11776.

TOOBIES - Transceivers: New, unused, 6146B, \$4.00; 6CW4, \$1.60; 811-A, \$4.25; 417-A, \$4.50; 6146-A, \$2.95. Free catalog. Vanbar Distributors, P.O. Box 912, Paramus, N.J. 07652.

AMATEUR Paradise Vacation. Livinestone Lodge, Mascota Lake, Enfield, N.H. Cozy cabin for two weekly, \$55.00. Swimming, fishing, boats, sports, ham radio, Dartmouth golf, tennis. Hot showers, fireplaces, light housekeeping, children half. Lake shore camp sites. Literature. A1, O. Livinestone, W2OPN, 12-01 Ellis Ave., Fair Lawn, N.J. 07410.

PROP Pitch rotors, excellent, small 10:000:1. \$45.00. John Link, 1081 Aron St., Coca, Fla. 32922.

HISTORICAL. Rare documents. Large number of QSTs from 1923 on to swap for Colin B. Kennedy longwave receiver. John Brolley, 719 41st, Los Alamos, New Mexico 87544.

TWENTY-Meter antenna system. Vesto HPX-100 tower, Telrex 20M-546 beam and A2675RIS rotor, \$1800 F.o.b., Alamogordo, New Mex. Write for details. Gary L. Grothen, W5OPL WOOMH, 710 Arnold, Alamogordo, New Mexico 88310.

RANGER, 10/11 thru 160 meters, Excellent. \$75.00. Anderson, W0FPV, 639 North Wahatch, Colorado Springs, Colo. 80903.

SCHEMATICS For T-61/AXT-2 transmitter. CRV-39AAE camera. CRV-60ABK monitor. Instruction manuals for following scopes, Type 241 Dumont, Hughes memo scope type 104, Jerry, K0RHK, 13512 Inverness Rd., Hopkins, Minn. 55343.

SELL: Hallcrafters SX-117, R-48 speaker; Johnson Navigator transmitter; Heath HW-32, HP-23, PTT microphone; Hallcrafters HA-1 keyer; Vibro-Key; Telex MRB-30 headset, new; Model 15, p.s., table, spare keyboard and type basket; Esco W2JAV type T.U. All units are in exlnt condx with manuals. Best offer. Donald Porter, WB2QKD, 230 Merritt Dr., Oradell, New Jersey 07649.

3000 V 3MFF brand new GE Pyronal oil capacitors, \$3.00 each. Can mail, 3-lbs, each shipping weight. FOB P. Wandelt, RD #1, Unadilla, New York 13849.

TELETYPE Gears, shifts, keytops, typbars, motors, torks, typboxes, typewheels, punchlocks, nonoverliners, CR-LFs, FEs, WPs, RSs, ASs, RSs, toroids, vacuum variables, testsets, SRT subchasses. Buy, too! Tyetronics, Box 8873, Ft. Lauderdale, Fla. 33312

HAMMARLUND HQ-170C, factory installed I.F. noise blanker, speaker, manual, 6M preamp, \$185.00. No scratches. W2-UPC, 75 Crestview Road, Mountain Lakes, N.J. 07046.

WANTED: Tubes, Diodes, Transistors and integrated circuits. Astral Electronics Corp., 150 Miller Street, Elizabeth, N.J. 07207. Tel: (201)-354-2420.

WRL'S Used Gear has trial-terms-guarantee! Gonset GSB6, \$189.95; HW-12, \$89.95; Galaxy V, \$269.95; SR46, \$99.95; 4F67, \$49.95; Vallant, \$149.95; Viking II, \$79.95; 6001 linear, \$19.95; HQ-100, \$99.95; 75-A-1, \$169.95; DX-1, \$149.95; 4300, \$79.95; Hundreds more. Low prices. Free "Blue Book" List. WRL, Box 919, Council Bluffs, Iowa 51501.

SELL: Collins S/Line; 75S-1, 32S-1, 516-F-6 w/speaker, cables and manuals, exlnt, \$75.00; Collins KWM-2, 516-F-2, exlnt, w/manuals, \$700.00; Hallcrafters HT-44 transmitter, power supply, SX-117 receiver, HA-10 low freq. converter, complete with cables, manuals, like new exlnt condx, \$500.00. WRL not split up sets. WA2TRF, Don Rudell, RFD #3, Plattsburgh, N. Y. 12901. Tel: (518)-561-4065.

COUNSELLOR: Pennsylvania brother & sister camp seeks ham radio man. College students contact David Blumstein, 1410 E. 24th St., Brooklyn, N.Y. 11210.

OST and CO magazines back to 1954, for sale. In excellent condition. Reasonable. By the volume or save 5 and take all. W8RBW, 3267 Redding, Columbus, Ohio 43221.

FOR Sale: Gonset GSB-100, \$175.00; Hammarlund HO-110, \$125.00; Globe Highbander VHF-62 six and two meter, \$80, all overhauled! Will guarantee and ship collect. Marv, K2VHW, 5 Lockwood Drive, Roselle, N.J. 07203.

SELL: Drake TR-4, MS-4, AC-3, D-104 with manuals and extras. All are in excellent condition, \$500.00, M. Tessler, 260-05 57 Ave., Little Neck, N.Y. 11362.

WIDOW'S Close-outs: Sola, floor model/power supply, TMC GSB-1 SSB receiver adapter, Collins 516-EL 12 V, mobile supply, National HRO-7. All coils, speaker, power supply; Hallcrafters HT-18, RME DB-22A preselector, Precision F-200 sig gen, Gerard 18 A freq. standard, E. Norman, E. Shifter FR-70-U, Bell 10 W. PA amp., black cabinet 14 x 22 x 15, black cab. 36 x 22 x 15; Hallcrafters S-51, Army freq. meter, some extras. Must dispose of immediately. Make offer, one or all, as is where is. Mrs. Perle Gerard, Box 1, Frankfort, Ky. 40601.

TRANSCEIVER HW-32, \$75; stereo amplifier 50-watt, \$75.00; Amperex 4-400A, unused, \$20.00, C. Kump, W6ZYC, 1389 Chelsea Drive, Los Altos, California 94022. Tel (415)-968-8877.

