CQ

May 1974
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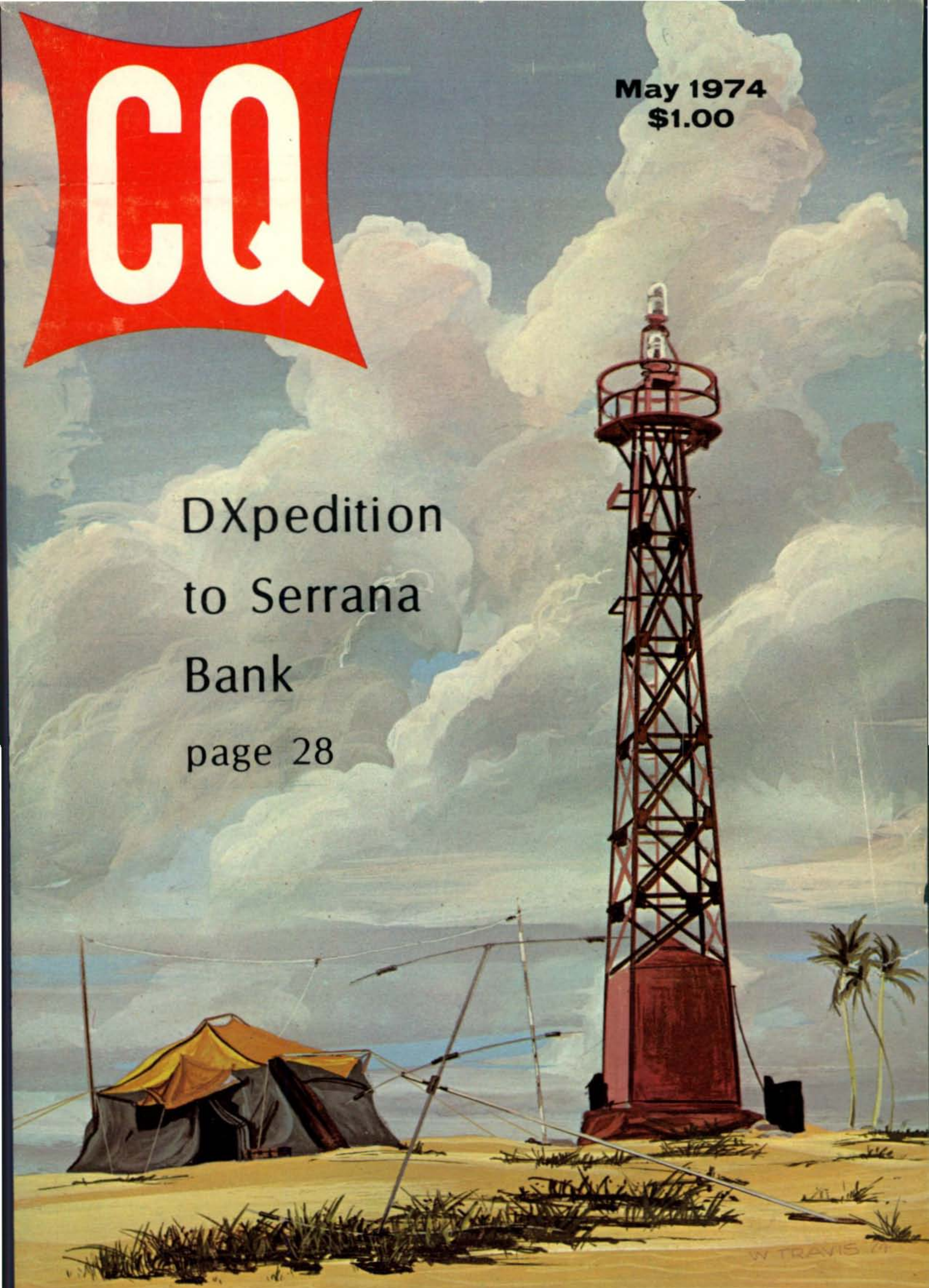

The Radio Amateur's Journal

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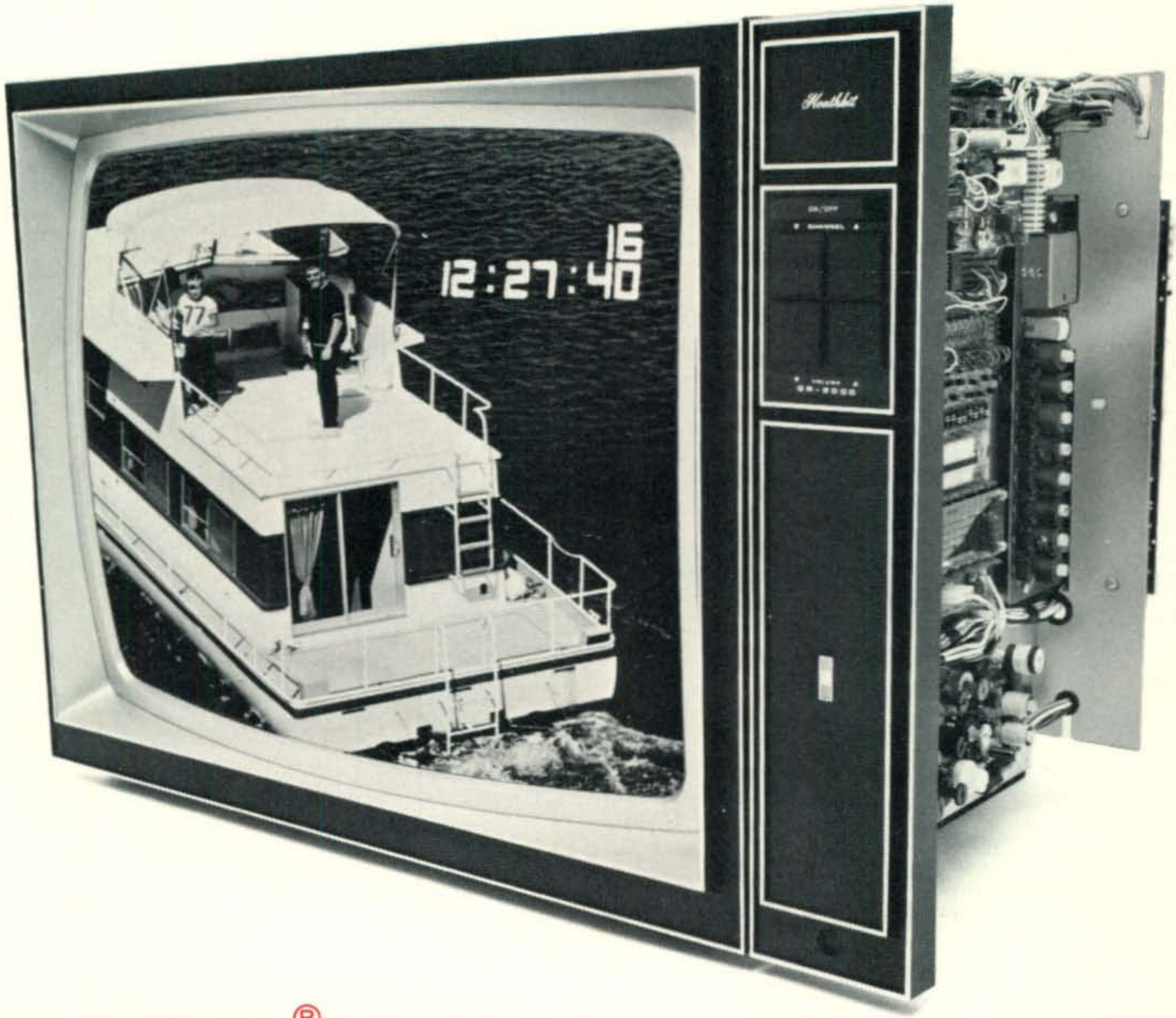

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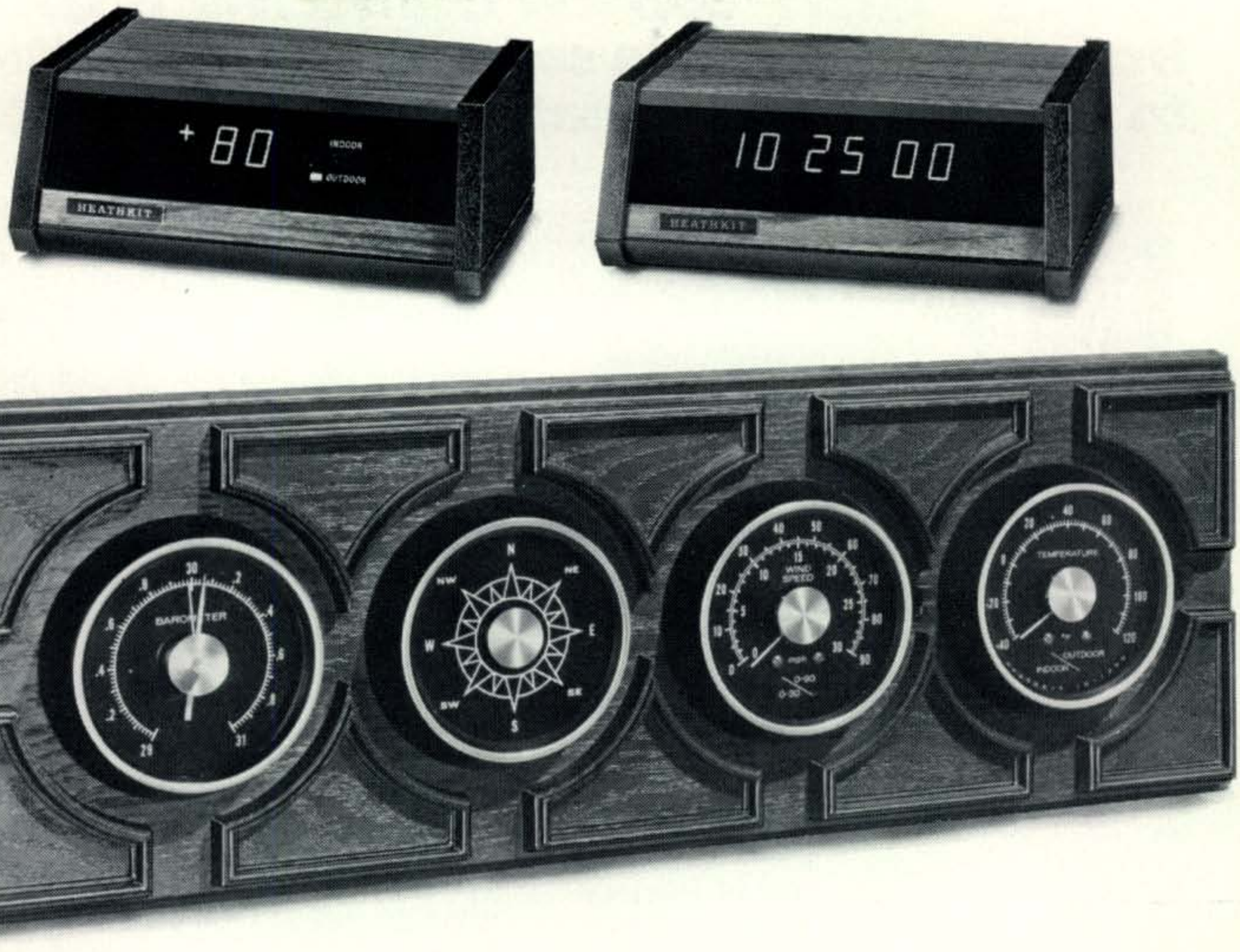

new kits to class-up the shack

electronic time & weather instruments

Top left is the Heathkit ID-1390 Digital Thermometer. A solid-state device that monitors indoor and outdoor temperatures. Switches set thermometer for alternate display of indoor/outdoor temperature at 4-second intervals, for constant display, and for readout in either degrees Fahrenheit or degrees Centigrade. Includes 85′ cable and 2 sensors. $59.95*. Mailing weight, 5 lbs.

Top right is the Heathkit GC-1005 Electronic Alarm Clock. A six-digit timepiece that displays hours, minutes and seconds on highly visible cold-cathode readout tubes. Gentle "beeper" alarm can be set for 24-hour cycle, features snooze switch for seven more minutes of sleep. Displays time in 12-hour, or 24-hour format. $54.95*. Mailing weight, 4 lbs.

Below is the Heathkit ID-1290 Weather Station. It has Uni/Mag® barometer for 2½ times greater pointer deflection; 8 wind-direction compass points that light-up in combination to give you 16-point resolution; wind speed indicator with 2 switch selectable ranges, 0-30 and 0-90 mph; dual-sensor thermometer with switch selection of indoor and outdoor temperatures. Includes weather cup and wind vane assembly, simulated walnut housing. $89.95*. Weight, 9 lbs., 50′ cable, 5.95*, 2 lbs.; 100′, 9.95*, 4 lbs.; 150′, 14.95*, 6 lbs.

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- Receiver Sensitivity: Less than 1 uV for 15 db SN Ratio
- Selectivity: 2.0 kHz
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- Receiver Image and IF Rejection: Greater than 60 db.
- Internal Receiver Spurious: Less than equivalent 1 Microvolt Signal
- Transmitter IM: 30 db below P.E.P. (26db below one of two equal tones)
- Adjacent Channel Desensitizing: 3 db with greater than 10,000 MV
- Sideband Suppression: -50 db minimum @ 1 kHz
- AF Power Output: 2 watts
- Stability: 100 Hz after warmup. Max. 100 with 10% line voltage change
- Frequency Readout: Within 1 kHz ± 100 kHz of Cal. Point not more than 3 kHz across entire 500 KC Band
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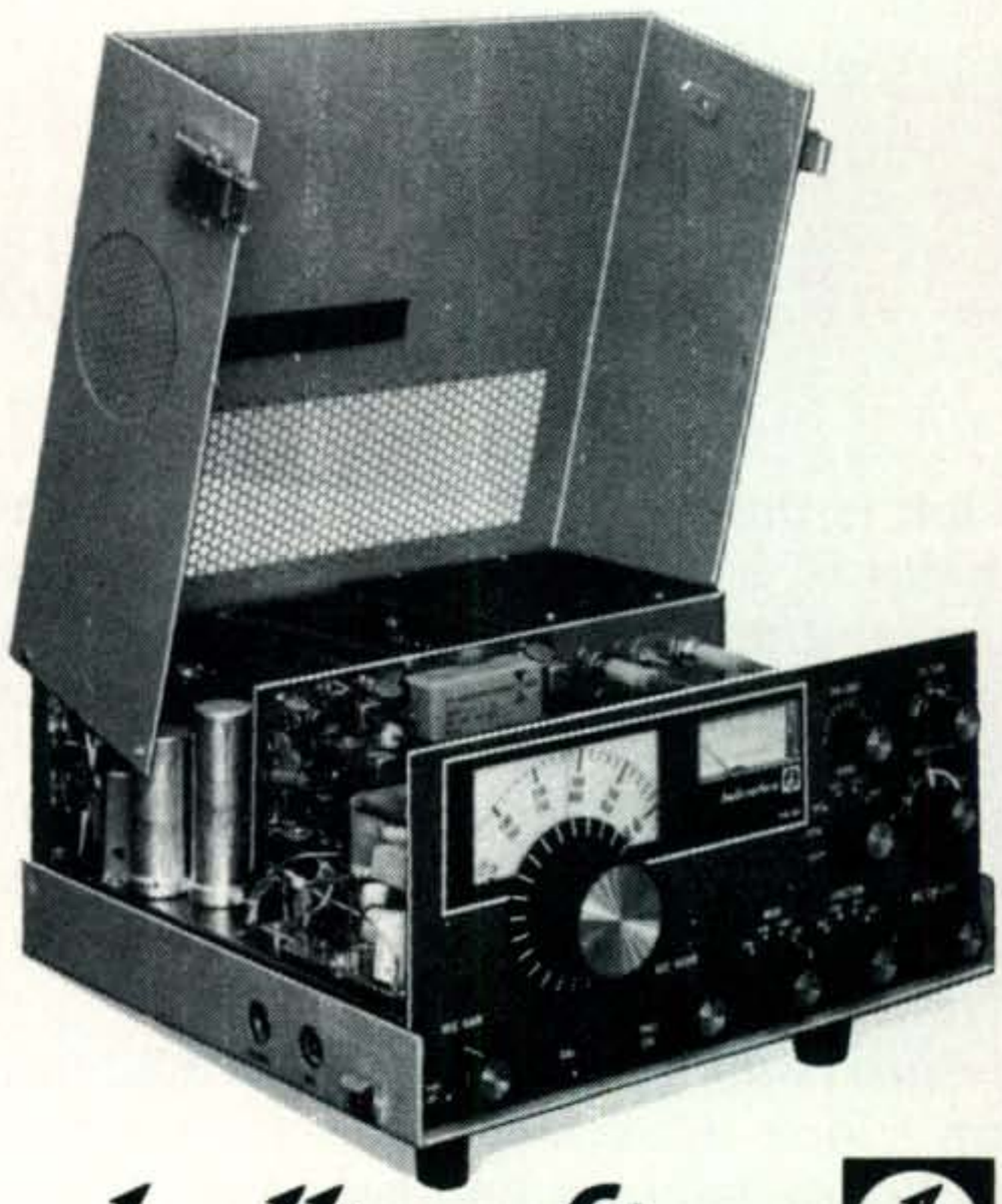

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MAY, 1974 VOL. 30, NO. 5

CQ The Radio Amateur's Journal

FEATURES

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ZERO BIAS

With stunning swiftness the realities of our tumultuous age struck the insular domain of amateur radio as a US Information Officer in Cordoba, Argentina was seriously wounded and kidnapped by Argentine guerillas on April 12, 1974. To most of the news media he was Alfred Laun, III. To amateurs around the world he was Fred, LU5HFI, formerly of XV5AC, HS5ABD, HS3AL, HI8XAL and W9SZR.

To try to relate this isolated incident to our hobby is pointless, but the observations of CBS News Reporter (WBBM-Chicago) Dick Helton, W9CTY, go a long way towards pointing up the irony of the occurrance:

"Fred Laun may have been a victim of circumstances caused by his hobby.....amateur radio. His yard was full of antennas and towers, his home filled with sophisticated communications equipment used in pursuit of his hobby. But to the terrorists that kidnapped him, all of this may have been seen as some sort of clandestine operation designed to pass along information about their guerilla operations in Cordoba. To the thousands of ham radio operators around the world, however, Fred Laun is better known as LU5HFI, the call sign assigned to him by the Argentine government. He had operated from similar setups elsewhere, most recently in Southeast Asia. Last night, he was using his gear to talk with friends in north and central America..... discussing topics far afield from the troubles that beset Argentina.

"What Fred Laun's kidnappers may have perceived as a threat to them, was in fact a hobby used by thousands of men, women and children around the world as a means of promoting friendship and understanding."

We wish Fred a speedy recovery.

73, Dick, K2MGA

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OUR READERS SAY

New Licensing Proposals

Editor, *CQ*:

I would like to express my feelings on the "prognosis" on the license structure of the future. The "incentive licensing" fiasco has proven to be just that. All the interesting people are on General portion and the Advanced and Extras don't use their little private portion because they can't find anyone of interest to talk to. The proposed Amateur Extra Phone license looks great and would restore that portion of the band that was taken away to those who could and would make good use of it. The Communicator Class would probably draw a lot of present CB operators who are growing tired of the misuse of 11 meters by many unlicensed operators. As I see it, the time is fast approaching when we as amateurs must get more frequencies. One can see more and more need each day, regardless of what band/mode. As requirements are lowered, more people will take part in this rewarding hobby.

David E. Manescu, W6CCM
Lakeside, CA

160 Not That Hard

Editor, *CQ*:

Being a 160-meter stalwart, I take a dim view on W6QLV's comments in the Q&A column of the February 1974 issue of *CQ* (page 12.) His answer to a newcomer to Ham Radio tends to discourage new activity on that band. I submit: (1) Activity has not dropped off in recent years, it has increased. Evidence: increased entries & scores in both the *CQ* & ARRL 160 contests. (2) He states "one of the MAIN reasons is space for an efficient antenna." I disagree. I, owner of a small suburban Houston home and lot, make use of my existing tower and triband beam as a shunt-fed top-loaded vertical on both 160 & 80, with outstanding results on both those bands. Tower is un-guyed, space required only a few square feet if no radials are used. (My buried radials do not extend beyond property lines). On 160, this type of antenna has proven to be more productive than large inverted-vee's and dipoles by far. On 160 alone, this antenna has netted me 45 countries and the only 160 WAC certificate to exist in W5-land and 160, and 160 WAS. This in four winters at this QTH. No, big space is not a requirement for a big signal on 160! 80 meters provides equally pleasing reasults (re: VK6HD comments: "the biggest 80-meter sigs from the central USA are from W5RTQ, K5PFL & W5LUJ." PFL & LUJ use two quarter-wave phased verticals. My antenna is a single element close to an electrical half-wave. We need to encourage activity on 160, not discourage it!

Also I disagree with Ade Weiss' comments in the Feb. 1974 QRPp column..... I have learned that reducing power from 100 watts to 25 is a 6 db reduction, not 3! From 25 to 5 watts is 7 db, not 4, and from between 100 watts and one watt, when actually it is 20 db! (10 times the log of the power ratio, right?) I'm sure this is being pointed up by other readers. It is interesting to note that the difference between a kw sig at 30 db over S9 is 30 db, hi!

Earl, W5RTQ
Houston, TX

"Face" Value

Editor, *CQ*:

Having lived down my embarassment and shame, the question can now be asked: "Does every other ham in the world but me know you can't take a surplus meter at face value?"

A while back during a search for a second hand low long bureau suitable for conversion to a kit built TV cabinet, I came across two more-or-less mint ARC-5(3.5 to 4) transmitters in a dusty alcove at the rear of the store.

The proprietor, being unaware of their existence or even how they got there, threw them into the furniture deal at a modest 50 cents each.

The cabinet project turned out most successfully, but the ARC-5 affair took a different turn.

A power supply was brewed up and cabled to the better of the transmitters, and damned if it didn't work the first time-with one exception. Output power was down about a half of what it should have been-for no obvious reason.

We will now skip hastily over the next year or so spent off and on in making output tank changes, installing intermediate and buffer stages, changing the drive, etc. etc. *CQ* patiently offered sound standard advice-to no avail.

While the project had been started as a "just for the hell of it" excercise, it had become a personal challenge bordering on a mania.

Surplus books were devoured. Output tank circuits and theory were practically memorized. Experimental notebooks were filled.

The time finally came to admit defeat. Murphy had triumphed. I would have to turn in my Extra Ticket and become a CB'er-a fate worse than death. But for posterity I would leave a record of every voltage and current measureable in the rig with two VOM's. The data was assembled and neatly tabulated. Nothing was revealed that had not been reviewed dozen's of times before. Final input current-but the P/S meter measured that-no need to---I stared at the beautiful Simpson 0-300ma face. My bargain surplus meter solidly let into the power supply chassis stared back at me and the sinking feeling in my stomach reached bottom. It couldn't be-or could it?

It was disconnected and a VOM substituted. The rig was loaded to 150ma and the output meter came to life popping up to where it should have been from the start.

With deepest apologies to the gallant and much maligned and worked over ARC-5, a piece of nichrome wire was trimmed to the proper length, shunted across the meter terminals and the thing finally was in fact a 0-300 ma meter. I had been trying to load at about 80!

Moral:
For the ham with more projects than dough
Buying surplus is one way to go
But be sure what you bought is just what you sought
Cause it ain't necessarily so

Sky Wardwell, WA1GFH
Stamford, Conn.

Customer Service

Editor, *CQ:*

Just read the article from William Pearson, WB6QBJ, on getting good service from Henry Radio. This is well and good and certainly Henry Radio is a good company to do business with.

But let me relate an experience with Burstein-Applebee of Kansas City, Missouri. I ordered a remote control switch on December 26, 1972 for the amount of $21.75. I was informed that they were out of this item and asked me to order some other item from them. I answered that I did not wish any other item from them and to refund my money. – This letter was not answered and no refund was returned to me despite repeated letters from me, plus two that were sent via Registered Mail. After attempting to get my money refunded over a span of eleven months, I was forced to bring this to the attention of the Postal Department and our local Postmaster.

This did the trick as I finally received my refund from Burstein-Applebee at a cost to me of several letters including the cost of Registered Mail. And what did Burstein-Applebee get from this? They earned interest on my $21.75 for eleven months.

George Freeman, W8BZH
Negaunee, MI

Announcements

Neenah, Wisconsin

The Neenah Menasha Amateur Radio Club would like to announce its Annual Hamfest and Banquet on May 4, 1974. This event will bring together Amateur Radio Operators from Wisconsin and neighboring states. Contact: Clifford McCoy, WB9ELH, 1018 Murray Rd., Neenah, WI, 54956.

Evansville, Indiana

The Tri-State ARS will hold their annual Hamfest on May 11, 1974, at the 4-H Fair Grounds, U.S. 41. Camping, Auction, Flea Market, Door Prizes, and Ladies Bingo. For information contact: Steve, WB9MDB, 5805 Berry Lane, Evansville, Indiana, 47710.

Lake Delton, Wisconsin

The fourth annual Yellow Thunder Hamfest will be held at the Dellview Hotel in Lake Delton Wisconsin, on May 18, 1974. Swapshop, meetings of MARS, ARPSC and VHF repeaters with a banquet and cocktail hour in the evening. For further information contact: Kenneth A. Ebneter, K9GSC, 822 Wauona Tr., Portage, Wisconsin.

St. Petersburg, Florida

The St. Petersburg Amateur Radio Club, will hold its annual Hamfest on Sunday, May 5, 1974, from 9:00 a.m. to 3:00 p.m. at Lake Maggiore, 9th St. So. at 38th Ave., St. Petersburg. Registration of $1.00, includes prize drawings and use of

[*continued on page 75*]

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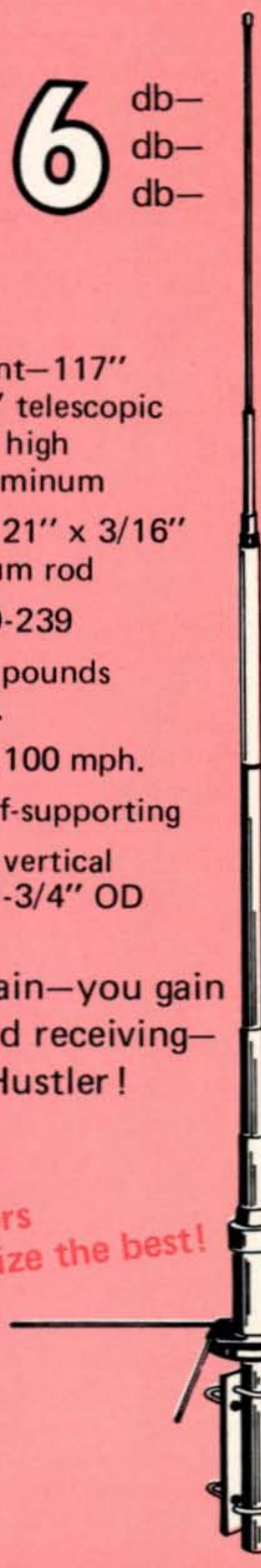

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Q AND A

BY CHARLES J. SCHAUERS,*
W6QLV

Q & A now receives a large number of letters from readers seeking redesign-modification information on transceivers. Where we can, we direct them to already published articles.

Redesigning or modifying a single band transceiver for operation on other bands is not an easy task and *cannot* be accomplished merely by drawing the modifications on a copy of the schematic! A large amount of "cut and try" is necessary when making any modification.

Converting older transceivers from tube to transistorized operation is impractical, unless one has time to burn. Changing final tubes in a transceiver for more "efficient" types is generally a waste of time, for in addition to adjusting the currents and voltages involved, considerations of tube capacitance etc., must be made and the final tank "Q" values carefully figured out.

Changing the v.f.o. from a tube operation to one using transistors may be ok, but it takes a good knowledge of transistor circuitry.

For major modifications there is relatively little space in most modern transceivers if coils and stages are added.

Slaving separate s.s.b. receivers and transmitters is a headache unless there is frequency compatibility. This means proper v.f.o. and mixer frequencies. If these are different then one does need a well designed conversion stage to do the job and the stage must be ultra-stable.

There are few shortcuts to redesign and modifications of today's modern amateur equipment but the day will never come when a manufacturer's design cannot be improved on by some amateur who has the time and the knowhow.

As I see the s.s.b. transceiver picture today, improvements can be made in the following areas—manufacturers take note: cross talk and modulation effects in receiver design can be reduced; selectivity can be improved; c.w. operation can be made better; more broadbanding of stages can be accomplished; there is still a better tube somewhere for transceiver finals; output

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stage efficiencies can be improved in the transistor areas; and finally there is need of a better dial arrangement. Of course, the cost can be brought down too—why not?

TR4C Noise on C.W.

"When operating c.w. with my TR4C (which operates fine) I have a terrible clicking noise. I use a Superex headset (hi-fi). What is the solution?"

Normal r.f. around the rig will cause the problem—coming back through the headset. The impedance match is not ideal. By inserting a .4 mf cap in series with the high impedance (600 ohms) line, the click disappears. *(Thanks to Doc., WB2IWH, who wrote me about the problem and I suggested a couple of approaches—his worked!)* Doc also suggests that he eliminated the "bass signal" (via the audio module) by putting a .001 mf cap in parallel with the two leads coming off the a.f. pot. This accentuates the highs. Thanks Doc.

HT-37 Noise

"When my HT-37 transmitter is on standby it emits a noise that bothers my SX-101-A receiver. I use a TR switch. Using a filter some of the noise disappeared but I still have enough to make it tough. What is my trouble?"

I'll bet it is "signal suck out." Noise generated by your transmitter's final can be stopped by increasing the bias to fully cut off the tubes—a relay is usually necessary to do this. The relay applies more than the operating bias necessary for full cut off. TR switches (most do not work well) can also generate noise. A good Dow Coax relay may be the complete answer to your problem.

Linear Tube Failure

"I built the sweep tube linear final as described in the ARRL *Handbook* (page 184) (1973). As you know this set uses 4 of the 6KD6's in parallel. It seems that the *same* two tubes consistently go out. Three replacements makes me write you. What do I do?"

First of all, I suggest that you get a set of *matched* tubes. But don't put them in until you have *carefully* checked the following: a. the 10 ohm 1 watt resistors in series with each cathode of the final tubes; b. each parasitic choke (Z_1-Z_2); sockets of each tube and each connection to these sockets; and finally the ground connections to pins 9, 5, 4 and 10 on each tube. If your trouble persists, balance up the circuit more by first trying an r.f. choke in series with the top two tubes (on the diagram page 185). This choke could be a replica of RFC_3 but you can use an ordinary layer wound 5 mh unit which will handle the current. Good luck. By the way, this is an excellently designed little amplifier.

73, Chuck, W6QLV

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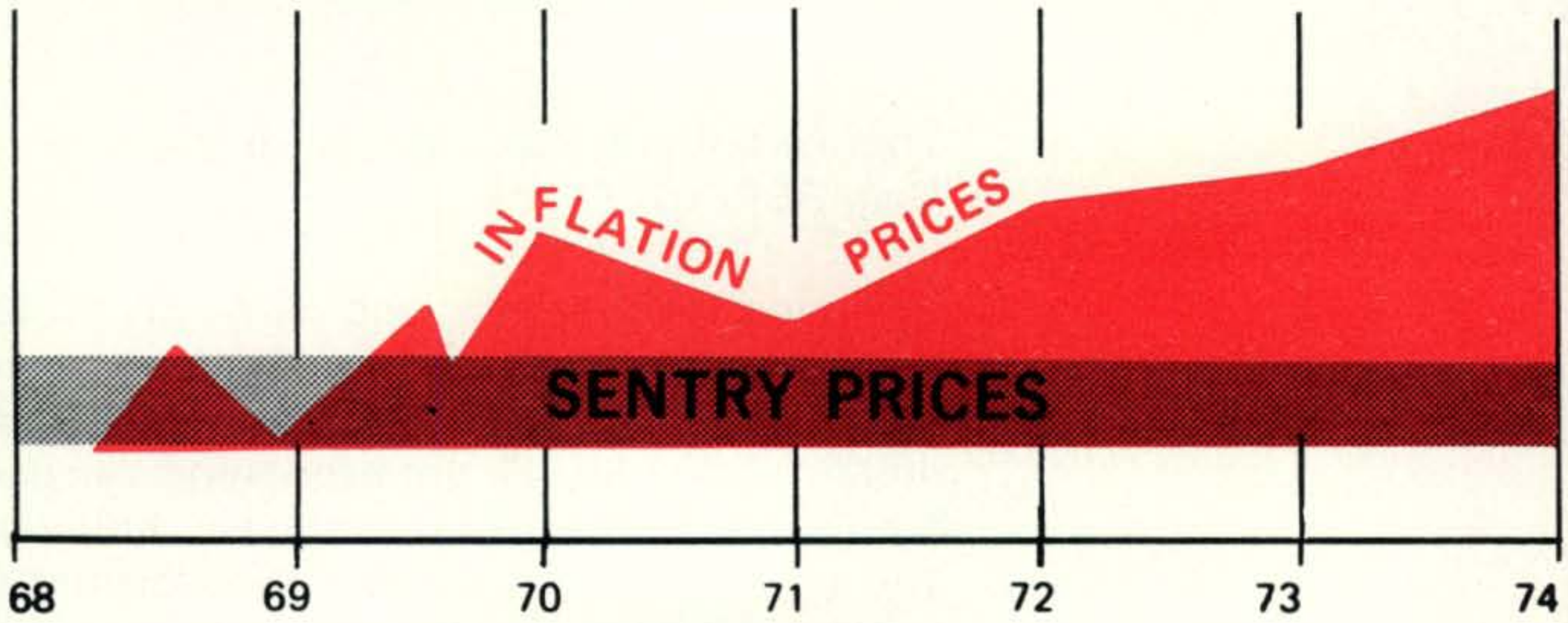

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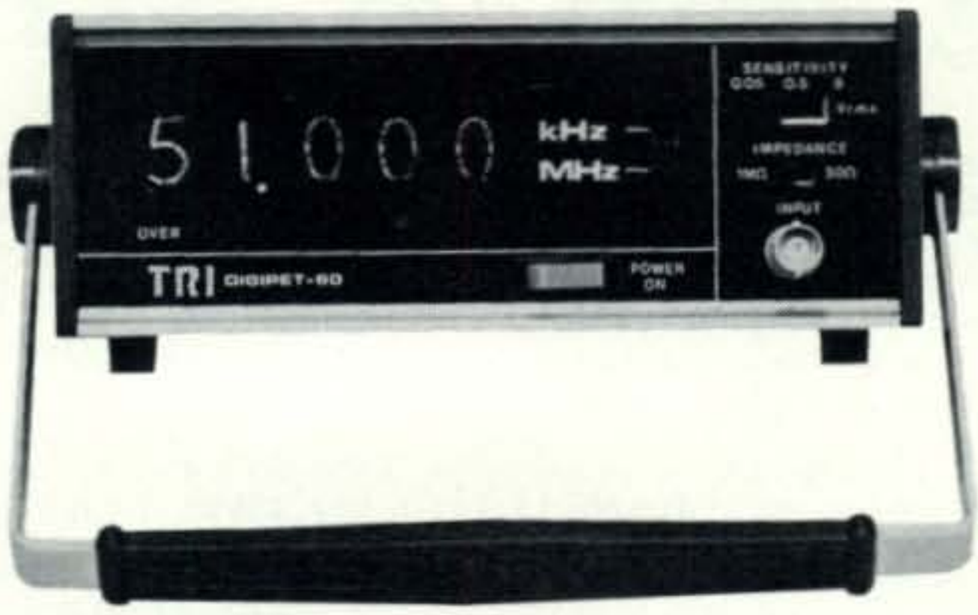