SX-111, \$129.00; T-150 transmitter, \$89.00; RCA T-1500M, mobile transmitter, power supply, cables, control box, \$35.00. CDR-TR2, control box, \$30. Will ship. Phil, K0ZFL, 619 First, Alamosa, Colorado 81101.

MOBILTRAN-40, 40 watts, A.M. mobile, 40 meters, self-contained 12-volt p.s., self-contained converter for car revr, \$40. D. Weisen, W2WHB, 18 Wilbur Ave., Newark, N.J. 07112.

CLEGG Zeus, Interceptor, Venus with power supply. Mfnt condition, with manuals and factory cartons. Make offer whole or part. Barney Scholl, 1551 McDowell, Sharon, Penna. 16146.

SB-100 modified with SSB and c.w. filters, HP-23 supply, SB-600 speaker, keyer, mike, extras, excellent condx, only \$360 for lot. J. T. Wall, WB2GCV, 834 Hawthorne Ave., Bound Brook, N. J. 08805. Phone 201-356-5158.

HEATH HW-16 xevr, \$85.00, HG-10B VFO, \$30.00. IT-11 capacitor checker, \$18.00. All in mint condition, with manuals. Ronald Mayro, 1520 Spruce St., Philadelphia, Penna. 19102.

SELL: Used two months, complete mobile or fixed station, NC-200 transceiver, AC-200 supply, PS150-12 DC supply, speaker, E.V. P.T. microphone, Key Complete Huston mobile antenna installation: bumper mount, mast, 80, \$20.00. Meter resonators, cable, SWR bridge, complete, \$385.00. TR-33 IR Tri-band beam, AR-22 rotor, cables, never used, \$100. Entire package \$475.00. Also, homebrew 2-R1A 500W. linear amplifier. Best offer. Kirschner, 2834 Alisdale, Toledo, Ohio 43606.

GONSET 2-meter transceiver Sidewinder 900A; 911A a.c. power supply, speaker console, 3 months old; \$240.00. Joseph Rotunno, WN2CKM, 1219 Elder Ave., Bronx, N.Y. 10472.

KWM-2 High S/N, 1648, \$695; 516F-6 a.c. P/S, \$80; 516E-1 heavy-duty 2WDC P/S, \$119.00; 312B-Sn. Chl., \$139.00; GSB-101 K.W. linear, \$149.00. All mint condx. no mods. Don Burns, 4410 Reading Road, Dayton, Ohio 45420. Tel: (513)-256-0345.

KILOWATT Mobile, SBE-34, \$300; SBE-1A linear, \$190.00; SBE Inverter, \$190.00; Mount, \$5.00; mike, \$12.00. Package: \$680.00. W8QGE, 1226 Westwood Lane, Fairmont, West Virginia 26554.

SELL: Collins 75A-4, 3 1/6 kc filters w/spkr. \$425.00; KWS-1 spare tubes. \$675.00; late models, on air, in excpt cond w/manuals, separate or package deal, Sry, no shipping. Bob Boring, K6LZB, 5437 Middlecrest Rd., Rolling Hills, Calif. 90274. Tel: (213)-377-2357.

SELL: Norelco 101 portable tape-recorder, in excpt cond: \$75. Tom, WB4FT, 1923 Oxford Cir., Lexington, Ky. 40514.

WRITE, Phone or visit us for new or reconditioned Collins, Drake, Swan, National, Galaxy, Gonset, Hallicrafters, Hammarlund, Hy-Gain, Mosley, Waters, SBE, Henry Linear, B1 Linear, tower rotators, other equipment. We meet any advertised cash price on most equipment. We try to give you the best service, best price best terms best trade-in. Write for price lists. Henry Radio, Butler, Missouri 64730.

WRITE for our listing of top quality American components at lowest prices. Wescomm Electronics, 1491 Overlook, Alliance, Ohio 44601.

WANTED: Collins 75A-4 in perfect condition. Serial Number must be above 4290 and priced reasonably. For sale: Ampex 600 1/2 track 7.5" professional portable tape-recorder, also matching Ampex 620 amplifier-speaker. In vs sud cond. K21RZ 156 Sandy Hollow Road, Northport, L.I. N.Y. 11768. Tel: (516)-AN1-1516.

COMPLETE Station in mint condition: NCX-5 with NCX-A p/s \$495.00; NCL-2000, \$495.00. Will ship. W3YZE, 7934 Winterset, Balto, Md. 21208. Tel: 301-486-5891.

COLLINS 32S-1, 516F-2 for sale. In excpt cond, physically and electrically. \$425.00 or might trade for good 75A-4 or transceiver. Mike Elliott, W0HZC, 3060 24th Ave., Marion, Iowa 52302.

PACEMAKER SSB xmt. \$110.00; HE-45A xcvr and VFO and mike. \$80. Eico mod. 470 scope. \$35.00. All good and manuals. You pay freight. W. A. Duff, W3AMP, 5 Hillside Road, Levittown, Penna. 19056.

FOR Sale: Galaxy III with power supply and matching speaker. \$230.00; Heath HW-12 and HW-13 DC supply with Hustler mobile 75 antenna. \$140. All in great shape. Dick Schellens, WA1BDA, Westbrook Road, Essex, Conn. 08426.

SELL: 50 Mc K.W. C.W. amplifier. Includes built-in mixer driver and power supplies. Pair 4CX300As in final. Local only \$95. Parks 6M converter, 7 m.c. IF. \$20; 9-tube Realistic RPA 30 to 50 mcs., AM-FM monitor receiver. \$35.00. Vibronlex key. \$5.00; with case. \$8.00. S. Savare, W6ARN, 101 N. Ladera Vista, Fullerton, Calif. 92631.

SELL: Heathkit HM-10A Tunnel Dipper, wired, mint cond. \$25.00; B&W Pi network model 851 new in carton. \$25.00; W2AU 171 beam, new in carton. \$10.00; Lafayette 10" amplified slide rule in leather case. \$10.00; Hckok 600A dynamic mutual conductance tube-checker. \$50.00. Dow-Key DKC-TRM-1 TR switch. \$7.50. Globe VOX-10, VOX unit. \$7.00. M. T. Donnell, Jr., W5HSE, 2805 First St., Brownwood, Texas 76801.