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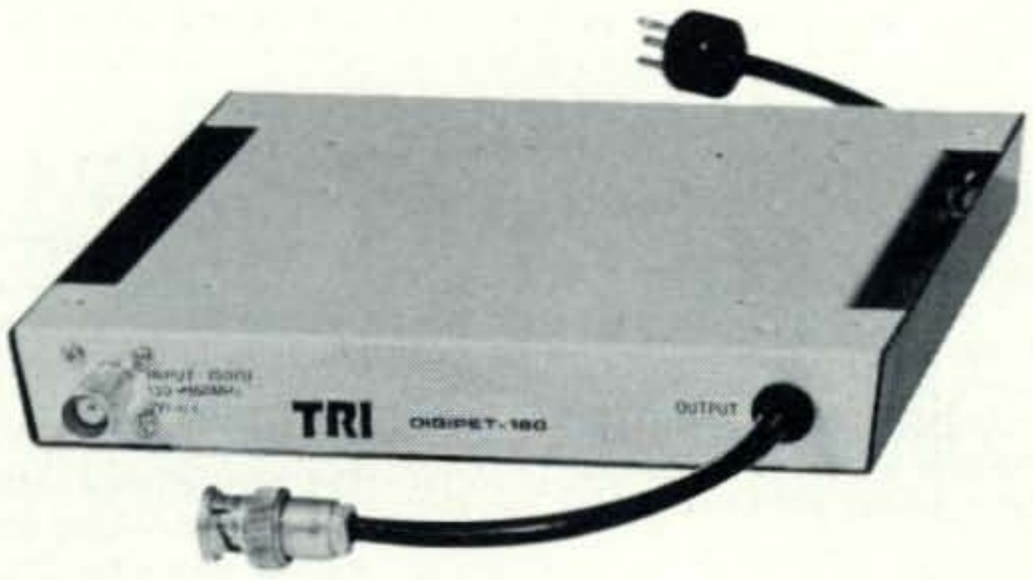

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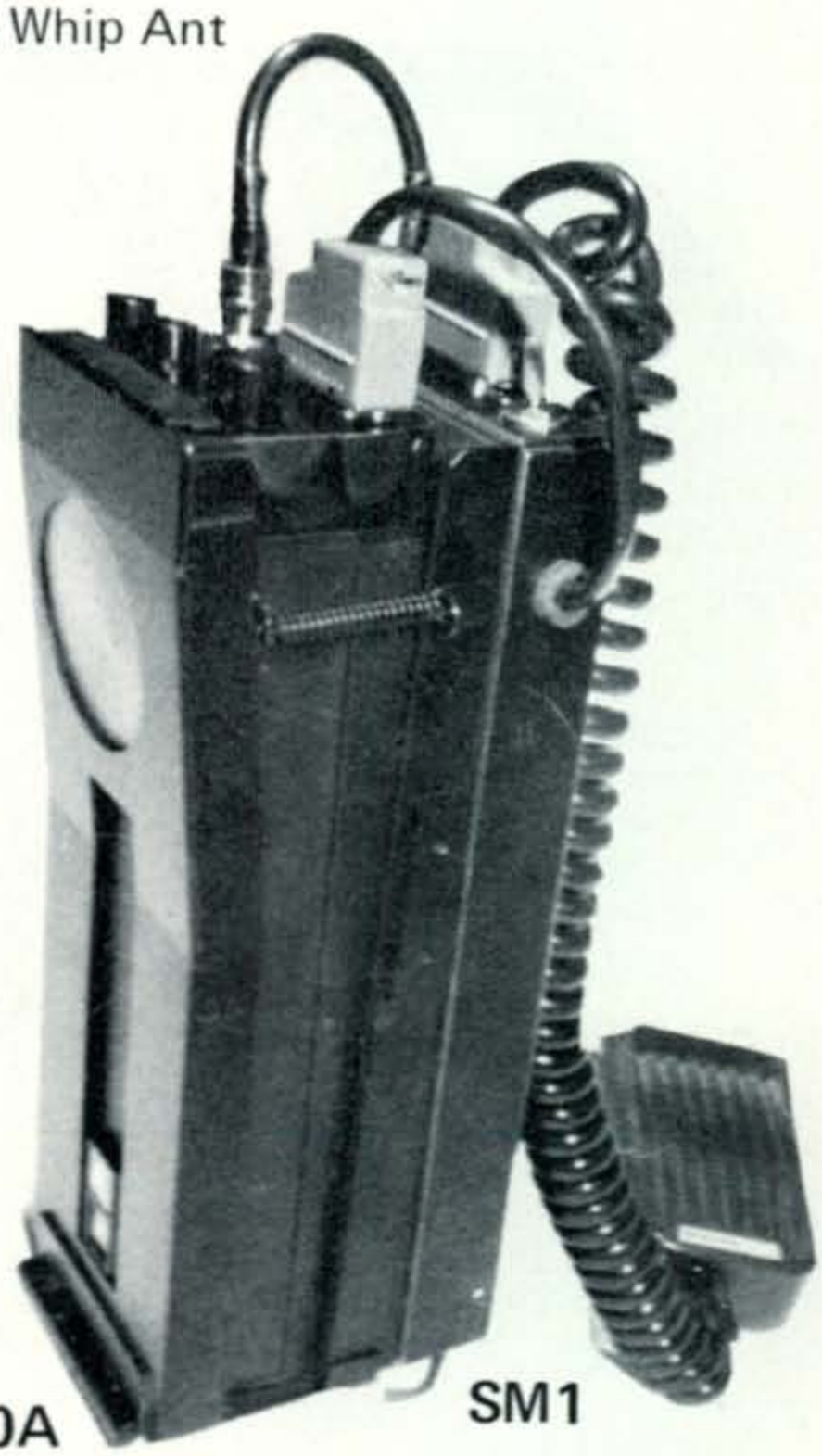

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A Message From The Publisher

For the past several months, subscribers across the country have been receiving their copies of *CQ* late—much later than we or you wish to tolerate. The complaints have been arriving at our office numbering in the hundreds, far too many, in fact, for our limited staff to answer individually.

Therefore, I'd like to explain the causes for the lateness, and of more importance, the attempts we're making to correct the situation. Back in September we were approached by a local typesetting firm, seeking to handle the composition for *CQ*. Their prices were indeed lower than we were currently paying, and they promised a delivery schedule as good as, or better than what we had been receiving. Needless to say, we gave them a try. The first month was fine, but the material for the December issue stopped cold halfway during the month, forcing us to return to our previous supplier. The loss in time was several weeks.

Bad as that was, we received a call from our printer in New Jersey advising that he hadn't received a paper shipment, and that he had no idea if and when a shipment would be delivered. After frantic scrambling we negotiated a contract with another printer in Florida that handles another of our publications. But again, the loss was time, a commodity that simply can't be recovered.

There are many fine printers in this country, but a very limited number who have the ideal presses to handle *CQ*'s page size, print run, delivery dates, and other service needs—all at a price the publisher can afford. What's worse, printers are being caught in a serious stranglehold by a very severe paper shortage.

We're doing our utmost to catch up on the lost time and hope to return *CQ* to its early mailing date that subscribers want. We ask your forebearance on this problem as we work overtime to do a month's work in two or three weeks. The problem *will* be overcome, but we'll need a few more months to finish the job to everyone's satisfaction. In the interim, we thank you for your patience.

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Serrana Bank Snafu

DXpedition Rivals the "Perils of Pauline"

BY FREDERICK J. LAWSON,* K6JAN

VERY possibly the last KS4 operations have been completed from Serrana Bank. This fact alone should make the QSL's extremely rare, but when the complete story is told of the hardships and frustrations suffered by the three hams who made it all possible, those QSL's should be worth plenty. During November 1-3, 1972, Serrana Bank was placed on the air as KS4KZ by three Americans (Fred, K6JAN; Pete, KZ5PW; and Jerry, KZ5JF who in a little over 48 hours of operation worked almost 2,000 stations on 10 through 80 meters. This operation will very possibly be the last KS4 operation and the last operation from KS4 Serrana Bank. Word has it that the United States has entered a Treaty[1] giving control of Serrana Bank to Colombia and that it will be included as an HKØ (since the island is within a 225 mile range from San Andres Island HKØ). This has already happened with Swan Island (KS4) between the United States and Honduras. This is the paramount reason this particular DXpedition was so important to the operators participating.

Organizing The DXpedition

The original group of operators chosen for the DXpedition included K6JAN, KZ5PW, KZ5JF, KZ5ZZ, KZ5PN, and KZ5HS. The group included one lawyer (K6JAN), one medical doctor (KZ5HS), one electrical engineer (KZ5ZZ) one mechanical engineer (KZ5PW), one Captain in the United States Army (KZ5JF), and one high school student (KZ5PN).

The group that eventually succeeded in operating from Serrana Bank consisted, however, of the lawyer, the mechanical engineer, and the military Captain, and, ironically, each was required to practice his profession at one time or another during the DXpedition. But more about that later.

Each of the original six participants played an integral role in organizing the DXpedition. There was much to be done in obtaining licensing, equipment, transportation, etc. All parties donated much time and money. The DXpedition was planned for October 26 to November 1 to coincide with the *CQ* World Wide DX Phone Contest, and at first everything went smoothly. On October 23 1972, four of the six operators left early from Panama to San Andres Island, most of whom were accompanied by their wives, for what was hoped to be a couple of days of vacationing while mak-

KZ5HS and author K6JAN (right) pose for a snapshot on San Andres Island prior to departure for Serrana Bank . . . departure number one, that is. KZ5HS did not make the second attempt.

---

*12011 Salem Dr., Grenada Hills, CA 91344.

[1]A check with the US Department of State Treaty Affairs Division prior to press time reveals that the US-Colombian treaty effecting the transfer of Serrana Bank and two nearby islands to Columbian possession is tied up in the Senate Foreign Relations Committee, and no action to ratify the treaty seems likely in the near future. Apparently, counter-claims to the ownership of the islands have been made by Nicaragua, and rather than side with either party, the US has chosen to delay any action, in hopes that the two latin nations can arrive at an understanding between themselves, possibly through the World Court. At the present time, therefore, Serrana Bank is still a possibility for additional KS4 operations, though in view of the politics involved, not a very likely one.

Before the storm, Fred, K6JAN operates KS4KZ from Serrana Bank. A short time later the Collins gear was to be disabled by wind driven rain—inside the tent.

ing final preparation for the boat transportation to Serrana Bank from San Andres Island and to obtain Colombian authority to operate from the Bank using the FCC-obtained KS4 license.

The very well liked and affable well known ham, Francisco, HKØBKX, met our group at the airport on San Andres Island. Francisco is that very rare type of person who enjoys helping people for the pure joy of just being nice. He is "number one" to anyone who has had the pleasure of his friendship and he is known and respected by literally everyone on the island. His wife, Linda, is from the identical mold, and when leaving the island, one's chief regret is having to say goodbye to Francisco and Linda.

Francisco's importance to the DXpedition was first realized only moments after landing at the airport. It appeared that a new policy at the airport adamantly required certain passport documents rather than Tourist Visas. We were not going to be allowed to proceed with our DXpedition; that is, until Francisco appeared, smiled and said a few words to the officials, and immediately we were all politely escorted through customs and to our awaiting gear. Our gear consisted of over one ton of sophisticated ham paraphanelia, including one Signal One CX7A, two KWM-2's with separate v.f.o.'s, one Drake Line, two Collins 30L-1 linears, two 3 kw generators, 1,000 feet of long wire antenna, one vertical antenna, one 3-element beam, dipoles, tents, tables, chairs, cables, antenna tuner, meters, coax, etc., etc., etc.

Awaiting us at the airport was a truck from the beautiful Bahia Marina, owned by Mr. Tod Hoffman, the American from whom we were chartering a 32-foot Grand Banks Cabin Cruiser. Very efficiently our gear was loaded aboard the marina truck and we were taken to Tod's very beautiful marina to stow the gear and inspect the craft that was to play a very discouraging role in our DXpedition. Tod and Joan Hoffman are two of the most affable young Americans in the entire Caribbean. Their family of three boys is very close and all members seemed intent on making our stay pleasant and enjoyable. Tod is soon to become a ham and I know his presence on the air will add much to our hobby as well as to provide many stations with a new HKØ call.

On October 25th we met the remaining two KZ5's at the airport and proceeded immediately to the marina for departure to Serrana Bank. The crew of our boat consisted of a pilot, navigator, and a cook. We had loaded the boat the night before, so we loaded last minute items and departed by 2:00 P.M. from San Andres Island for Serrana Bank. The trip was supposed to have taken about 18 to 20 hours, but after 30 hours at sea the navigator finally admitted he was lost. We faced very high seas and everyone had experienced sea sickness, some more seriously than others. In fact, three of the party never raised themselves from their bunks (except to empty their stomachs into the sea). So at about midnight of the second day out, a vote was taken, and by a 5 to 1 majority, it was decided to return to San Andres Island.

[*Continued on page 73*]

Winds up to 80 m.p.h. buffet the tent housing the KS4KZ operations on Serrana Bank.

The RME Success Story

BY WILLIAM I. ORR,* W6SAI

EACH evening the two amateurs would get together on 75 meter phone and chat about receivers. It was their opinion that most shortwave receivers available for phone operators left a lot to be desired and the perfect ham receiver had yet to be built. Bill Ingersoll (W9BHT) and Shaw Shalkhauser (then W9CSZ, now W9CI) discussed their ideas for a radically new amateur receiver that would do away with plug-in coils, have all-wave coverage along with good bandspread, have a signal strength meter, exhibit high sensitivity and selectivity and incorporate a hum-free power supply—all in all, a real challenge to the design and manufacturing techniques of 1930.

In true ham fashion, many good projects start in the basement workshop and this was no exception. W9CI decided to build this perfect receiver instead of talking about it. His decision led to a breakthrough in communication receiver design, founded a company that advanced the state-of-the-art in the years before World War II and made important contributions leading to today's sophisticated communication receiver.

In this article, W6SAI continues his story of the early communication pioneers in the amateur game and the evolving development of the modern s.s.b. communication system. Read how some energetic and daring radio amateurs in Peoria, Illinois proved that "the hometown boy can make good."

THE great idea of a new communication receiver started around Bradley University in the dark years of the Great Depression. Radio development was at a near-standstill, the large companies being concerned with day-to-day survival and unwilling to spend money on new developments. As W9CI says, "the terrible bust in 1929 meant that only a practical amateur working in his own shop among all his accumulated radio gear could dream up what had to come. We could never be sure that what we were going to do would actually work, but whatever it was, it surely got the practical tryout it needed!"

In his spare time away from his teaching work at Bradley, W9CI ran a small radio business known as *Sound Recording Studios* which built a condenser microphone and preamplifier for public address equipment. He also built a doublet antenna system baptized "the firecracker" by the ham users. Shaw also experimented with television, having one of the earliest receiving set-ups in the midwest using two rotating 24-inch discs

Fig. 1 — E. G. Shalkhauser, W9CI, professor at Bradley University and one of the founders of Radio Manufacturing Engineers. Now retired, "Shaw" can often be found on 80 and 20 meter s.s.b.

* 48 Campbell Lane, Menlo Park, CA 94025.

with small holes around the periphery. With luck, he was able to make the primitive apparatus simulate early-day TV techniques, seeing a picture about one-inch square. Then, acquiring more components, he assembled a unit using the carbon paper recording technique and was able to tune in the Chicago TV station on 150 meters and record a blurred TV image several inches square.

The Birth of RME

As a result of on-the-air conversations and armed with good working knowledge of what constituted a practical shortwave receiver, Shaw borrowed several hundred dollars and went looking for a partner for his venture. He soon found him in the person of one of his ex-students, R. M. Planck, W9RGH. Russ had returned to Peoria after losing his job with a defunct radio company in Michigan. In the bleak winter of 1931, therefore, the two engineers set about building an advanced prototype shortwave receiver in the basement of W9CI's home. It was a slow and time-consuming job as few items of test equipment were at hand and money was running out.

After a few false starts, the team of Shalkhauser and Planck had a working model of a receiver that seemed to fill the bill. Even today, the new receiver, christened the

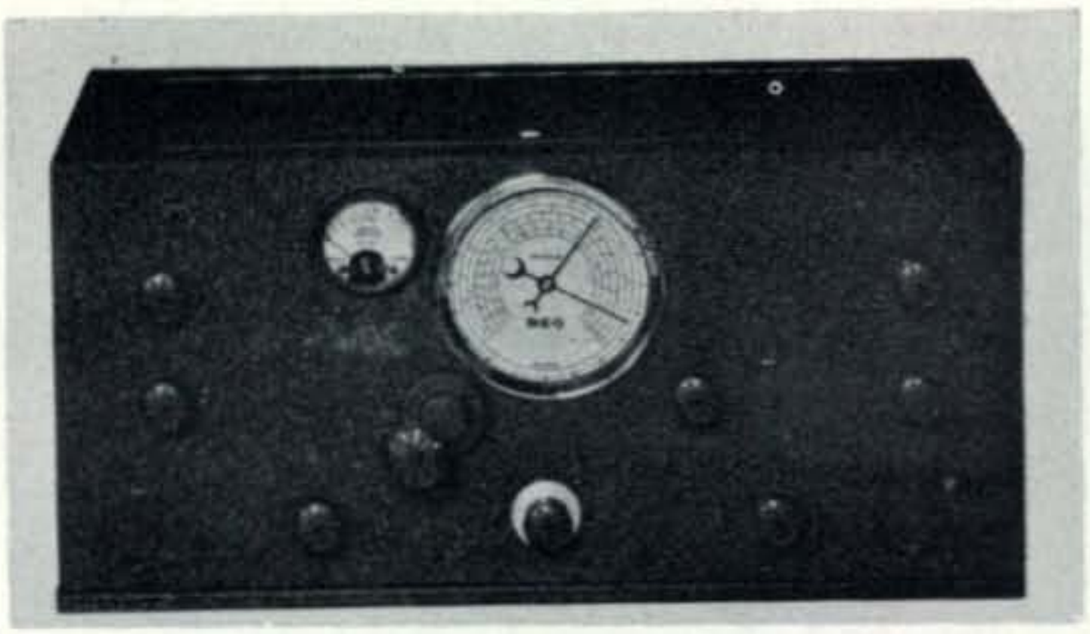

Fig. 2—The "grand-daddy" of them all, the RME-9. The first published photograph of this original design shows the early receiver had a dial with auxiliary bandspread pointer and featured that great aid to the appliance operator, the signal strength meter. Less than 100 RME-9 receivers were built, and some of these were torn apart by RME before they were sold in order to provide parts for the improved RME-9D.

RME-9, is an interesting device as it is the forerunner of today's sophisticated s.s.b. receiver (fig. 2). The name of the receiver was derived from the initials of the new company, whose name was changed from *Sound Recording Studios* to *Radio Manufacturing Engineers*. The receiver was built in an all-metal cabinet and featured a calibrated tuning dial and that great boon to the appliance operator, the signal strength meter (better

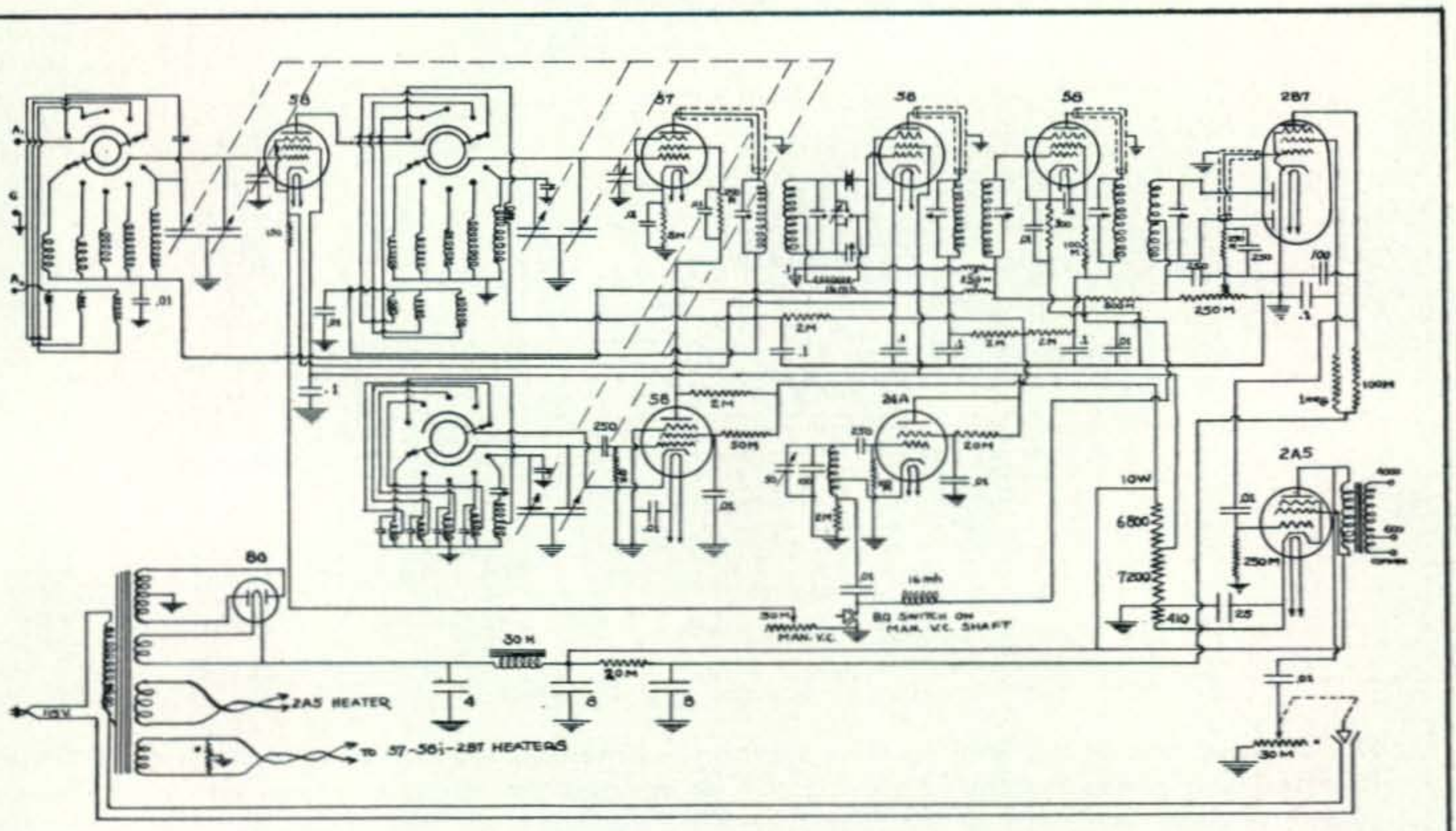

Fig. 3—The schematic of the RME-9 receiver. One r.f. and two i.f. stages were used. The very first receivers did not incorporate the signal strength meter, as it is missing from the hand-drawn schematic. Full a.v.c. was incorporated as well as a beat oscillator for code reception. The receiver used 2.5 volt, heater-type tubes.

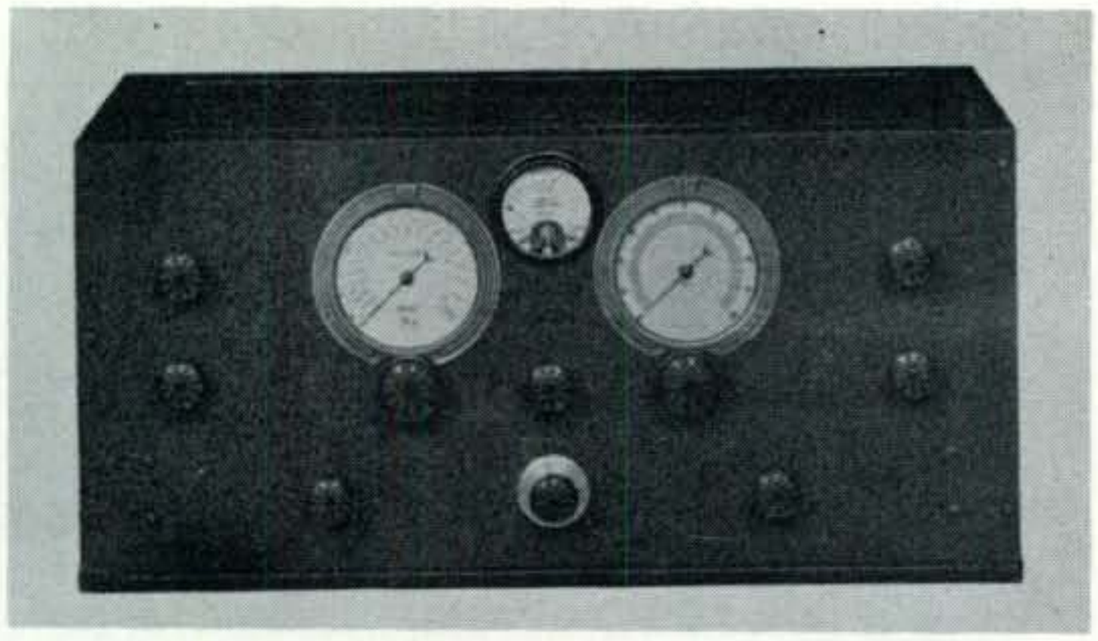

Fig. 4—The RME-9D receiver, which incorporated a separate bandspread dial and tuning gang. The receiver came in two models, one of which included the broadcast band and the other included the range of 22,000 to 30,000 kilocycles. This model receiver was used by W6FQY to establish the first 10 meter phone WAC before World War II.

known today as the S-meter). As far as is known, the RME-9 was the first production receiver to incorporate this device.

The circuit of the RME-9 is shown in fig. 3. The recently-developed Lamb Crystal filter was incorporated in the i.f. circuit and an auxiliary, slow-speed geared pointer on the tuning dial was used for bandspread reception at any point in the tuning range of 540 kilocycles to 22,000 kilocycles. Bandswitching was used, and the receiver incorporated one r.f. stage and two i.f. stages, plus a beat oscillator for c.w. reception. Full automatic volume control was included in the receiver. Series and shunt padder and trimmer capacitors in the bandswitch assembly allowed accurate alignment and an antenna resonator control was incorporated to peak the r.f. stage to the antenna in use. The RME-9, complete with eight 2.5 volt tubes plus the rectifier and an auxiliary speaker was net priced at $106.50, FOB the factory.

The new RME-9 receiver sold slowly by word of mouth, as the little two-man company had no money for advertising and by 1933 less than a hundred receivers had been built. While the future looked dark at the time, Shalkhauser and Planck spent their spare time redesigning the receiver to better suit it to amateur phone operation.

The original design had only one tuning capacitor gang with a planetary dial mechanism for fine tuning. Complaints were received from users that it took a magnifying glass to read the dial calibration. Other users asked for a built-in phone monitor for modulation checking. Accordingly, the engineers revised the receiver and added a separate bandspread tuning condenser gang and dial, as well as a station monitor circuit.

The improved set was designated the RME-9D ("D" for dual drive) and the first

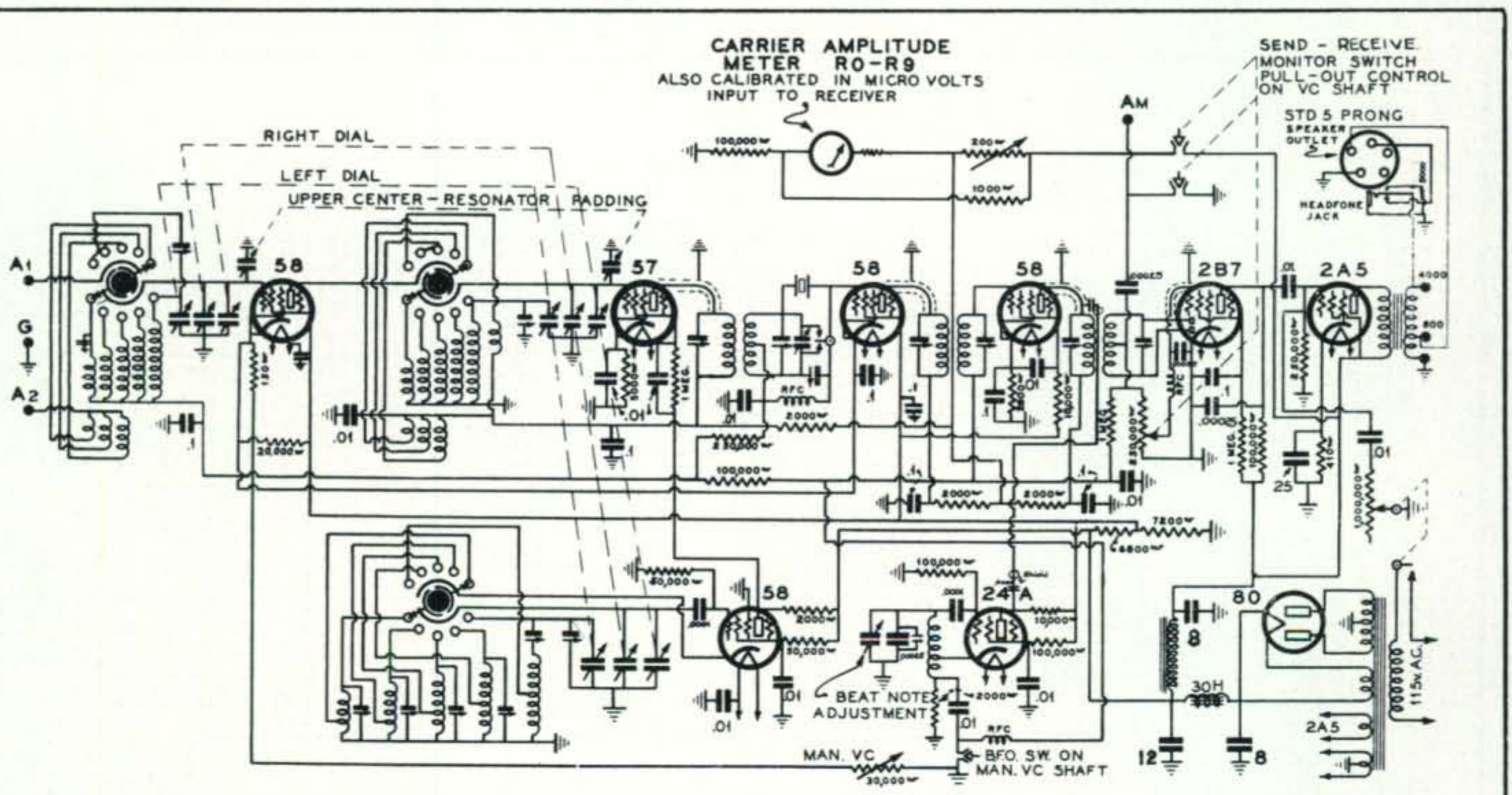

Fig. 5—Schematic of the RME-9D. This receiver incorporates the carrier amplitude meter circuit (S-meter) and phone monitor. An extra coil set covered the 10 meter range and a non-microphonic type 58 was used as the high frequency oscillator. As with other manufacturers, RME experienced hum problems when they shifted from 2.5 volt tubes to the new 6.3 volt tubes, so the RME-9D remained with the early tube types. By the time the RME-69 was developed, the tube hum problem had been partially solved by the tube manufacturers, and the new receiver employed the 6.3 volt line of tubes.

Fig. 6—The new RME factory that produced over 6,500 RME-69 receivers between 1935 and 1940.

RME advertisement for the receiver ran in the December, 1933 issue of *QST*. The company was still so poor that a photograph of the obsolete receiver had to be used in the ad for the new receiver!

To the immense relief of the company owners, the improved RME-9D was an instant success. Orders piled in and the little company had to move out of W9CI's basement into a nearby vacant store in the fall of 1934. The two engineers were now faced with the happy problem of going into mass production on a complex piece of electronic equipment (figs. 4 and 5) in order to meet the increasing demand for their brain-child.

Shalkhauser and Planck were determined to keep the quality of their product high in spite of knotty production problems. First of all, Peoria was 150 miles away from the nearest pool of trained labor (Chicago) and there were no local electronic factories where trained personnel for the young company could be recruited. RME finally had to hire young would-be radio enthusiasts from the Peoria area and teach them how to solder, wire, assemble and check out the complex receivers.

Each RME-9D was hand assembled by one man from start to finish, working from master plans and drawings. When the receiver was completed, tested and approved, the builder initialed it on the bottom of the chassis. This gave the worker personal pride in his accomplishment and the incentive to do good careful work, as the receiver went out under his name. The workers competed among themselves for the best looking receiver and worried about complaints received at the factory, since any receiver could be traced to the assembler who made and tested it! Even by today's standards, the workmanship of the RME-9D (and the RME-69) is first class!

The RME-69

After a second move into larger quarters (fig. 6), the company grew to about 30 employees and between 1935 and 1937 the RME-9D was further refined into the classic RME-69 (fig. 7). The designation stood for "six bands and nine tubes". The improved receiver had an extended range up to 30,000 kilocycles to cover the popular 10 meter band and incorporated 6.3 volt tubes. The dials and panel were restyled for improved appearance. Various modifications were made to the circuit to improve performance, particularly at 20 and 10 meters. Between 1935 and 1940, about 6500 RME-69 receivers were built, with the little company running far behind in deliveries most of the time! The news of the wonderful receiver spread quickly through hamdom and you just weren't "one of the boys" if you didn't have an RME-69 which, in effect, became a status symbol among the 20 meter DX men.

During these frantic years, the DB-20 preselector for the RME-69 was developed and proved to be an unexpected and valuable adjunct for the Navy and Coast Guard, who ordered over 5000 preselectors at the start of World War II. The preselectors were used ahead of regular military receivers to suppress receiver radiation and prevent detection by the German U-boats roaming the waters of the coast of the United States.

The War Years

In late 1940, RME began to feel the pinch of other radio manufacturers, notably Na-

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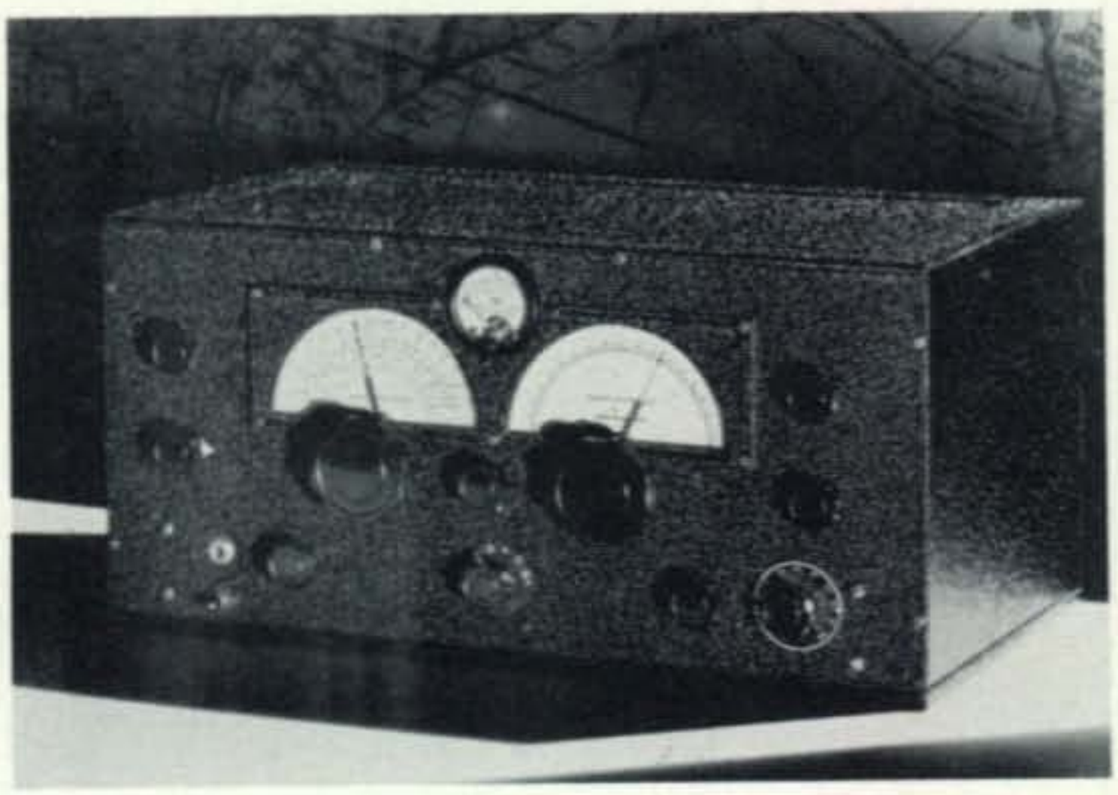

Fig. 7—The famous RME-69 receiver. The main tuning dial is at the left with the bandspread dial at the right. The DB-20 preselector was made in a matching cabinet to go with this receiver. A noise limiter could be added as an option and the receiver was also available in a silver finish.

Another Approach to Lightweight Yagi Construction

BY KEN SCHOFIELD,* W1RIL

AN average wide spaced 3 element 15 meter array, even when constructed of lightweight aluminum tubing, can be a cumbersome beast. Such an array, designed to defy ice loading and stiff winds, will usually weigh in at better than 50 pounds and present a large wind load. Several arrays of this type have been constructed by the author over the past 15 years, each with the goal in mind to reduce weight and wind load without sacrificing strength or antenna gain. The antenna described here weighs 18 pounds, has less wind load, and is stronger than its equivalent all-aluminum counterpart.