SWAN 250, new model, excellent condition, \$400. Call 782-5398 or write Marc Brown, 6545 Varna, Van Nuys, Calif. 91401. W6HWRI.

SALE: Collins 32S-3 receiver, 75S-3 transmitter and power supply. \$1000; Gonset GSB-201 linear. \$200.00; Heathkit SB-301, CW filter and 6 meter converter. \$300.00; SB-401, \$285 for SB-200. \$220.00; all three pieces three months old; RTTY general-coverage Stromberg Carlson CCT-46217 receiver. \$50.00; converter with scope. \$95.00; Model 19 printer \$125.00. Three Aerotron 2-meter AM transceivers, \$100 each. Sydney Horn, WASTE0, 343 Broad St., Lake Charles, Louisiana 70601.

NCX-3, NCX-A, NCX-D in good condition, \$250.00. August Karvonen, K8HHZ, Route #1, Mass, Michigan 49948.

EICO 753, aphp and speaker. \$150.00 or best offer. Roger Young, 2309 Kings Point Dr., Chamblee, Georgia 30005.

A BUSINESS of your own. An industry leader shows you how to get into the Sound and Intercommunications business on your own. Send today for a free brochure to: Action! Systems Company, 34 Cambridge Street, Meriden, Conn. 06450.

SELL: SR-150 with AC supply. J. H. Wisneski, WA1DLM, 81 Hoover Ave., Bristol, Conn. 06010.

HT-32B for sale. Pampered like-new condition. Shipping prepaid in 48. \$295.00. Roddick, K7BDG, 5105 East Sunset, Yakima, Wash. 98901.

MOBILE Operation de luxe: Original owners (2 adults) selling 1963 DeVille Cadillac fair hardtop completely wired for multi-band operation. Includes Webster Big-K (1000 watt) foldover antenna, remotely tuned from driver's seat with visual RF tuning monitor. Mounting for Swan 350 or 500. Under-hood mounted 550-watt Swan power supply. Car has factory air-conditioning, tinted glass, transistorized ignition, controlled differential and many more extras. The air-conditioned Cadillac \$2100. Asking \$2100 for the deal. W6A7Y (Steffan) 2819 Park Blvd., Oakland, Calif. 94610. Telephone 415-452-3466.

POLYCOM "G", new condition. \$155.00; Drake 1A receiver. \$135.00; DX-20 \$20.00; Knight R-55. \$45.00. Galaxy 300 with PSA300. \$210.00. Wanted: Keyer paddle. List available. W2-FNT, 18 Hillcrest Ter., Linden, N.J. 07036. Tel: (201)-486-6917.

SBE-34. One year old. With mike. \$360.00, or your best offer. F.O.B. K9LZ1/9, 2550 Yeager Road, Apt. 7-4, West Lafayette, Ind. 47906

DRAKE R-4A, T-4X, AC-4, MS-4, low-pass filter, Turner mike, practically new. Also electronic keyer, double paddle keyer Vibronlex, SWR meter. \$650.00. Buyer must pick up. K2JFD, H. R. Williams, 3 Amherst Drive, Plainville, L.I. N.Y. 11803. Tel: (516)-931-7653.

FOR Sale: Collins 75A-4 serial 4409, KWS-1 serial 1456, SC-101 Central Unit, Collins dummy load and a pair of new final tubes for the KWS-1. (Prefer package sale) \$1000.00. Arthur W. Lee, W1BHR, Rte #1, North Monmouth, Maine 04265. Tel: (207)-933-2869.

WANTED: TR-4, SR-150, KWM-1, 500-C with AC/DC supplies and cables. Also G-76 AC power supply, Lester Harlow, W6BZNV, 5015 Cape May Ave., San Diego, California 92107.

NCX-3 and AC and DC supply, \$200; Johnson Viking 6 & 2, \$75.00; 18 AVQ 10 thru 80, new, \$30.00; Poly Com 6 & 2 transceiver, \$175.00; Possible swap for HO-180, Make swap offer. WA3HTZ, 55 Ironwood Road, Levittown, Penna. 19057. Tel: (215)-945-3712.

HY-GAIN Hy-tower. \$50.00; SB-200, \$180.00; SB-300, \$210.00; SB-400, \$220. K2GDP, Wheeler Ave., Fayetteville, N.Y. 13066.

TELETYPE Converter; RCA CV-57/URR, 455-500 kc IF discriminator, wide or narrow shift. With manual, cabinet and connectors. \$50.00. J. von Sneider, Jr., K2GTY, 43 Oriole Ave., Bronxville, N.Y. 10708.

KWM-2 #12282, perfect, with 516F2 for \$695.00 and have SB-Line 300/400 smart man's S-Line. Sell or trade for Galaxy Mark III w/supplies. Mobile P & H Spiffie, new, w/12VDC KW linear; trade for transceiver. W0BNF, P.O. Box 105, Kearney, Nebraska 68847.

SELL: DX-60A, \$65.00; HG-10-B, \$25.00; Hallicrafters S-85, \$60.00; HO-170C, perfect, \$200.00. Heathkit AT-1 xmt, \$150. 24 Novice crystals, \$30.00. D. S. Swain III WB4GMI, P.O. Box 434, Washington, North Carolina 27889.

SELL: Viking II, VFO. \$85.00; HO-129X, O-mult., snkr. \$75.00. Both in excpt cond. Cash & carry deal. W2UNT William Van Horn, 4168 Nottingham, Trenton, N.J. 08690.

SELL: Ameco CN-144 w/p.s., \$25.00; Tecraft 2M transmitter/p.s., \$35.00; S-38D, \$25.00. Winegard AP-220N TV Booster, \$13.00. All are in gud cond. K8MMP, 334 N. Miami Street, Trenton, Ohio 45067.

HT-37, \$200.00, and Drake R-4A, \$325. Hardly used and in excellent cond. Both for \$500. George Ziegler, 710 North Palm Drive, Beverly Hills, California 90210. Tel: (213)-275-0721.