The idea for this type of element construction came about during portable 10 meter operation in Oklahoma in the early 60's. At that time 1 inch pine strips were covered with aluminum foil and sucessfully used as a 2 element 10 meter beam. As the availability of fiberglass fishing poles improved, and prices became realistic, this type of element construction became economically feasible.

In 1972 a 15 meter 3 element yagi was constructed using this technique. It has weathered New England's winter ice and winds and summer heat exceptionally well, showing no signs of deterioration.

*21 Forestdale Rd., Paxton, MA 01612.

Construction

The fiberglass poles are cut to length and covered completely with a thin coating of Pliobond glue. This is most easily done with a small paint brush. After each use keep the brush in a solution of lacquer thinner to prevent the brush from stiffening up. Remove excess thinner from the brush before each use so as not to thin out the glue. Cut a piece of aluminum foil, (permanently

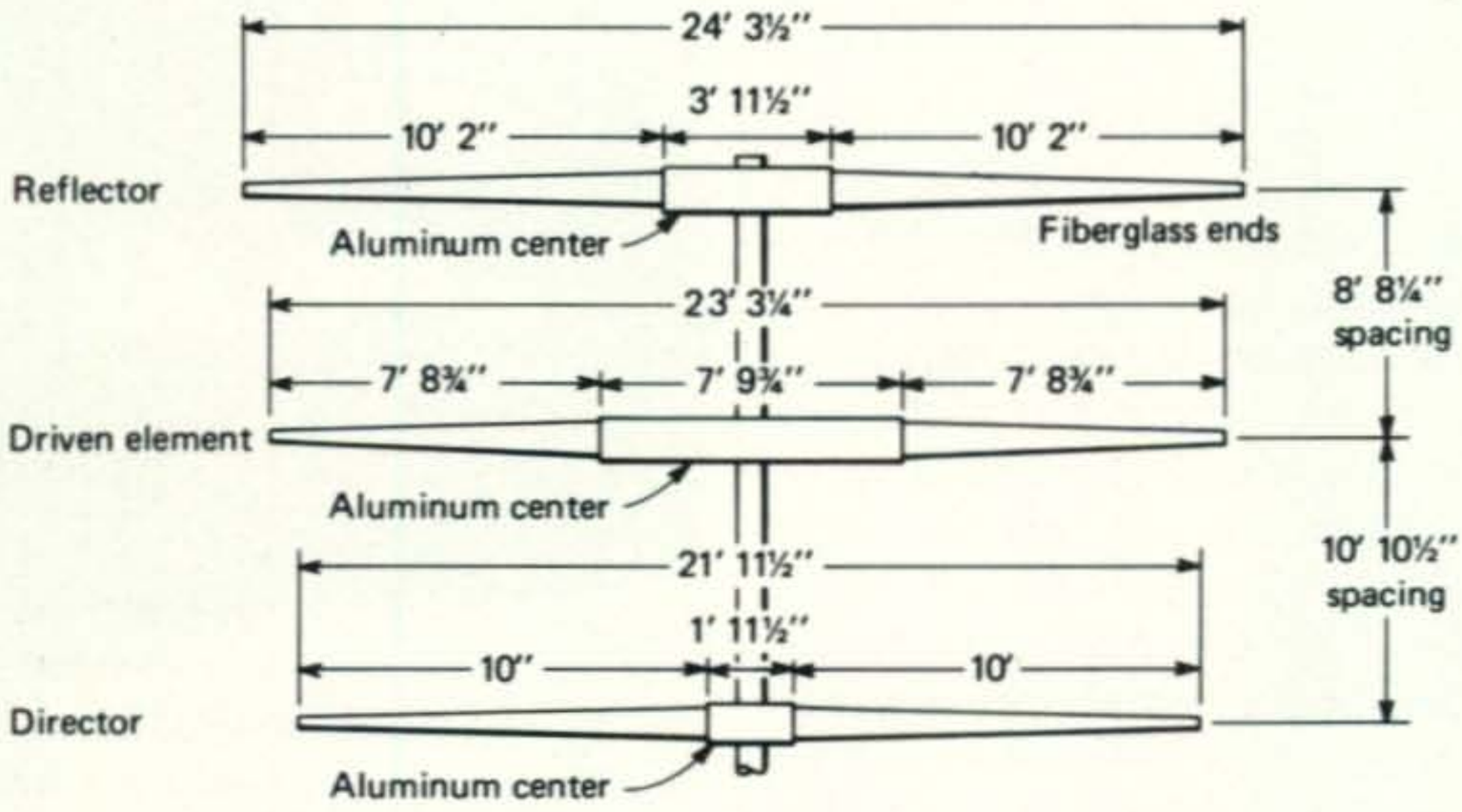

Fig. 1—Dimensions of lightweight 3-element yagi. (not to scale). Stainless steel clamps are used at all aluminum-to-aluminum and aluminum-to-fiberglass junctions.

borrowed from the XYL's kitchen supplies), the length of the pole and lay out on a flat surface. Coat the center third of the foil lengthwise with glue and allow to dry. After the glue on the pole and foil have dried, lay the pole on the foil and roll to completely cover the pole. Trim off the excess foil leaving enough for a slight overlap. At the large end of the pole push the foil hanging over the end into the tube's center cavity. At the small end trim the foil off even with the end of the pole. This end will be sealed later. The entire pole is then wrapped with a vinyl tape such as Scotch #33, #88, or Plymouth "Slipknot Grey." The latter is slightly thinner and goes on easier in this application. Start at the small end and wrap around the pole, allowing a 1/8 inch overlap

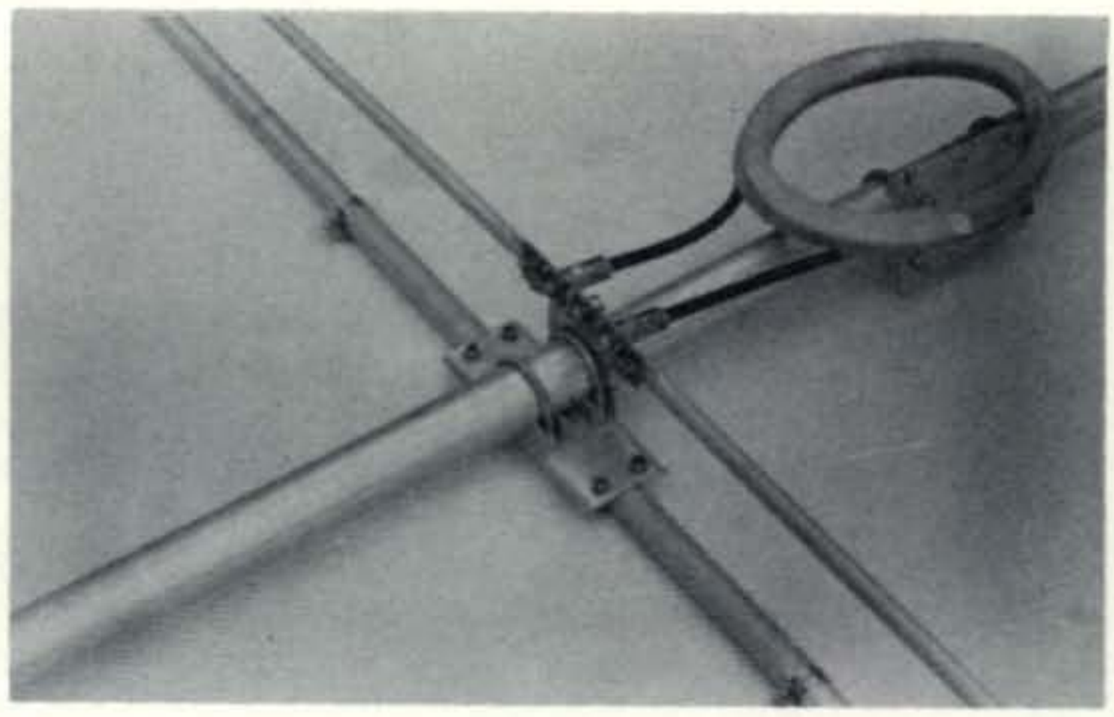

Fig. 2—Match assembly showing balun assembly connections. Antenna feedline is connected to the center Type-N connector. The length of the driven element is adjusted at the clamps shown. At the center of the coiled up balun can be seen the boom-to-mast mounting plate.

Material List

FIBERGLASS POLES: *Reflector & Director*	4 Lamiglas #01164 hollow fiberglass poles; Lamiglas, Kent, Washington. 11 ft. long—cut off at 1" OD. Insert into aluminum center section 3 inches.
Driven element	2 Lamiglas, 8 ft. long —cut off at 13/16" OD. Insert into aluminum center section 3 inches.
ELEMENT CENTERS:	3 pieces: 1⅛" OD, .058 wall, 6061-T6 aluminum tubing.
DRIVEN ELEMENT ADJUSTMENT SECTION:	2 pieces: 1" OD, .058 wall, 6061-T6 aluminum tubing.
HARDWARE:	Misc. Stainless hose clamps, U bolts, tape, etc.
BOOM:	1 20 ft. long, 2" OD, .058 wall, aluminum irrigation tubing.
MATCH:	2 3 ft. long, ⅝" OD, .035 wall, aluminum tubing. 3 Type N connectors, UG-58A/U. 2 pieces ⅛" thick, 1" × 1" fiberglass board (PC board with copper removed)

of the tape. Tape up to the point where the pole will be inserted into the center aluminum element section, indicated in fig. 1. The remaining uncovered aluminum foil is coated with No-Lox to improve conduction and prevent corrosion, and is then inserted into the aluminum center portion of the element to a distance of about 3 inches. The taping is then continued over the joint and beyond the slotted portion of the center section. The two pieces are then secured using a stainless steel hose clamp placed over the taped joint and securely tightened. The other half of the element inserts into the opposite end of the aluminum center section thus completing the element. Fig. 1 shows the dimensions of the complete array.

The matching section consists of a T match and 1/2 wavelength coaxial balun. The T is constructed of 3 feet of 5/8" OD aluminum on each side of the boom, spaced 3 inches from the driven element. Capacitors are not used to tune out the inductive reactance introduced by the match. The driven element is adjusted to the capacitive side (slightly short) to cancel the inductive reactance as seen at the T input. This system has been used by Telrex for many years and is much more reliable then trying to maintain weather-proofing of variable capacitors in the matching section. The center of the matching section consists of an L-shaped bracket which mounts to the boom as close as possible to the driven element. Three type N female chassis connectors are mounted on the bracket and pieces of 1/8 inch thick fiberglass insulation board are mounted on each end. The ends of the T

match bars are flattened and bolted to the fiberglass boards, one on each side. Jumpers are soldered between the connectors and T bar mounting bolts. Type N connectors were used in lieu of the more common UHF type to eliminate the entrance of water into the feedline and coaxial balun. The feedline connects to the center N connector and the balun across the outside connectors. See figs. 2 and 3.

To further lighten the array only the U bolts of the muffler clamps are used to mount the element plates to the boom. New half circle clamps were cut from aluminum channel stock to replace the steel ones. U bolts are used to mount the elements to the plates.

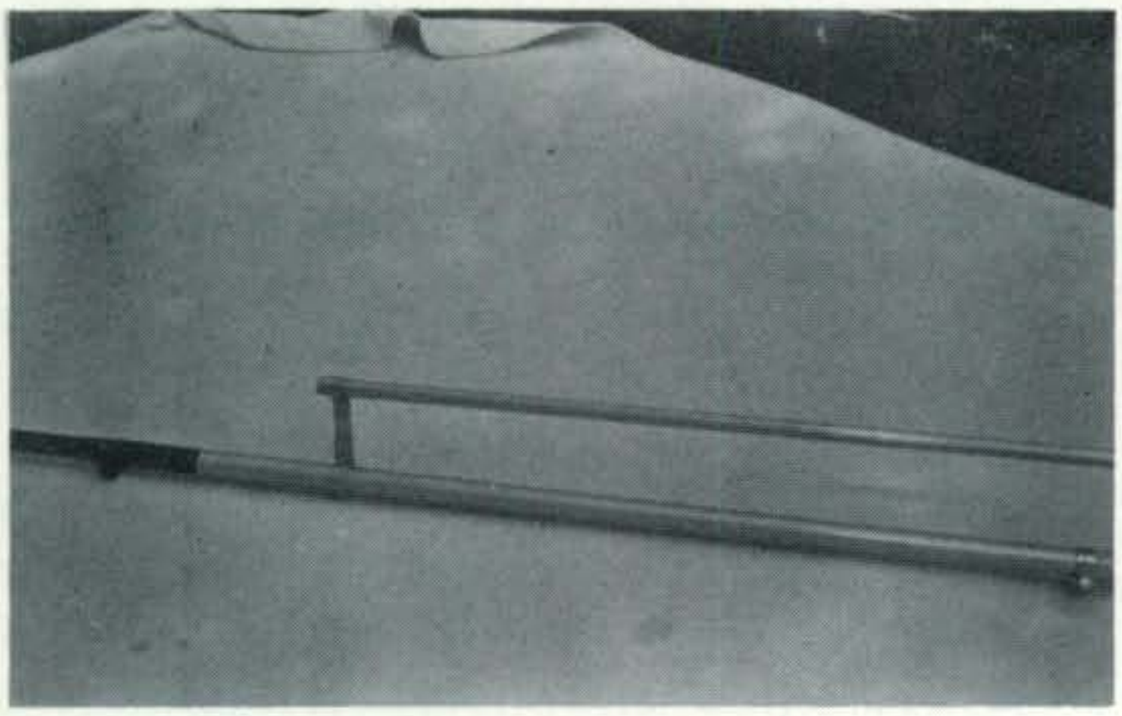

Fig. 3—One side of the T-match showing transformation from aluminum to fiberglass, and T-match shorting bar.

After the array is completely assembled the tip of each fiberglass aluminum clad element is sealed using a silicone rubber sealant. The entire array except the adjustable sections and T match is sprayed with flat black Krylon paint. This seals the tape seams to protect against weathering and provides a heat absorbing surface to help the array shed ice in the winter months. This would not be necessary in southern lattitudes.

Tuning, if necessary, is done on the center aluminum section of the driven element and corresponding corrections made on the director and reflector lengths at the fiberglass/aluminum center junctions. Tuning should not be necessary if the array is at least 45 to 50 feet in height and reasonably in the clear.

Conclusion

The antenna works equally as well as an all aluminum one of the same design dimen-

[*Continued on page 72*]

Determining Resonant Lengths of Transmission Lines

BY KEN GLANZER,* K7GCO

HAVING designed and experimented with hundreds of various antenna systems over the years, both in ham radio and in business, I am often asked what is the most important factor or technique that one should take into account when putting up an antenna system.

If I had to narrow it down to the most important item, the one most likely to be overlooked and yet one of the most important factors affecting the antenna system, I should have to say, the ham's ability to measure and adjust the electrical length of his transmission or feedline, using a grid dip meter and taking into account the feedline velocity factor. We'll get to the velocity factor business in a minute.

Working with lines that are electrical half-wave multiples—and often quarter-waves—helps eliminate many feed problems: for one, with a half-wave multiple, your s.w.r. taken at the transmitter end will be accurate; for another, you can measure the impedance of the antenna with an Antennascope connected at the end of the feedline. Without the half-wave multiple, you would have to measure the impedance right at the physical feedpoint to the antenna. With the half-wave multiple feedline, I am measuring at the "electrical" feed point —exactly where the measurement should be taken. With an s.w.r. meter installed at the transmitter end, you can *believe* what the meter reads. When your line is a true electrical half-wave multiple, you'll find making measurements and adjustments a good deal easier and convenient—and your results to be far more reliable.

How do we determine and adjust for this electrical half-wave multiple? What do we need in test gear? I'll answer these questions and others based upon my own experiences in this field.

*202 S. 124th Street, Seattle, Wash. 98168.

Basic Equipment

You will need a grid dip meter, a steel tape, and perhaps a slide rule or a calculator. For more precise measurements you will need a receiver with some way of checking its exact frequency (such as a BC-221 frequency meter) and, for convenience, some removable "short-shorts," which will be described later.

The formula for a *quarter* wave of feedline is:

$$Feet = \frac{246\ (Velocity\ Factor)\ (N)}{Freq.\ (\text{mHz})}$$

and for a *half wave* of feedline is:

$$Feet = \frac{492\ (Velocity\ Factor)\ (N)}{Freq.\ (\text{mHz})}$$

where (N) = Number of quarter or half waves. Any even number of quarter waves divided by 2 becomes that number of half waves. (We'll show you how to work with this formula in a minute.)

You may have forgotten what the term Velocity Factor means. It's the *ratio* of the actual velocity of the current along a line to the velocity of the current in free space. And although we often think of current traveling through a wire at the speed of light, it is actually traveling somewhat less than this speed because the electromagnetic field generated by the current travels slower in the feedline's dielectric than it does in free space. When we speak of half-waves and quarter waves, we're speaking of electrical half-waves and quarter waves, and not their mechanical tape-measure lengths. The difference between the velocity of the current in free space versus that in a certain type of line

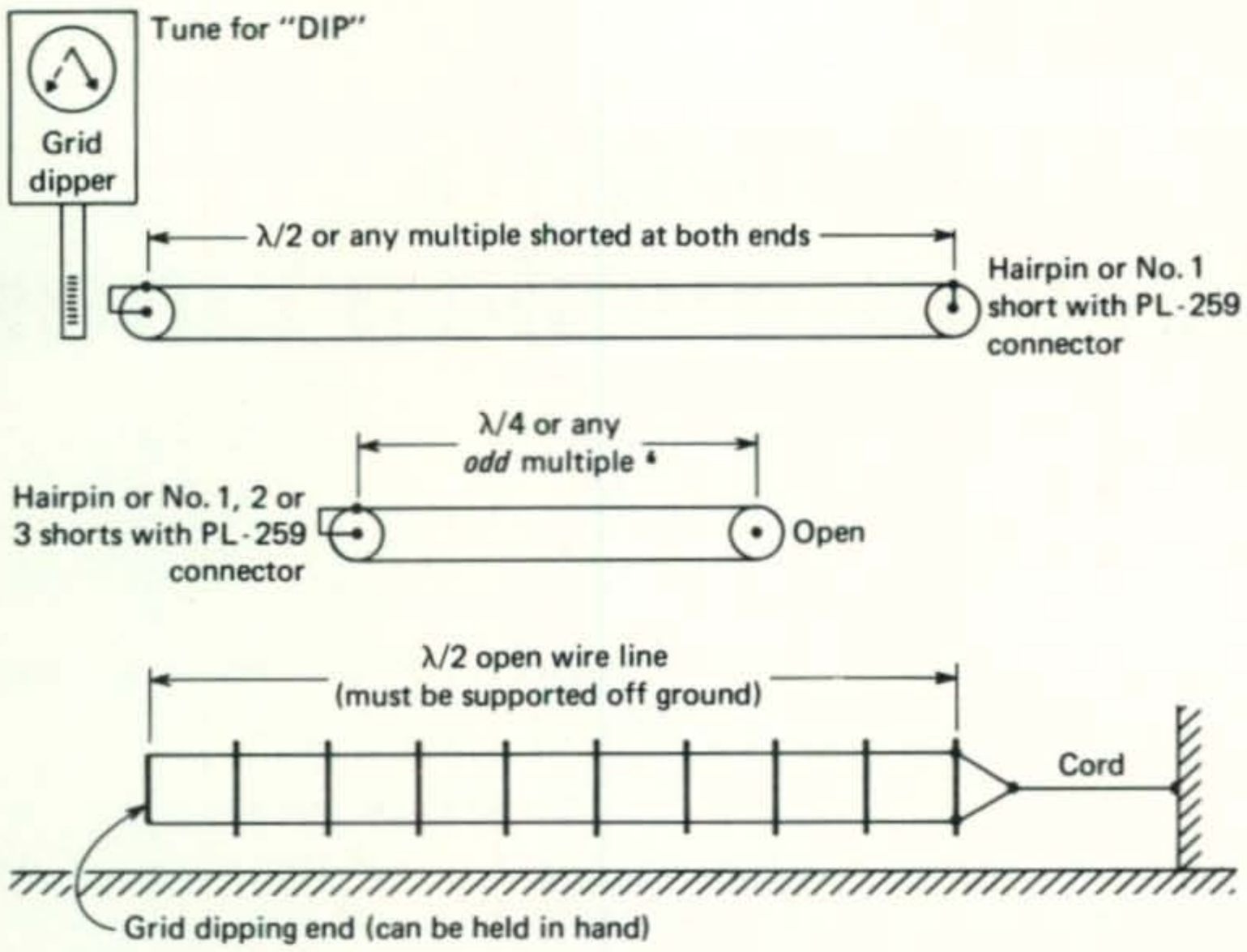

Fig. 1—Basic test set-up for grid dipping coax and open wire line. Keep the open wire line off the ground. Coax cable can be coiled up with no affect on resonant frequency.

is taken in account in the fomula by the Velocity Factor. As you might expect, different types of lines (coax, twin-lead, etc.) will exhibit different Velocity Factors. For open wire line it's 0.98; for 300 ohm ribbon it's 0.86; for foam coax, 0.75 to 0.83; for solid dielectric coax, 0.66. (For more about this, refer to *The Radio Amateur's Handbook*.)

Whenever I'm about to install or check out an antenna system, either on the job or at home, I make it a point to check out the line for its velocity factor, because I've found

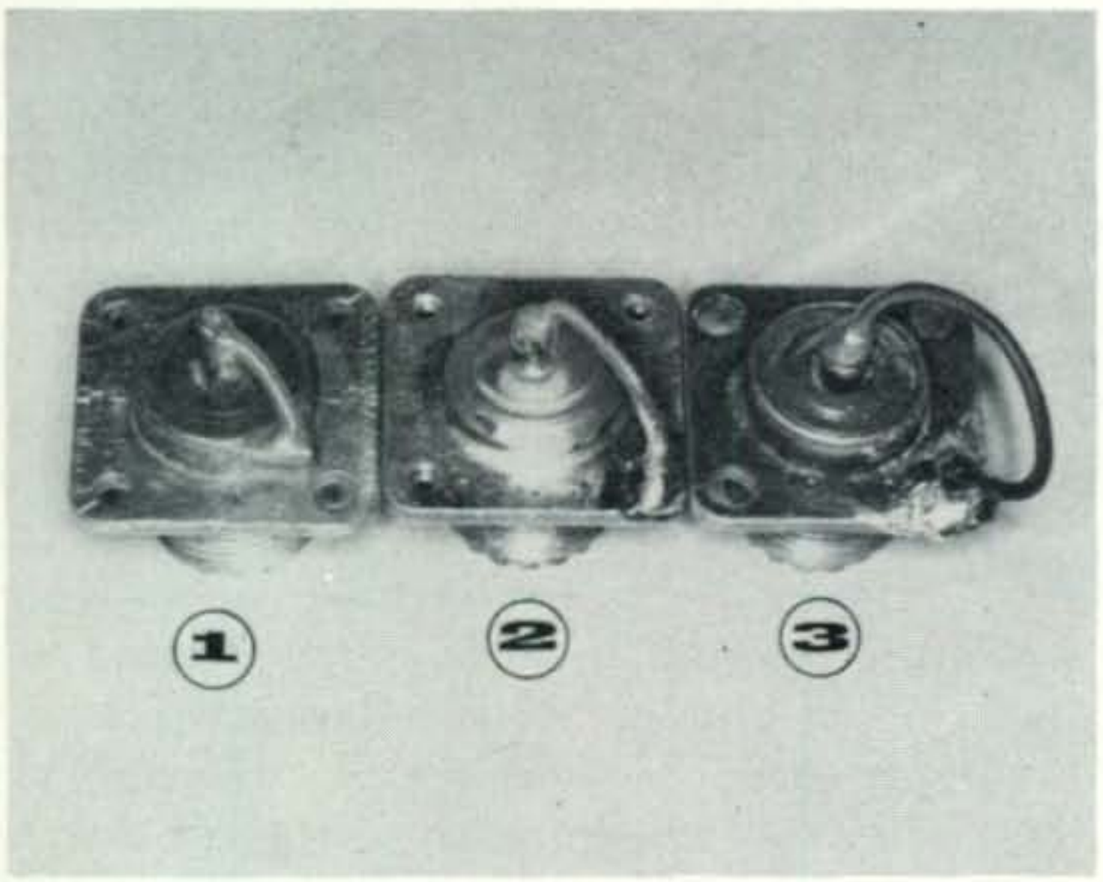

Fig. 2—Glanzer "Short Shorts" for grid dipping coax cables. The shorts shown are intended to thread onto PL-259 connectors. Type #1 is for use from 20 mHz and up; #2 is for 7 to 20 mHz; #3 is for 1.8 to 7 mHz. Use the shortest Short Short that will give a perceptible dip on a grid dip meter.

significant variations among supposedly identical types of lines.

In the past I would grid dip a line of solid dielectric coax and then cut a second line of the same length, never bothering to check the second piece. The solid dielectric was *supposed* to be constant. Then on a certain antenna that required two equal-length foam coax feedlines I did this and later discovered that the two feedlines were not the same *electrical* length. I had to cut 3 feet from one feedline. Since it was used on 10 meters, that length represented about 60° or λ/6 of feedline. I then checked out 8 pairs of coax cut from the *same* roll and in every case one had to be about 3 feet longer. When the velocity factor varies—so does the impedance! This kind of problem does not exist with good quality solid coax (and with a few of the foam coaxes). But had I not checked the velocity factor by grid dipping, I would never have found the antenna trouble and probably would have discarded the antenna design.

Basic Test Set Up

For checking half wave or half wave multiples, short out the opposite end and the end to be grid dipped. However the "short" that is grid dipped will have to be just long enough so that enough coupling to the grid dip coil is obtained to dip the meter at resonance. At 14 mHz (and higher, usually) just a direct connection between the shield and center conductor will be enough. Insert a small "hair

pin" (as illustrated in fig. 3) in the end of the coax to provide a loop-short for grid dipping. In overall length, this short adds a very small percentage to the resonant frequency and may therefore be neglected. But if the short is made into a loop, a very prononuced dip will be observed on the grid dip meter, but the reading will be lower in frequency. Further, the calibration of the meter is affected as it "pulls" the oscillator frequency. With a shallow dip that would be obtained with a Glanzer "short-short," this also has the least affect on the calibration accuracy.

Grid dip a quarter wave or any odd multiple of a quarter wave at the shorted end in the same way, but leave the opposite end open. This setup is illustrated in fig. 1. This arrangement simplifies the procedure, as you have only to snip off small increments of coax to bring it into resonance when it is too long.

Basic Procedure

In normal circumstances, you will be checking either the velocity factor of a certain feedline, in which case you are also determining its resonant frequency, or you will be cutting a feedline to a half or quarter-wave multiple for a certain frequency. In the first case, estimate the "approximate" velocity factor and work out the formula to see what frequency this feedline is relative to, a half wave or a multiple of a half wave.

For example, suppose you have a "foam" coax line that is 100 feet long. What frequency should be used to check its velocity factor? Using the higher velocity factor of 0.83 quoted earlier, use this value in the formula and calculate the frequency at which it is a half wave. The formula for this is

$$Freq. = \frac{492(Velocity\ Factor)}{Feet} = \frac{492 \times .83}{100}$$

$= 4.083$ mHz.

The length measurement should be made with a steel tape. If the velocity factor had been 0.75, the frequency would be 3.690 mHz. So it will lie between these two frequency limits. If the coax under test doesn't have PL-259 connectors on each end, attach at least one and connect the grid dipping "short-short" and, in this case, use the one with the complete loop (#3) and short out the other end of the coax. If it already has a PL-259 on the other end, attach the other SO-239 with the shortest short (#1). Slip the grid dipper coil in the loop and raise the grid dipper frequency from about 3.5 mHz to 4.1

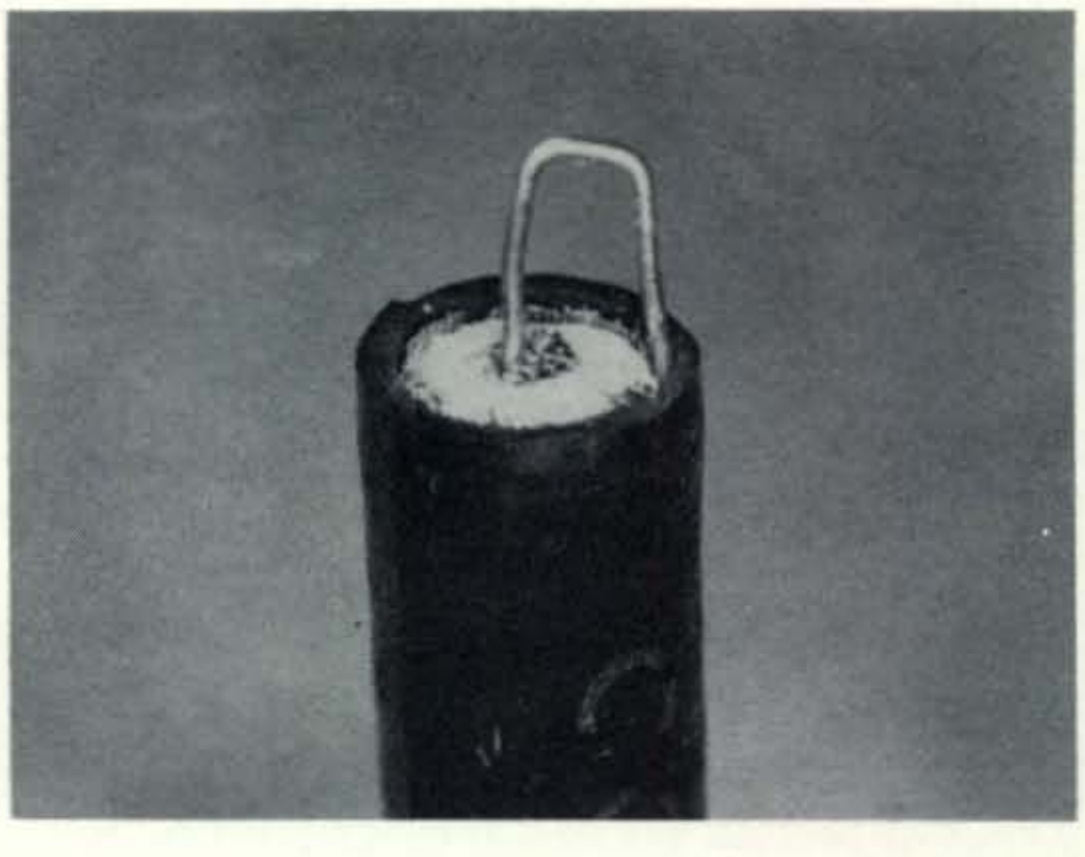

Fig. 3—Hairpin type of short on open end of coax. Make it as short as possible while still giving a perceptible dip.

mHz. Somewhere between these limits you will get a pronounced dip.

Next, move the coil out of the loop and repeat the process until you get a shallow dip. Then tune the receiver until the grid dipper signal is heard and measure this frequency. Let's assume it is 3.9 mHz. We now know the resonant frequency of the feedline for a half wave of line. The next step—determine its velocity factor. Entering the just-determined resonant frequency into the formula, solve for the velocity factor:

$$Velocity\ factor = \frac{(Feet)\ (Freq.)}{492} = \frac{100 \times 3.9}{492}$$

$= .792$

It is desirable to have the coax held in a vise (fig. 4), and the grid dipper positioned

[*Continued on page 71*]

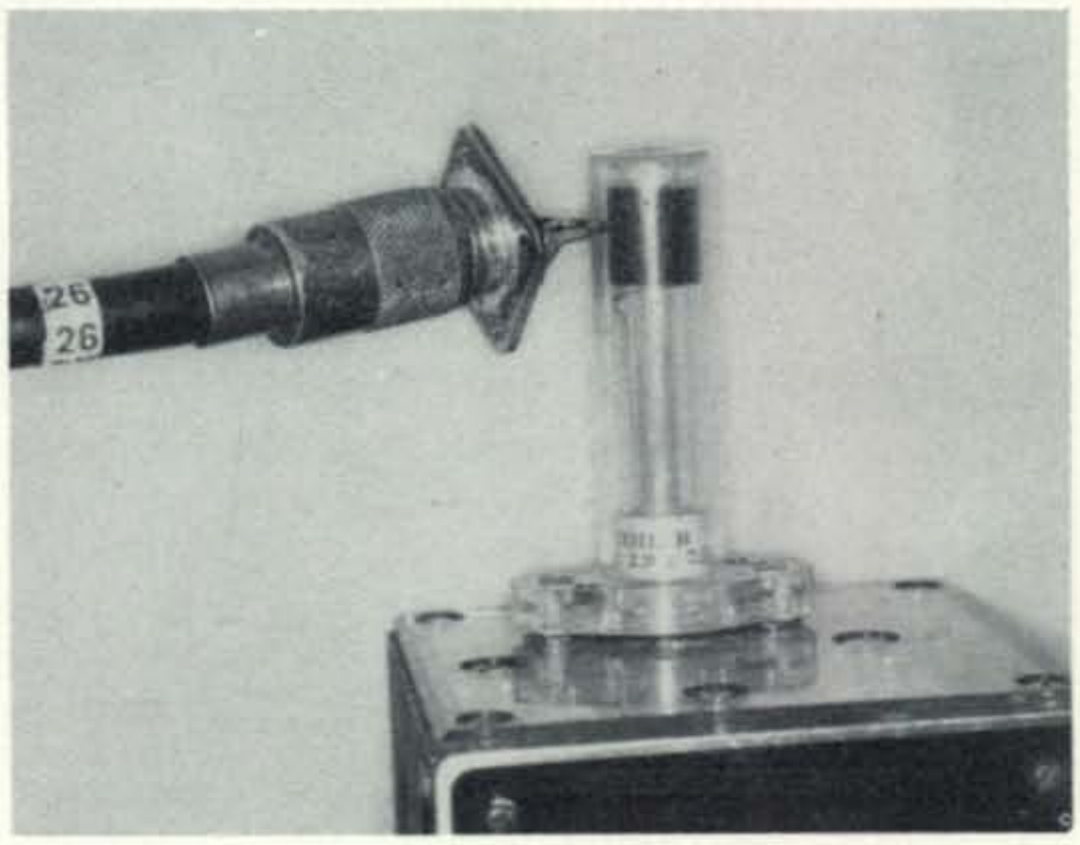

Fig. 4—Method of holding grid dipper near shorted end of coax. It helps to have one end of coax in a vise at the right height. Number strip on coax may be used in conjunction with a coax data sheet.

Silver Anniversary 25th Annual Armed Forces Day Communications Tests

ARMED Forces Day, observed annually on the third Saturday in May, takes on special significance this year. Saturday, May, 18, 1974, will mark the occasion's twenty-fifth anniversary. Military radio stations and amateur radio stations conducting their usual communication tests will be celebrating a quarter century of cooperation and mutual high regard between the U.S. amateur radio community and the U.S. Army, Navy and Air Force.

As in the past, the Silver Anniversary military-to-amateur tests will include crossband operations using c.w., s.s.b. and RTTY as well as c.w. and RTTY receiving tests.

QSL cards commemorating the 25th Anniversary Armed Forces Day Tests will be forwarded to amateurs establishing two-way contact with participating military stations confirming crossband communications. Certificates will be awarded to those who display their operating ability and technical skill by receiving and acceptably copying a message from the Secretary of Defense. His message will be transmitted in both c.w. and RTTY during the receiving part of the tests.

Interception by s.w.l.s does not qualify for a QSL card. However, anyone with the necessary equipment and ability may copy the Secretary of Defense messages and become eligible for a certificate.

Additionally, in special observance of this twenty-fifth annual event, a separate 25th anniversary certificate will be awarded to any participants who can show proof that they have taken part in all 25 of the annual tests.

Military-To-Crossband Tests

The military-to-amateur crossband operations will be conducted from May 18, at 1300 GMT to May 19, at 0245 GMT. The military stations WAR, NSS, NPG, N0NNN, and AIR will transmit on military frequencies and listen for amateur stations transmitting in the portions of the amateur bands indicated below. The operators at the military stations will specify that portion of the amateur sub-band they are tuning.