SELL: Heath GR-54, 16 months. Ethan R. Bush, WA2ASW, 5 Terrace Dr., Hastings-on-Hudson, N.Y. 10706. Tel: (914)-478-1917.

WANTED: Used 5 x 7 or 8 x 10 view-camera in good condition. Desire lens system and sheet-film to go with unit. Will consider trade for beam gear, or will pay cash if price is right. All inquiries will be answered. Contact Doug DeMaw WICER, ARRL Hq.

SELL: Excellent used Cetron 572B/T160Ls; new United Electronics 572B/T160Ls, WIHEZ/K21JM, 7 Kirk, Springvale, Maine 04083. Tel: (207)-324-4074 and (207)-324-2717.

COLLINS 75-S-3B, #15585, \$450.00; Johnson Invader 200, \$240.00, both mint cond. vs. little use: Eico 752 unwire kit, \$35.00. Jerry Felch, W4DVC, 2901 Claiborne, Huntsville, Alabama 35810.

SWAN 350 and 117 XC power supply, 1 year old, hardly used. Not a scratch! Microphone, Turner 454X; \$350.00. VJ Sultan, W8ZVAC, 2162 Holland Way, Merrick, L.I. N.Y. 11566. Tel: (516)-623-1892.

COMPLETE KW station for CW, SSB, AM, HT-44, HT-45, SX-117, PS-150 and P-45 power supplies plus HA-8 splitter guard, all interconnecting cables, relays and SWR bridge. Asking \$900 for original \$1500 package. 50-mile radius delivery or you come and see it. K2SJM, 50 Parcot Ave., New Rochelle, N.Y. 10801. Phone (916)-636-7962 evenings.

HEWLETT-PACKARD Frequency counter HP524B and HP-525B plus-in. \$795. Wheatstone CW perforator, Boehme keying head, \$295.00. HT-32B, \$225.00; Eico 460 scope. \$50.00. WRCV, 1910 Longpoint, Pontiac, Michigan 48053.

B&W 5100B, 80-10 meter transmitter, \$85.00; Lafayette HA-225, 80-6 meter receiver, \$70.00; 3 element, 6 meter beam, \$10.00. Bruce 80-42 250th St., Beltsore, L.I., N.Y. 11426.

SWANTENNA #55 remote control antenna; Swan #412 DC power supply, both \$130.00, and in mint cond. new in January. Also Heath HC-13 G-multiplier. \$9.00; S-40B receiver, sud cond. you make offer and pay shipping. M. Eckart, WB4GXO, 8039 Kingsston Pike, #9, Knoxville, Tenn. 37919.

SWINGING Choke needed. 25/5 H or 20/4 H 700 Ma, 3000 V, min. rating. Also two 4 mf., 4000 V, capacitors. W8INB, 9 Valley View, Vienna, West Virginia 26101.

R-390A, in excpt cond. with manuals: \$700. Will deliver within 200 miles. WA4TNR, 2905 Louisville Rd., Augusta, Ga. 30906. Phone (404)-798-7615.

SELL: Swan 400, 420 VFO, AC p/s, TH3 MKII beam, rotor, 32 ft. Spaulding Tower, T-O kever, Vibronlex key, all cables, mint cond, 2 years old. F.o.b. this QTH. Package deal only. \$500. Davis, 3435 Pitt, N.E. Albuquerque, New Mexico 87111.

WARRIOR Linear amplifier for sale. New silicon diode power supply. Immaculate. \$150.00. K1JPR, 22 Darbrook Road, Westport, Conn. 06880.

WANTED: Power supply for AN/ART-13 transmitter, plus cables. Also manual. W3BIN, Apt. 301 2008 Ft. Davis, S.E., Washington D.C. 20020.

COLLINS 75A-2 receiver, in sud cond: \$175.00. Certified dealer. C. Mettler, Jr., Lewis Dr. Ridgefield, Conn. Tel: (203)-438-6100.

NOVICES: Conley 900 receiver for sale. \$27.50 postpaid, or will trade for heavy-duty TV rotator. William Weir, 406 Prospect, Berea, Ky. 40403.

NC-300 receiver, \$165.00; DX-60A transmitter, \$60.00. Both for \$210.00. Jerry Abern, 704 McKee St., State College, Penna. 16801.

SELL Multi-Elimac AF-67 and PS-2V AC power supply in good condition. Make offer. Landfield, 965 Green Bay Road, Winnetka, Illinois 60093.

BEST offer over \$4.00 odd QSTs 1920-1924; also poor cond. Collins mechanical filters 360 Kc., 900 cycle 80 Kc, 900 cy. 114 Kc. 200 cycle. \$10.00 each. B. M. Susman, 30 Wiltshire Lane, West Hartford, Conn. 06117

COLLINS S/I line: 75S-3B, 32S-3, 516F-2, SM-2, \$1100. G. Grothen, W0OMH, 710 Arnold Lane, Alamogordo, N. Mex. 88310.

WANTED: Collins MP-1 power supply and 351D2 mobile mount in unmodified, "like new" condition; state age and usage. R. I. Hammond, 102 Highfield Road, Villanova, Penna. 19085. W3L3MW

DO You have technical questions—how to modify rig, solve TVI, want circuit design? Free details, Kav, W1YZP, 132 Washington, Reading, Mass. 01867.

MUST Sell: New G-50 w/Rotron, \$160.00. Polycomm-2, in exclnt condx; \$175.00. Will ship, Want: 2 m. FM mobile and base, WA2COQ, Dan Vermont, 250 Parkville Ave., Brooklyn, N.Y. 11230.

WANTED: Heathkit RX-1 Mohawk or National NC303 receiver. Must be located in New York City area. Contact George Hawrysky, W3GWT, 54 Boorum St., Apt. 10-D, Brooklyn, N.Y. 11206. Tel: (212)-EV8-1893 between 4 and 7 PM.

NEED Space, Kirk balun #1, new, \$6.00, BC-348-0, no power, \$25.00, Weston 301, 0-1 Ma., \$3.00, QSTs 1932, 1933, 1939, \$1.50 year. Some 1938, 1944 and 1945. 15¢ a copy, WBMYB.