Station	Military Frequency kHz unless otherwise noted)	Emission	Appropriate Amateur Band (mHz)
WAR (Army Radio Washington, DC)	4001.5	c.w.	3.5-3.65
	4020	l.s.b.	3.775-4.0
	4030	RTTY	3.65-3.775
	6997.5	c.w.	7.0-7.15
	14405	c.w.	14.0-14.2
	20994	u.s.b.	21.25-21.45
NSS (Naval Communication Station, Washington, DC)	3385	c.w.	3.5-3.65
	4012.5	RTTY	3.65-3.775
	4040	l.s.b.	3.775-4.0
	6970	l.s.b.	7.15-7.3
	7301	c.w.	7.07.05
	7380	RTTY	7.1-7.15
	7385	c.w.	7.05-7.1
	13827.5	RTTY	14.1-14.2
	14385	u.s.b.	14.2-14.35
	14400	c.w.	14.0-14.1
NPG (Naval Communication Station San Francisco, CA)	4001.5	l.s.b.	3.775-4.0
	4005	c.w.	3.5-3.65
	4010	c.w.	3.65-3.75
	6989	c.w.	7.0-7.075
	7301.5	l.s.b.	7.15-7.3
	7347.5	RTTY	7.0-7.1
	7365	c.w.	7.075-7.150
	13922.5	RTTY	14.0-14.15
	14356	u.s.b.	14.2-14.275
	14375	c.w.	14.0-14.1
	14389	u.s.b.	14.275-14.35
	20983	c.w.	21.0-21.2
	20998.5	u.s.b.	21.27-21.4
	*49.995 mHz	a.m./u.s.b./c.w.	50.0-51.0
	*143.995 mHz	a.m./u.s.b./c.w.	144.0-146.0
	†148.41 mHz	a.m./RTTY	145.0-146.0
	†148.95 mHz	f.m.	146.0-148.0
	*222.0 mHz	a.m./u.s.b./c.w.	221.0-222.5
NONNN (Naval Academy Annapolis, Md)	4045	l.s.b.	3.775-4.0
	7385	l.s.b.	7.15-7.3
	13975.5	u.s.b.	14.2-14.35
AIR (Air Force Radio Washington, DC)	4025	l.s.b.	3.775-4.0
	7315	c.w.	7.15-7.3
	7315	c.w.	7.0-7.15
	13997.5	c.w.	14.0-14.2
	14397	u.s.b.	14.2-14.35

*To be operated from Mt. Vaca
†To be operated from Mt. Diablo

C.W. Receiving Test

The c.w. receiving test will be conducted at 25 words per minute for any person capable of copying International Morse Code. The c.w. broadcast will be a special Armed Forces Day message from the Secretary of Defense to all participants. The transmission will begin on May 19, at 0300 GMT with a ten minute CQ call for tuning purposes with the message commencing precisely on May 19, at 0310 GMT as follows:

Transmitting Station	Frequencies (kHz unless otherwise indicated)
WAR—Army	4030, 6997.5, 14405
NSS—Navy	4012.5, 7385, 14385
NPG—Navy	4005, 6989, 14375, 49.995 mHz 143.995 mHz
AIR—Air Force	7315, 13997.5

RTTY Receiving Test

The RTTY receiving test will be transmitted at 60 words per minute, beginning on May 19, at 0335 GMT with a ten minute CQ call for tuning purposes followed by a special Armed Forces Day message from the Secretary of Defense at 0345 GMT. This test is to test the technical skill

[*Continued on page 71*]

COP'S COLUMN

BY COPTHORNE MACDONALD,* WØORX

THOSE of you who have been following this column over the past year or so have seen a gradual broadening of the range of topics covered. While SSTV remains the major technical focus, we have recently explored some basic transistor design techniques that are useful in *many* areas of amateur radio. On the non-technical side, we've talked about the New Directions Roundtable and other steps toward more meaningful interpersonal communication via amateur radio. There are a lot of exciting things on the horizon in all those areas. There is also a real need to explore the possible futures that exist for amateur radio itself. The new column heading is a recognition of this wider scope of interest and involvement. We hope that many amateurs who have in the past flipped the page because they have no inclination toward SSTV, will pause for a moment and perhaps discover something of interest.

"New Directions" Activities

Some of those interested in the New Directions Roundtable discussions on matters of importance to our planet and its inhabitants have started additional on-the-air activities. One of these is a West Coast section of the Roundtable that meets Tuesday, Thursday, and Sunday evenings at 8 P.M. PDT on 3898. Randy Brink, WA7BKR, and Bob Hickerson, WA6RRR share the facilitator role.

Another activity is a net devoted primarily to discussing alternative sources of energy. (Alternatives to fossil fuels and nuclear power such as: wind, solar, tide, wave, and geothermal energy as well as energy from organic wastes.) This ASE Net meets on 3905 (±) at 11 P.M. EDT at this writing, but may move as the QRN level builds up in late Spring and Summer. If you're interested, but don't hear anything, drop me a note.

General Class frequencies were picked because a home in the Advanced portion of the band excludes many who would like to participate. It is still possible to QSY into the Advanced frequencies to transmit pictures, and this seems the lesser of the two evils. Incidentally, I do have on tape an SSTV illustrated talk about solar heated houses, wind generators, methane generation from manure, and related topics by Don Marier, Editor of *Alternative Sources of Energy* magazine. I hope to share it on-the-air with many slow-scanners in the coming months. (A subscription to Don's magazine is $5.00 for 6 issues and well worth it if you are into the energy thing. His address is Rt. 2 Box 90A, Milaca, MN 56353).

Simultaneous Voice And SSTV

The communication effectiveness of SSTV is certainly enhanced if the pictures can be viewed at the same time they are being discussed verbally. There are at least three different approaches to accomplishing this:

1. Independent Sideband (i.s.b.) transmission where voice is transmitted in one sideband and SSTV is transmitted at the same time in the other.

2. Single channel multiplexing where the voice is squeezed into that portion of a single voice channel lying between 300 and 1000 Hz.

3. Image storage techniques at the receiving end (frame snatching) where a single transmitted SSTV frame is stored and viewed continuously

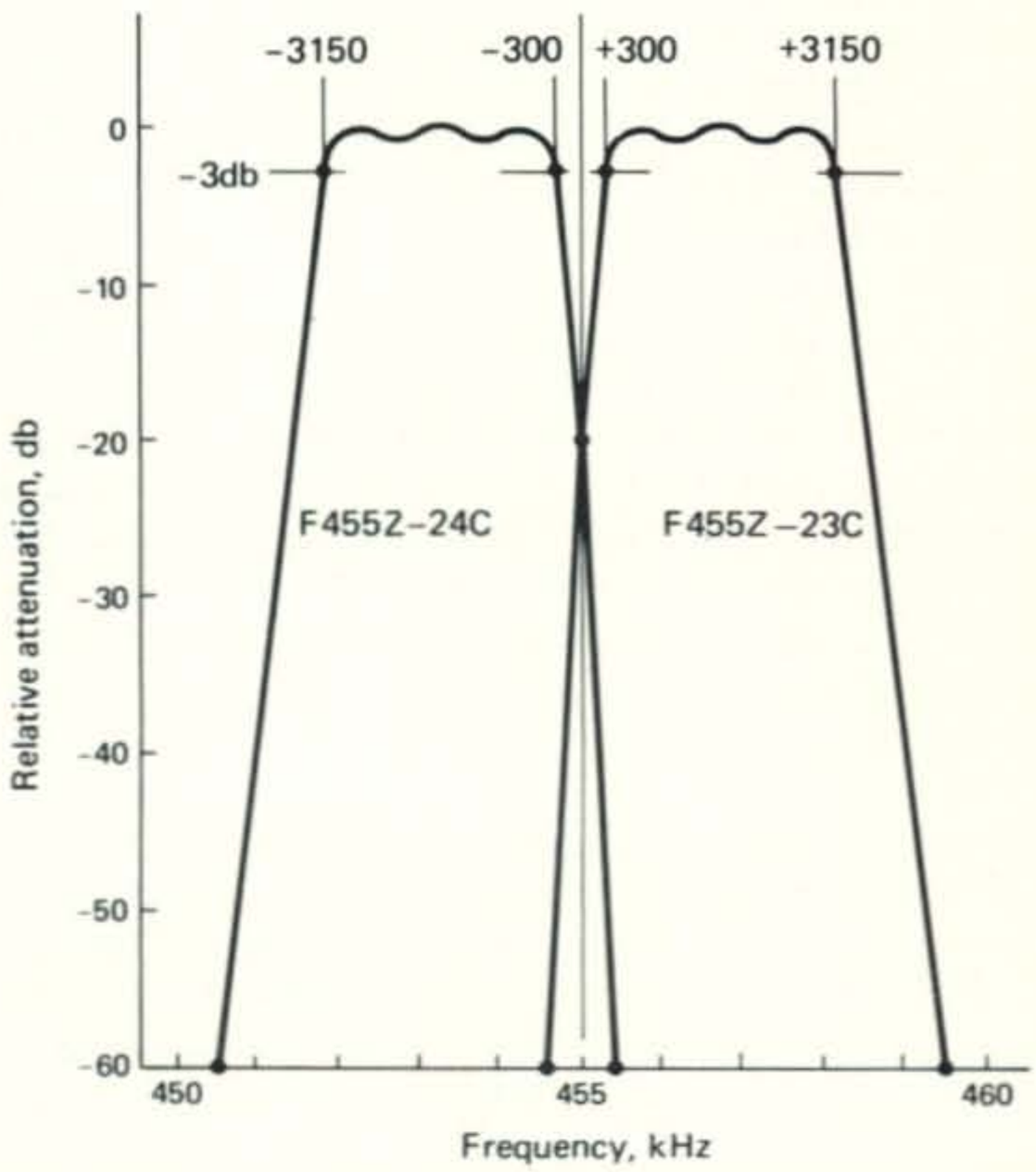

Fig. 1—Passband characteristics of the new Collins ISB mechanical filters.

*P.O. Box 483, Rochester, Minn. 55901.

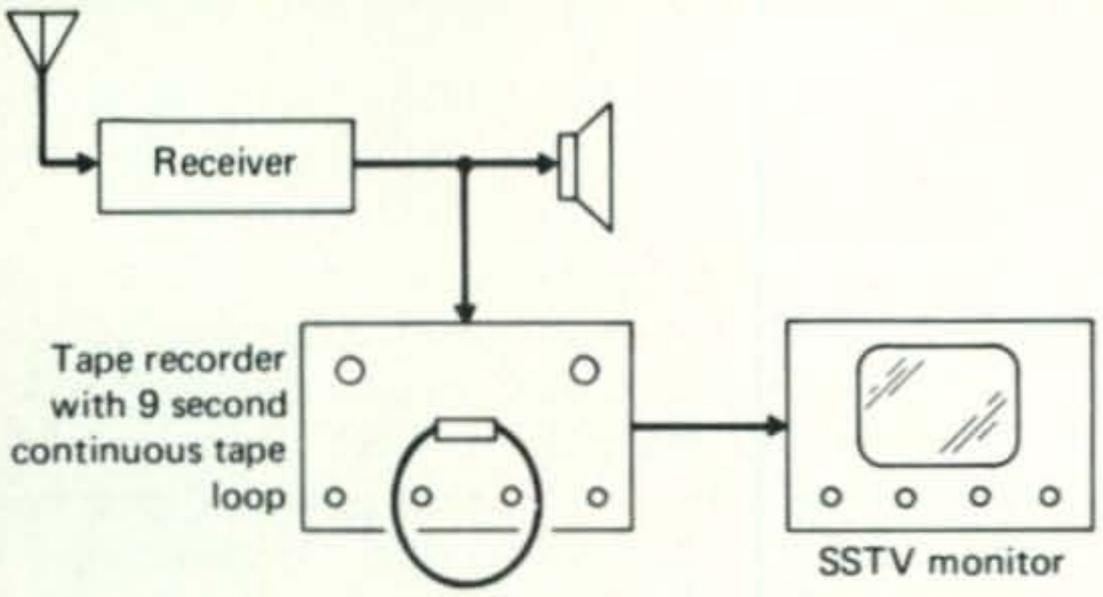

Fig. 2—When the recorder output monitors the input signal on RECORD, this simple frame-snatching scheme is possible.

. . . the sending station switching to voice commentary about the picture as soon as the one frame is transmitted.

In a recent letter from Don McNamara, W6-JNS, he said, "Independent sideband, where both audio and SSTV are employed at the same time is probably the most exciting advance in amateur radio in 25 years. Is there any prospect for any manufactured gear in the offing? . . . It is safe to say that an awful lot of amateurs might be interested in your reply."

I wholeheartedly agree, but haven't heard any rumors that this might happen soon. It is characteristic of the electronics industry that information on products under development is a closely guarded secret until the product is ready for general sale. Thus, if a manufacturer did have plans to come out with amateur i.s.b. equipment, I would probably not be in on the secret any sooner than anyone else. Writing letters to manufacturers expressing interest in such a product might help to get something moving.

In the meantime, we can continue to encourage those who have converted existing gear for i.s.b. operation to write articles describing their conversions. Perhaps, too, one of the smaller amateur-oriented companies might be induced to put an i.s.b. adapter unit on the market.

In the April '73 column in which I described my own i.s.b. setup, I mentioned that the filters I had used were a bit wide in bandwidth for amateur use, and wondered if there were others better suited to our purposes. Through some communications with Collins I discovered that there *are* more suitable filters. Fig. 1 shows the worst case attenuation curves of the Collins 455Z-23C and 455Z-24C upper and lower sideband filters. The slow-scan signal falls near the center of the passband of these filters, insuring that all subcarrier frequencies will be transmitted at about the same amplitude. This also minimizes delay distortion which can cause "ringing" effects (multiple vertical edges) when the white subcarrier frequency is on the attenuation slope of the sideband filter. The filters are rather expensive (about $61 each), but have very steep cutoff slopes, a 60 db/3 db shape factor of 1.72 maximum (1.32 nominal!), and appear to be the best 455 kHz i.s.b. filters on the market.

For those with very limited funds, I'd like to mention that Collins usually has an excess stock of certain filter types, and these filters are sold for only $15 each. If you are interested, I suggest that you request a copy of their *Excessive Stock List* as well as the *Mechanical Filter Catalog* so that you can match up part numbers on the stock list with filter characteristics. Of particular interest is a whole series of filters originally intended for telephone multiplex applications. They were designed as 3.1 kHz wide l.s.b. filters. The carrier frequencies for these filters are spaced at 4 kHz intervals throughout the 64 to 108 kHz range. It looks as though the filters for any two adjacent channels would make a satisfactory pair for i.s.b. use. Requests for literature and orders for filters should be addressed to: Components Marketing, Collins Radio Company, Newport Beach, California 92663.

While the i.s.b. approach is an ideal approach under good band conditions, it does have certain drawbacks. At this low period of the sunspot cycle the great majority of h.f.-operating amateurs are jammed into only three bands: 75, 40 and 20. It is hard enough to find one 3 kHz wide slot free of QRM, let alone two slots adjacent to each other. The second drawback is that the transmitter power must be split between the two sidebands, resulting in lower transmitted power in each individual sideband. The actual reduction is somewhat adjustable and could amount to 3 db in each sideband, or more than that in one and less in the other.

Single Channel Multiplexing

Since it is only necessary to pass the frequencies between 1.0 and 2.5 kHz to get satisfactory SSTV transmission, voice and SSTV could be transmitted over the same channel if a way could be found to squeeze a voice signal into the 300 Hz to 1 kHz region of the audio passband. The direct approach is simply to pass the lower audio frequencies, and to separate the audio from video with low pass and high pass filters. This approach, and the filters required to use it, are described in Don Miller and Ralph Taggart's *Slow-Scan Television Handbook*. The major problem is that the audio is somewhat difficult to understand because there are no "highs" in the voice.

There is work under way in a number of industrial labs to reduce speech bandwidth without appreciable loss of quality. There are possibilities of fallout that could be useful to us, as well as the possibility that we amateurs could once again make a contribution to the art. How about it?

Frame Snatching

Most of the advantages of simultaneous voice/vision transmission can be obtained without actually transmitting the two simultaneously. A

single slow-scan frame contains all the information necessary to reproduce that particular picture. In theory then, it would take only an 8 second video interruption in a voice transmission to get a new picture to the receiving station. What is needed at the receiving end is some means to store, and repetitively view, that single frame. As Robert Suding, WØLMD, pointed out in a recent letter, the new solid-state slow-to-fast scan-converters that he and others are working on are ideally suited for this mode of transmission. (These converters store a single frame of video information in the form of digital bits in a shift register memory, and read out the stored information indefinitely as a fast-scan picture on a standard TV set.) In the years to come, when this type of scan-converter becomes more widely available, the technique will no doubt be automated so that the push of a button at the transmitter location will "change the picture" at the receiving location during the following 8 seconds.

The "frame snatching" technique can also be used today with P7 monitors, through use of a tape recorder. The trick here is using a continuous loop of tape slightly more than one slow-scan frame in length. When a slow-scan transmission is expected, the tape recorder is put in the RECORD mode and started. (Both the recorder and SSTV monitor are connected to the receiver output.) If only a single frame is being sent, the recorder is stopped just at the end of the frame. If a series of frames is being sent, the recorder is stopped at the end of any frame which is reasonably free of QRM. If the recorder is then started in the PLAY mode and feeds the slow-scan monitor, that particular frame will appear on the monitor screen as long as the tape is running . . . and the channel is freed for voice transmission.

If you are currently using a cassette recorder to record slow-scan signals off the air, the simplest way to equip for this mode is to purchase a Type F1 "Frame Grabber" cassette from Venus Scientific Inc. 399 Smith Street, Farmingdale, N.Y. 11735 for $3.75. This cassette contains a continuous loop about 9 seconds long, and is designed especially for continuous loop operation. Has anyone successfully rolled-his-own continuous loop cassettes?

If your recorder is the reel-to-reel type you'll have to splice up your own loops and figure a a tape routing around your own particular machine that keeps the loop moving freely. For a 9 second loop the length will be 33¾ inches at 3¾ i.p.s. speed and 67½ inches at 7½ i.p.s. (The 9 second figure is not sacred, but it should be at least the 8.53 seconds required for a 128 line picture plus the length of time it takes the tape to travel from the erase head to the record/playback head.) Take care to make a good diagonal splice so that there won't be a "dropout" at the splice point.