SELL: Collins 62S-1 #11604, immaculate, \$595. Wagner, 3890 Tubbs, Ann Arbor, Michigan 48103.

FOR Sale: DX-100, T-60, WA9NJS, Wayne Groff, Lake Park, Iowa 52447.

DRAKE T4X, real hot, clean, like new; \$315.00. W5DV, 4908 NW 31, Oklahoma City, Okla. 73122.

RME 6900 ham band 10-80 meters c.w. SSB AM, VVV receiver, in exclnt condx; \$200. John Bittens, W8WTK, 6463 Buckingham Dr., Parma, Ohio 44129.

SALE: Collins 32S-3, 75S-3B, 516F, \$950.00. Mint condx Model 2KSR with Altronics-Howard Model-L, \$500. Sixty-two foot McMartin tower, with ladder and platform, TH-43, Ham-M, \$600. Johnson Matchboxes, 250W, \$40.00, KW, \$75. RBC General Coverage receiver, \$125.00. LM freq. meter, \$75.00. Lyn Judkins, K4VB, Box 831, Martinsville, Virginia 24112.

HALLICRAFTERS HT-37, perfect electrical condx. All new tubes, \$200. No trades, please! L. E. Herrin, Jr., W84ARK, 285 Glendale Rd., Charlotte, N.C. 28209.

COLLINS 75A-4, in mint condx. Late serial number, with weather dial and 2.1, 3.1, 6 kc. mechanical filter. \$425.00. K1HNO, Stewart Mitchell, 104 Teaticket Path, Falmouth, Mass. 02536. Tel: (617)-548-5671.

HAM Station: Comanche, Cheyenne, AC PS, excellent, \$100. Will sell separately. W4LQC, 1228C 18th Ave., South, Nashville, Tenn. 37212.

FOR Sale: and Wanted—Sell: Eico 3070/Cortina solid state stereo amplifier, 70 watts, 5HZ-100KHZ, 9 months old, \$100. BIO amplifier, Mod. 2122, Biocom, Inc., Gain 6000, 0.5c/s, 2 to 5 Kc/s, 2 months old, \$150.00. Wanted: MIF receiver and ultrasonic or sonar transducer, 15K/C/S, 50K/C/S, J. L. Courtney, 122 S. Data Drive, Lima, Ohio 45805.

WANTED: Collins DL-1, exclnt condx. Charles M. Williams, WA8AXQ, 4325 Drake Road, Cincinnati, Ohio 45243.

FOR Sale: Valiant, factory-wired, in exclnt condx. \$175.00. KR1HL, 1216 Vine Street, Sandusky, Ohio 44870.

SR-150 and AC supply, \$375.00 firm. SX-101A, \$175 firm. WA9VQE, 4340 Sunrise Road, Indianapolis, Ind. 46208.

MOHAWK Receiver for sale: \$110.00. In perfect condx, re-aligned at Benton Harbor last summer. WA9AUM, 2415 West Main, Richmond, Ind. 47374.

SP-600-JX, \$225.00; 2-meter Compressor III, \$110.00; 5" HO-1 Hallcrafters oscilloscope, \$70; BC-13, \$15.00. Deliver reasonable distance. W4FEYU, Eugene Wood, 7754 N. Central, Portland, Ore. 97203.

NATIONAL NCX-5 Mk II VX-501, NCX-A, XCU-27, \$600; Johnson KW Matchbox \$110.00; E-20, W/BC-458, \$85.00; Robert Wittfa, 15117 Steel, Detroit, Michigan 48227. Tel: (313)-272-3856.

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HAM-TV, C/T Camera, \$110.00; Toshiba 7038 Vidicon, \$150.00; new RCA 8507, \$60.00; GEC 7325, \$10.00. WB2GKF, Stan Nazimek, 506 Mount Prospect Ave., Clifton, New Jersey 07012.

SALE: Hallcrafters SX-101, \$185.00; Johnson Viking converter 6-2, \$35.00; Ameco TX-86 factory-wired for 12 volts, \$60.00. All in exclnt condx. Srv, will not ship. Leo, W2MNB, tel: (516)-OR6-7046.

FOR Sale: DX-100B and SB-10, \$140 for both. NC-183MR receiver (military version of NC-183D), \$100. Will deliver in 40 mile radius. Jerry, WB2VMO, 112 Estanga Ave., Haddonfield, N.J. 08033. Tel: (609)-428-8730.

75A-4 Serial No. and 4000 5 kc. and 500 cycle, \$400 firm. Johnson Viking 500 extra relays, \$190. TA-33 Sr., \$50. F.o.b. 18 Allerton Ave., Middletown, New York 10940. Tel: DI3-7287.

EICO 720 and 722 VFO, \$80.00; Hallcrafters SX-110 and spkr, \$90; Vibroplex deluxe bug, \$15.00; relay, \$5.00. Package for \$175.00. All are in exclnt condx. Frank Field, WA1FNQ, 20 Norwich St., Concord, N.H. 03301.

FOR Sale: Hallcrafters HT-41, grounded-grid KW linear amplifier, serial No. 341002812011 (table-top), power supply self-contained, in perfect condition: \$190.00. Doug Luz, K8HFH, Rte. 450 East, Mansfield, Ohio 44903. Tel: (419)-589-3914.

FACTORY aligned Marauder and Speed-X spk. Shure 440-S1 mic with stand, antenna relay, \$225.00; HQ170C with clock-timer and matching S-200 speaker \$185.00. Package, \$400. Phone (206)-364-6429. WA7CSK, 2943 N.E. 178m Seattle, Washington 98155.

DRAKE R-4, speaker, \$325; Drake converter console, 2-6M Fct. converters, Avco supply, package, \$140.00; Ameco 6-2 vmt, VFO \$150.00. Navigator, \$10. Adventurer, \$30; Cush Craft -AM beams, \$25.00. Pick-up deal only. W8ANNL, 1334 West Giles, Muskegon, Michigan 49445.

SALE: Ballantine Labs electronic voltmeter, Model 300, capabilities: 1 millivolt to 100 volts AC. Make offer. Six-amp. Recticon bulb; Simpson round meters, 500 VDC, Model 27, \$4.00; 100MADC, Model 26, \$3.00. All plus carriage, W2TB.

SELL: SX-101A and HT-32; both in excellent condx, \$435.00. Might accept less. T-60, \$35.00; DX-20, \$20.00. WA00XL, Michael Prust, 514 North Washington, St. Peter, Minn. 56082.

FOR Sale: BC-221 frequency meter, \$60; HQ-145-C, \$150; Ranger, \$70; PE-1013 Panadaptor, \$40; DX-100B, \$80; DX-20 V20; BC-348 receiver, \$30.00, Shawnee 6 meter xcvr, \$100; Globe VHF-62 xmtr, \$50.00. All items first check or your best offer. W4TJ, 53706, Clive Brazier Secy. Treas., Amateur Radio Society, Elec. Eng. Bldg., University of Wisconsin, Madison, Wis. 53706.

COLLINS 75A-1 with speaker and manual, mint condx. \$125.00. WB2AXH, 94 Brittle Lane, Hicksville, N.Y. 11801.

SSB Transceiver, Eico 753 with solid state VFO and a.c. power supply. Excellent, \$150.00. Ameco CN50 6 meter converter, factory-assembled, \$25.00. Knight R-100A with crystal calibrator, \$50.00. Write W2YEH for details. 6678 Gates Drive, Derby, N.Y. 14047.

SELL: Swan 350 crystal calibrator VOX AC supply 80-40 trap antenna 75 feet RG 8/U Turner microphone SWR Bridge Vibroplex Blue Rec headphones OSTs 1962-1968, 73R 1961-1968. New \$750. Best offer over \$475. David Levitt, WA1-FVH, 44 Seminole Circle, West Hartford, Conn. 06117.

VIKING II w/Viking VFO, \$70; SX-110 w/spkr, \$70; Lambda Electronics regulated power supply 200-325V unused, \$20.00; Vibroplex, \$8.00. Ready to ship on first check. Might trade for 6 mtr. transceiver. R. B. Hines, Rte. 3, Box 206A, Ardmore, Okla. 73401.

NOVICE Or General complete c.w. and a.m. station: \$318.00; Hammarlund HO-119, Johnson Challenger w/VFO-122, Plus Matchbox 275 w/directional coupler, electronic T-R switch, Speed-X key, Drake TV-1000 low-pass filter; Astatic mike, extra tubes, manuals. All working excellent. Saul Nathanson, WB6GIB, 12850 Oxnard St., North Hollywood, Calif. 91606.

FOR Sale: DX-100B, mike, converted for SSB, \$75.00. Large prop. pitch selvsyns, gears, transformer, all \$50. TH6 and BH2, \$75. Hx-Gain DB-1015 and BN12 \$40.00; Mosley 3 element 3, 2nd boom, \$25.00. Mosley A320 1/4 boom \$35.00; 1 1/7 tube-checker and MX949 adaptor, \$30.00. Will take offers. Paul Neveu, W1CKA, P.O. Box 653, Bristol, Conn. 06010. Tel: (203)-582-4885.

ESTATE OF W2KRV, Sell Collins 32S-3, 75S-3B and 516F-2. Johnson Kilowatt Matchbox, BTT LK-2000; Microphones Astatic (2) Model 10 D-A (new) Shure Model #404C (new), Turner Serial #6495, Frequency Meters (2), BC-221 BTT (2) Vibroplex, 3 power studs 50/60-70 amps 2.8 max. KVA. Hallcrafters splatter guard mod. HA-8, plus tubes, wire (800 ft. new) and various other smaller items and parts. All in excellent condition. Must sell as a complete unit. Best offer. J. Nelson Westbrook, 960 Drake Lane, Stroudsburg, Penna. 18360.

C-W Crystals will close for annual vacation—July 7, through August 25. Thanking all of you, our customers over the many years. See you in August. C-W Crystals, Marshfield, Missouri 63706.

FOR Sale: Galaxy 300 with P S-300AC, \$175.00. In exclnt condx. K3ZQN, 26 Wildrose Lane, Levittown, Penna. 19054.

WANTED: KWM-2—TR4-x SB-101 transceiver. Trade 3253 or cash. Also want 312B4 and d.c. supplies. F. E. Coble, 251 Collier Ave., Nashville, Tenn. 37211.

IMPSCOPE, Heathkit oscilloscope for biological studies, for sale (\$150) or trade scope plus cash for kilowatt. Hank Magnuski, W2DTG, 19 Dunlap Street, New Providence, N.J. 07974.

P & H Linear amplifier LA-400C, \$95, Mrs. E. Willcox, 39 Woodbine St., Auburndale, Mass. LA7-8506. Shipping charges extra.

75A-4 Serial 4213 in original packing. No modifications. \$375.00. Like new and clean. Ivan Fry, Minerva, Ohio 44657.

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MUST Sell: HO-170AC, noise immunizer, speaker, \$200; TX01 w/6146B's, \$85; 7B-500 beam, \$20; Knight 5" scope, \$20.00 or best offer. Manuals, boxes full of accessories. Call Jerry, WA0PYI, tel: (314)-527-8719. Write 415 Wildbrier Drive, Ballwin, Missouri 63011.

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HT-37, \$190.00 or will swap for Valiant II. Eico 722/723, new, unused, \$80.00. A111Y, Higview Drive, Ridgfield, Conn. 06877. Tel: (203)-438-4368.

TOROIDS, 44 and 88 mhz., unused, center-tapped, 5/\$1.50 postpaid, 11/16, 25 per ft., \$3/box. Paper, \$5.50/case. Heath DX-60A, \$55. Hammarlund HQ-150, \$135.00. Tecraft 2M Criterion, \$35. Dow-Key DK-60G2C coax relay, \$10.00. Vibroplex Original \$15.00. Want: Rotator, tower, Matchbox, stamp for list. Van. W2DLT, 302Z Passaic, Stirling, N.J. 07980.

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MAKE Offer: 32S-3, #101350, new 11/67; 516F-2 p/s, TA-33, up six months only, TR-44 with control; Johnson KW Matchbox, like-new. Write: P.O. Box 1, New Rochelle, N.Y. 10804, King, WB2WWD.

SALE: Make an offer. Going into the Service. Eico 753 (solid state VFO); A.C. 751, D.C. 752; D-104 mike. Excellent. Package deal only. Eight months old. S. Allen, 5300 Fifth Ave., Apt C-2, Pittsburgh, Penna. 15232.

COLLINS 75S3A, w/additional 500 hz. filter, 32S-3 and 516F2 power supply. All immaculate condx. \$900. Pick-up, no ship, srv. WATFKY, 320 Echo Lane, Phoenix, Arizona 85021.

FOR Sale: Hallicrafters receiver SX-101A, Serial No. 1011000. Also Hallicrafters transmitter HT-32A, Serial No. Q47122. Both used less than 24 hours. Like-new. Original factory adjustments. In perfect operating condx. Best offer takes both. Dr. Bernard Wexler, 1801 N. Wood Ave., Linden, New Jersey 07036. Tel: (201)-486-4055.

SELL: Swan 500C, \$470; 410C, \$90.00; 117XC, \$85. Mosley TA-33, Jr., \$50.00; AR-22 rotor, \$20.00. All items mint and in perfect operating condx. Gene KIFNO, 11 Drummond Road, Thomastonville, Conn. Tel: (203)-745-6209.

DRAKE 2-C, 10 hours, \$190.00, Drake 2-CQ, \$35.00. Heath HW22A, \$90. HP-13 d.c. supply, \$35.00; Heath mobile k.w. linear, \$100; HP-14 d.c. k.w. supply, \$50.00. I. Weinman, W9-HMO, 4718 N. 80th St., Milwaukee, Wis. 53218.

STAMP Collection wanted. Trade Swan transceivers k.w. amp., 60 ft. tower and miscellaneous. WA6RTD, 3874 S. Sycamore Ave., Los Angeles, Cal. 90008.

HT-32, SX-101, TA-33, Jr. beam, \$400. WA1EBJ, 40 No. Broadway, Haverhill, Mass. 01830

SWAN 350, latest factory version, VOX other sideband and crystal calibrator, \$300. Tom Comport, 2851 Cataract Pl., El Caion, Calif. 92020.

FOR Sale: SR-2000 and supply, new in January. Need money. Just bought SR-400. Price is firm at \$975.00. Jack Yeoman, W8VHY, R#4, Washington, C.H. Ohio, 43160. Tel: (614)-335-5297.

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HALLICRAFTERS SX-100 Mark A receiver, in excnt condx. With manual and spare set of tubes. \$140.00. W8JAY, Barber-ton, Ohio 44203. Tel: (216)-825-4706.

TV-7D-U, chart and manual, or copies wanted. Greg Scott, WA0NDH, 10617 Hill Park Ter., Independence, Mo. 64052.

WANTED: KWS-1, any condition. Geo. Conn, W2TTA, 412 Old Boonton Rd., Boonton, N.J. 07005.

COMPLETE Station package: SX-117, HT-44, tubes, antennas, test equipment. Zachary Botwinick, WB2OLU, 253-42 87th Dr., Bellerose, New York 11426.

DAMAGED, but repairable equipment for sale. SBE-33, LA-1A, G-76. AC supply. Make offer or write for particulars. John D. Wilson, Box 351, Lakeview, Ohio 43331.

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HALLICRAFTERS HT-32B and SX-115 AM, C.W. SSB. Both are in A-1 mint condx. electrically and physically. \$850.00. Package deal only! Mike Matich, WA9NVN, 1101 Ewing Ave., Chicago, Ill. 60617. Call 312-768-3099.



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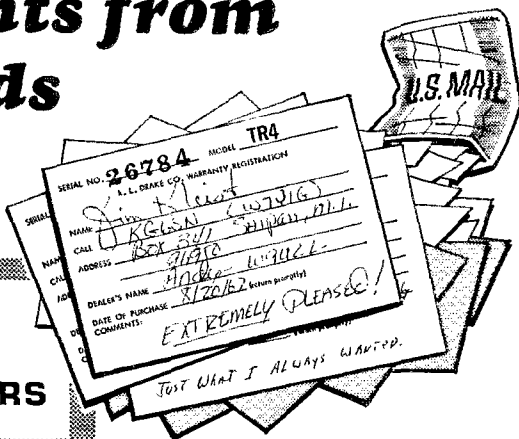


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Some comments from warranty cards by owners of

DRAKE TR-4 SIDEBAND TRANSCEIVERS



"The TR-4 is the best rig I have ever known to be made. Glad to own one."

Dan Tangorra, WA7FWH
Tacoma, Wash.

"Finally got what I wanted!"

Ronald E. Lyons, WB2BQX
Oakhurst, N. J.

"A superb piece of equipment, no comments necessary."

C. G. Noakes, G3UHR/VO2
Labrador City, Newfoundland

"Great rig—First contact was an QN5 in Belgium."

Bill Busse, WA9TUM
Mt. Prospect, Ill.

"Best gear I have had the pleasure of working with. Receiver is exceptionally sharp and stable."

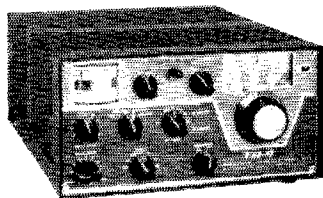
Albert V. Mitchell, WA9BUP
Jeffersonville, Ind.

"Nothing to comment, except that my TR-4 is a real jewel, and I am very satisfied with it. I would like to receive the catalogue of your products."

Joe Braz Ribeiro, PY4UK
Monte Carmelo (MG) Brazil

"A very F.B. piece of equipment. Audio very nice, especially on SSB, which is rare."

Thomas F. Totten, Jr. WB2GZR
Saratoga Springs, N. Y.



"Running it with a Mosley "Classic" beam and proves a most fine and nice transceiver. Really proud of it."

Orlando Escudero O., CE-3-OE
Santiago, Chile

"Looks good—sounds good—very well pleased with performance."

Wayne M. Sorenson, WA0ETL
St. Paul, Minn.

"Have had Drake 2-B for three years. Knew that TR-4 was same Good Stuff."

Charles E. Bishop, WA8FTT
Columbus, Ohio

"Just what I always wanted."

Daniel N. Hamilton, WA4WXQ
Ashland, Va.

"Why not build a good 6 Meter SSB & AM Transceiver . . . hurry up, I'm waiting."

Harold A. Zick, WA9IPZ
Creve Coeur, Ill.

"Excellent equipment."

W. T. Newell, WB6UZU
Palm Springs, Calif.

"O.K. 100 x 100. RV-4: O.K./W-4: O.K./L-4: O.K. Very Good!"

Francisco Fau Campmany, TI-2-FAU
San Jose de Costa Rica

"A beautiful piece of equipment. My second piece of Drake. The first was a 2-B and this sold one friend an R-4 receiver and another a TR-4. We are Drake-minded here in town. Many thanks."

Charles E. Boschen Jr., WA4WXR
Ashland, Va.

"I'm sure this, like the other Drake equipment I have, is the finest money can buy. YOU MAY QUOTE ME ON THAT."

C. E. (Ed) Duncan, WA4BRU
Greenville, S. C.

"I'm a real happy man with it. Does a real good job of getting thru."

Jerome D. Lasher, W2RHL
Hamburg, N. Y.

"Replaces my TR-3."

D. G. Reekie, VE 6 AFS
Calgary Alberta Canada

"Finest performing gear I have ever had the pleasure of operating."

Milton C. Carter, W2TRF
Lakewood, N. J.

"PS Several months have passed . . . I now employ TR-4 as mobile unit and base station. I have logged more than 1000 contacts, many being rare DX. I am looking forward to owning a second unit to be used strictly for mobile. To date TR-4 has been trouble-free."

Milton C. Carter, W2TRF
Lakewood, N. J.

"Well pleased."

Rev. James Mohn, W3CKD
Lititz, Pa.

"I am delighted with Drake gear. This is the second of your transceivers for me. I have used a TR-3 in my car for about 2½ years—only trouble: replacing a fuse!"

Guy N. Woods, WA4KCN
Memphis, Tenn.

"Ask the ham who owns a Drake TR-4"

... or write for details ...

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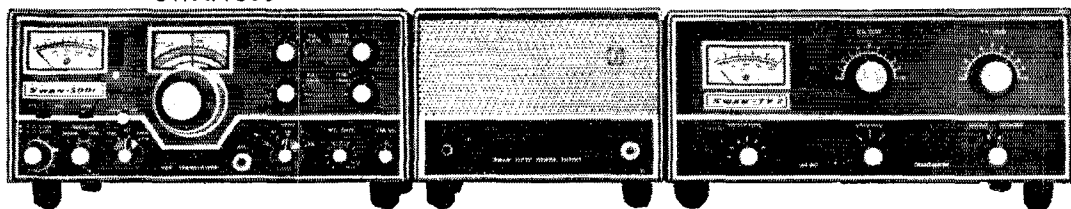
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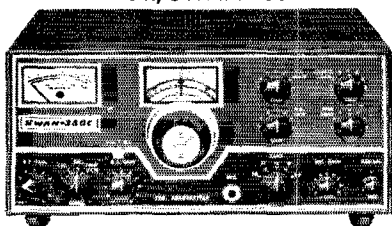
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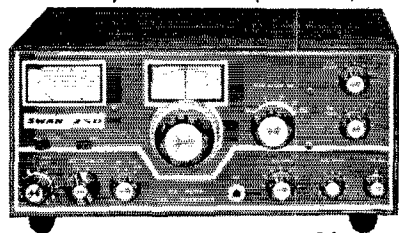
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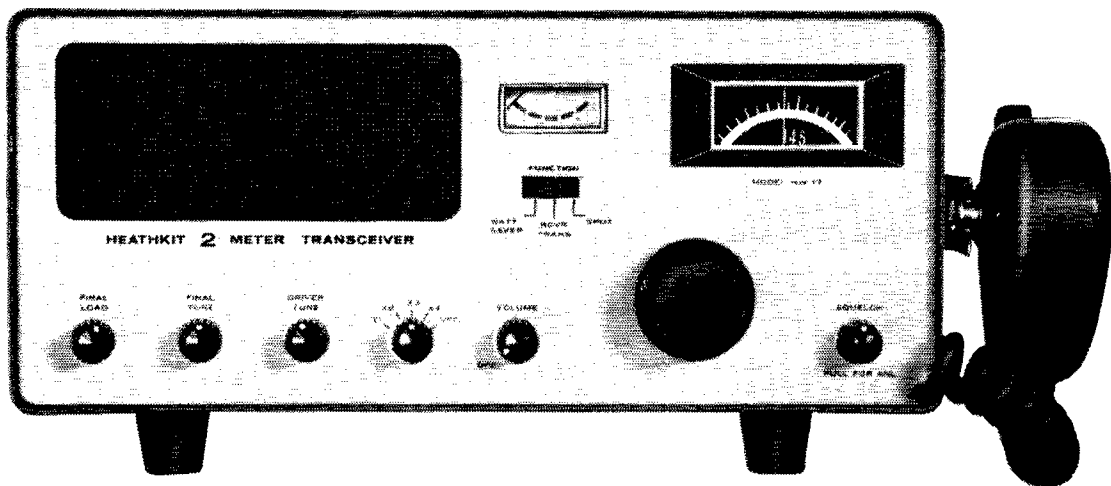
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On the transmitting end is a hybrid circuit including transistors and tubes with an 18 to 20 watt power input and an AM power output of 8 to 10 watts. Modulation is automatically limited to less than 100%. A front panel selector switch chooses any of four crystal frequencies or an external VFO (the Heathkit HG-10B VFO at \$37.95 is perfect for this job).

Front panel controls include Final Load, Final Tune, Crystal-VFO switch, Main Tuning, Squelch with ANL switch, Battery Saver-Receive/Transmit-Spot switch; rear panel has S-meter Adjust, Head-phone jack, Power socket, VFO power socket, VFO input, and Antenna connector (50-72 ohms, unbalanced).

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