Fig. 2 indicates the best setup if your recorder output jack allows you to monitor what is being

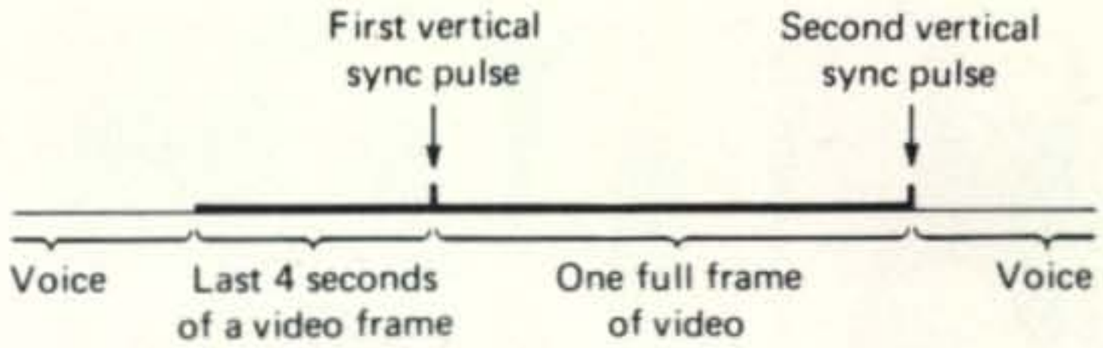

Fig. 3—1½ frame transmission using this format permit the receiving operator to perform the frame-snatching operation manually.

recorded. (Many recorders give a MONITOR output at the earphone or speaker output jack during RECORD.) The advantage of this scheme is that the SSTV monitor never needs to be switched electrically. The recorder feeds the amplified receiver output signal to the monitor during RECORD, and the recorded tape loop signal to the monitor on PLAYBACK. If your recorder is used for SSTV purposes only, you might want to modify the machine to defeat the mechanical interlock that forces you to stop the machine in order to switch to RECORD. If this is done, it should then be possible to leave the machine mechanism running continuously, and simply hold the RECORD button down while snatching a frame.

Fig. 3 shows one possible format for transmitting single frames. It should work well with the manual type operation of the recorder that we have been talking about. The first four seconds of slow-scan serve primarily as a warning to the receiving operator to switch the tape machine to the RECORD mode. The second vertical sync pulse is there primarily to save the day if the machine is switched out of RECORD slightly after, rather than slightly before, the end of the frame. I should mention that on the recorded loop there is always a blank space equal to the distance between the erase and record heads. This results in a band of "nothing" or noise on the screen. This band will be at the bottom of the picture if the machine goes out of RECORD just *before* the second vertical sync pulse, and at the top if just *after*. Bottom is the preferable location.

If you are using a monitor with an automatic vertical retrace such as the Robot model 70, you will probably want to adjust it for a free running rate somewhat longer than 9 seconds. Adjust the control R_{125} on the model 70) for good retrace action when playing back a frame recorded on the loop.

Automatically controlled frame snatching should not be terribly difficult even with the tape loop approach, and I hope that we can all decide on a tentative standard for the control signal within the next few months. My first thought is that whatever scheme we arrive at should be compatible with manual frame snatching, and provide sending-end control of automated loop type, and scan-converter type, frame snatching hardware. VY 73, Cop, WØORX

'UP on FM

BY NORM STERNBERG,* W2JUP

LAST night some evil spirit drove me to tune my recently-acquired surplus R392 digital-dial super-receiver to the Forbidden Frequencies, around 27 megs. For several hours, I listened intently, trying hard to understand just what it was that I was hearing. Since I am not now nor have I ever been licensed to use those frequencies (since the demise of the eleven meter band) much of the procedure used and most of the communications effected left me in the dark. I listened for an hour to Channel 21, to a group of very young, (being father to several, I find them easy to recognize) obviously teenage-type people. Needless to say, the operation was totally in violation of the Rules as contained in Part 95.

In a mood of disenchantment, I swung over to my faithful Motorola and cranked my crystal switch over to the local repeater, a club operation whose site is just under two miles from this location. For the next hour and a half, I listened to the repeater and, in great wonderment, I arrived at the painful conclusion that many of the people on the repeater sounded just as strange to my ears as the beings I had left on Channel 21. The only difference much of the time was that the people on the repeater were using assigned call letters rather than pseudonyms. But frankly, the disenchantment was just as strong.

Now, please don't get me wrong . . . although my mane is tinged with grey, I do not date back to the synchronous spark gap and the Fessenden Alternator. My time as a ham dates from the World War 2 era and not before. I was brought up in amateur radio during an epoch of great growth. But, nothing like the growth we have seen on two meter f.m. in the last three years. I think the two meter repeater has a very definite place in the scheme of things . . . and after listening to some of the baloney on the local machine last night, I think I know where that place is! As strange as the denizens of CB appear to be, some of the types audible on two meter f.m. are just as weird. Which brings me to the point . . . what ever happened to the old rule, "Make sure brain is engaged before operating mouth"!

I realize that quite a few of the repeater users are newcomers to amateur radio. Many, I am sure, have recently graduated from the Novice ranks. I also realize that the procedures and phraseology which they will acquire while operating through the repeaters will serve as a pattern of future performance for many of them. Now, this worries me because I hear a heck of a lot of procedure in use on the repeaters which just doesn't make sense, or follow the rules of logic, or even in too many cases, the Rules of the FCC. And, why f.m. operation has to serve as the seedbed from which lousy operators will develop is a question which I would like to examine.

Example 1

"W2XXX mobile 2 for a call, please"
"Go ahead, XXX"
"K2XYZ, this is W2XXX mobile 2 . . . are you there, George?"
Now the airwaves are filled with silence. There is no response.
"This is W2XXX mobile 2. *Nothing heard.* Thank you gentlemen."

Obviously, here we have a cat who is a refugee from the low band phone nets . . . and by his procedure you may conclude that either he is just an unfortunate creature of habit, unthinking but well-meaning . . . or else he just is unthinking. He is simply not bearing in mind the fact that he is on an f.m. repeater. Or else, he doesn't understand what an f.m. repeater really does. When he was calling someone two thousand miles down the pike on the low frequency bands, there was reason to say "Nothing heard". Maybe someone in mid-path might have heard the other guy reply to our friends call, popped in and offered to relay. But let's face it! On the repeater, everyone is hearing exactly what W2XXX is hearing! So why on earth should he announce to all the gang that he has heard the same nothing as everyone else? Waste of time and indicative of little thinking before speaking. Why bring inappropriate stuff into f.m. from other operations?

Example 2

"W2XXX mobile 2 and K2XYZ portable 2, this is WB2ZWR.", *et cetera.*

I wonder when this joker ZWR took the trouble to read the Rules on identifying his station. And, man, this is prevalent all over the bands, not just on the repeaters! There is nothing in Part 97 that requires the transmitting operator to describe the operational status of the stations he is working or calling . . . all he has to do is say their calls without the "mobile" or "portable" addenda. The Law says that each of us does his own thing in this respect. See for yourself! (97.87b).

*2 Regal Lane, Levitown, N.Y. 11756

Example 3

"WB2ZWR mobile 2 listening 94 simplex"

To that last word, "simplex", I say a hearty "So what and who cares?" What earthly difference can it make in the real world if you are listening "simplex", "repeat", or even "duplex"? If a guy comes back to you directly or via the local repeater, you're gonna hear him just the same. Or is it possible that you are giving all the guys orders? Like, maybe you don't want them to come back via the repeater? I don't know the answer to this one and I wish someone would explain it to me!

Example 4

"WB2ZWR Handie-talkie on the subway, listening 25-85 METRO repeat via WR2XXX"

Now, this guy is really a gem! Not only does he put out a bunch of needless verbiage on the repeater, he fails to identify per the rules! He lets us know that he is rich enough to own a handy-talkie, has the necessary 35 cents to buy a subway token, knows the input and output frequencies of the local repeater, it's call sign and the name of the local club that sponsors the machine! What a wealth of useful information! The fact that we already know all this good stuff doesn't matter to him. He is going to do his thing, and show all and sundry that he is a real f.m. operator, 'cause he *"knows all the words!"*

Bigger And Better Nits

By now, most of you can rightly mumble, "Boy, this JUP really knows how to pick nits!" Possibly these points are truly nits that I pick, but, frankly, I think the time has come to pick my nits in public! Because of this type of operator technique, f.m. gets more and more to sound like CB! Why do we have to have this kind of nonsense proliferating like bubonic plague in f.m.? The simple fact that our techniques are new and different from some of the non-f.m. modes of operation, and the consideration that many of our f.m. repeaters are audible for dozens of miles in all directions should make us more accutely aware of what we sound like . . . should make us strive for a better grade of operator effort . . . not the deterioration that is becoming more evident on f.m. with each passing month!

I have no quarrel with the guy who operates the "rice-box". I own two of them myself. I have no axe to grind with the newcomer to amateur radio. I was once one of them myself. I do decry the copy-cat method of learning the art . . . picking up the mistakes of thoughtless people and allowing those mistakes to become a pattern of behavior for an entire fraternity. It reminds me of the word "ain't". They used to tell us that it wasn't in the dictionary, that it was poor, low-class English. Well, today it is in the dictionary, and has become accepted usage in many places. But the stigma is still there . . . "ain't" still ain't good English and won't be in my lifetime.

I sometimes wonder if some of our guys operating f.m. are out of their minds. Judging by what I hear on the air, many of our chums must have money to burn and not give two damns about efficiency. I refer to the apparently widespread use of "linear amplifiers" in f.m. Seems almost like these devices are belly-buttons . . . everybody has one!

I don't know about you, but running an f.m. broadcasting station for a living, I must be making some kind of strategic error . . . the rig that I run at work, a Collins 831D, operates with its single tube final amplifier running Class C, with a measured stage efficiency of 67.6%, which ain't too bad at 98.3 megs. Not much sense in running a linear stage, since with constant carrier amplitude the stage simply doesn't have to be linear. That, my chums, is one of the f.m. "Facts Of Life". How many of our gang operating f.m. know that the so-called "linears" that they claim to be running as afterburners, would be far less efficient than Class C types, and most probably, unless the manufacturer really goofed, are in truth Class C birds, and not "linear?" Just try shoving a single sideband signal through yours, and find out real quick!

Fact—F.m. does not require a linear amplifier.

Fact—Linear amplifiers at best can give no more than the theoretical fifty percent efficiency.

Fact—Efficiency is still the "Name of the Game!" Especially in a mobile installation.

Possibly the best way to look at the concept of the power amplifier in the f.m. service is to take a trip back to the basics, without getting too exotic. We should be able to evaluate the need for an amplifier, and determine approximately what a given amplifier will buy us, maybe even decide, on a "watts per dollar" basis that we might not be getting as much as we are paying for.

As much as I hate arithmetic, this is one of the rare occasions where there is not much alternative. But, in keeping with my mental state, let's keep the thing simple. One very elementary formula comes to mind— .

$$e = \frac{7\sqrt{ERP}}{d}$$

where e = free space field intensity in volts per meter
ERP = effective radiated power in watts
d = distance in meters (1610 meters = one mile)

for example, for an ERP of 1000 watts, at a distance of 1 mile,

$$e = \frac{7\sqrt{1000}}{1610} = \frac{7 \times 31.6}{1610}$$

$$= 0.1375 \text{ volts/meter}$$

which is the same as 137.5 millivolts per meter. This gem, by the way, is the magic number on

DISTANCE = ONE MILE (1610 meters)				
Power Output ERP	Free Space u/v/m	Xmtr Ant @ 100' Rcvr Ant @ 30' microvolts/meter	Xmtr Ant @ 300' Rcvr Ant @ 5' microvolts/meter	Xmtr Ant @ 5' Rcvr Ant @ 5' microvolts/meter
1000	137490	148813	74407	1240
500	97220	105227	52613	877
250	68745	74407	37202	620
125	48610	52613	26307	438
60	33678	36452	18226	304
30	23814	25775	12888	215
15	16839	18226	9113	152
10	13749	14881	7441	124
5	9722	10553	5261	88
1	4348	4706	2353	39

Table I—Field intensities at a distance of one mile.

which the Feds (spell that FCC) base the prediction of field strength in the f.m. Broadcasting service.

But, unfortunately for all of us, the earth is not free space. Neither is it a perfect copper sphere. And as long as we are not dealing in interspacecraft radio, we have to take a more practical approach. So that brings us to another simple formula—an approximation yes, but very useful nonetheless—

$$e = \frac{3.2\ a\ h\ \sqrt{ERP}}{d^2\ lambda}$$

where, e = field intensity in microvolts per meter
a = height of transmitting antenna in feet
h = height of receiving antenna in feet
ERP = effective radiated power in watts
d = distance in miles
lambda = wavelength in meters

In practice, ground effects must be considered and the field intensity becomes a function of frequency or wavelength. Note that since wavelength is in the denominator, the shorter the wavelength (the higher the frequency) the greater is the received field strength. (All you 450 types note!) But since life gives us nothing for nothing, this is usually offset by the effective antenna length which, for a half wave dipole, varies inversely with frequency.

Since so much f.m. operation is at v.h.f. and u.h.f., take a long look at the final gem for the month . . . line of sight! The line-of-sight distance in v.h.f. is frequently based on this formula—

$$D = 1.22\ (\sqrt{h_1} + \sqrt{h_2})$$

where D = line-of-sight distance in miles
h_1 = height of transmitting antenna in feet
h_2 = height of receiving antenna in feet

And in case you never thought about it, the height of an antenna is always referenced to the effective center of radiation, which on my car is about five feet above the ground!

As my exercise in futility for this month, I have taken the above numerical nonsense and mathematical macaroni and whipped up a little antipasto for you in the shape of a couple of tables. Believe me, were it not for my faithful HP-45 electronic slide rule, I would have forgotten about the whole thing!

Table one plots some field intensities at a distance of one mile. I have gone through the numbers for a variety of conditions. The first column lists the free space values, which no one ever finds, but the scientific fraternity is forever babbling about free space, so we might as well look at it . . . it reminds me of the Antenna Engineer's Answer To Diogenes . . . some poor slob walking around the radio stores trying to buy an Isotropic Dipole!

The remaining columns plot values in the cases as follows—

1. Transmitting antenna height at 100 feet, receiving antenna at 30 feet. This is the FCC's basic premise for field studies in f.m. Broadcasting. Sort of like you with the ground-plane on the house-top working the lucky rich guy in the next suburb who has his up on a tower.
2. Transmitting antenna at 300 feet, receiving antenna at 5 feet. This is like most of us working the local repeater from our cars.
3. Transmitting antenna at 5 feet, receiving antenna at 5 feet. This is the sad case of guys trying to work mobile-to-mobile.

Bear in mind that where ERP, effective radiated power is mentioned, this is still the result of multiplying transmitter output power by real antenna gain then deducting the losses in the transmission lines. Another factor to remember is polarization scattering, where signals bouncing in and out of terrain obstructions may result

DISTANCE = FIVE MILES

Power Output ERP	Free Space u/v/m	Xmtr Ant @ 100' Rcvr Ant @ 30' microvolts/meter	Xmtr Ant @ 300' Rcvr Ant @ 5' microvolts/meter	Xmtr Ant @ 5' Rcvr Ant @ 5' microvolts/meter
1000	27.5	5953	2976	49.6
500	19.4	4209	2105	35.0
250	13.8	2976	1488	24.8
125	9.7	2105	1052	17.5
60	6.7	1458	729	12.2
30	4.8	1031	515	8.6
15	3.4	729	365	6.0
10	2.8	595	298	4.9
5	1.9	420	210	3.5
1	0.9	188	94	1.6

Table II—Field intensities at a distance of five miles.

in change of polarization from whatever you are using for transmitting, to something else different from what you started with.

In the one mile table, the Case 1 figures are reasonably close to the free space figures, and Case 3 shows the lowest values. In the five mile table, the free space figures look worse than anything else, with the Case 3 figures still grim. In the ten mile table, you can observe that the Case 3 figures approach pretty closely to the free space figures. In all three cases, one thing becomes evident. It takes a heck of a large increase in power to buy anything significant in the way of field strength increase. For example, look at the ten mile case for mobile-to-mobile operation. Increasing power from ten watts output to 125 watts output buys a field strength increase from 1.2 microvolts to only 4.4 microvolts, a gain of only 11.29 db. If both stations were to use two-element colinear antennas, each having a legitimate gain of about 4.6 db over a half-wave dipole, the net system gain would be 9.2 db, and gain antennas are still generally a bunch cheaper than v.h.f. power amplifiers capable of raising the signal power from 10 to 125 watts output!

Many of the modern v.h.f. receivers have sensitivities unheard of just a few years ago. 0.4 microvolts for 12 db quieting is not difficult today. But 12 db of quieting is still a fairly noisy signal. The much-abused phrase "full quieting", or worse, "dead full quieting" is rather difficult to define. In strict engineering terms, "full quieting" is taken to mean a carrier strength into the receiver system such that all atmospheric noise and other crud is reduced to a value 60 db lower than it was before the carrier signal came into the receiver. Sixty decibels represents a reduction to one one-millionth of the original noise level. That's a bunch! By the way, the FCC states that for this kind of signal quieting in the f.m. broadcasting service, the transmitting station must deliver to its area of assigned coverage an r.f. signal level of 70 dbu, or 3,160 microvolts per meter. With the transmitting antenna at 100 feet and the receiving antenna at 30 feet, at a

[*Continued on page 70*]

DISTANCE = TEN MILES

Power Output ERP	Free Space u/v/m	Xmtr Ant @ 100' Rcvr Ant @ 30' microvolts/meter	Xmtr Ant @ 300' Rcvr Ant @ 5' microvolts/meter	Xmtr Ant @ 5' Rcvr Ant @ 5' microvolts/meter
1000	13.8	1488	744	12.4
500	9.7	1052	526	8.8
250	6.9	744	372	6.2
125	4.9	526	263	4.4
60	3.4	365	182	3.0
30	2.4	258	129	2.2
15	1.7	182	91	1.5
10	1.4	149	74	1.2
5	1.0	105	53	0.9
1	0.4	47	24	0.4

Table III—Field intensities at a distance of ten miles.

MATH'S NOTES

BY IRWIN MATH,* WA2NDM

WE have received several requests recently to discuss solid-state methods of switching antennas, crystals and the like. Most readers asking this type of question are mobile operators who would like to mount as much equipment in the trunk as possible thereby assuring short r.f. connections and protection from theft. Two other amateurs who have written would like to remote-control r.f. circuitry at the top of a normally inaccessible tower. As a result, we will look at several easily implemented techniques that could meet many such requirements.

Fig. 1 is a simple method of controlling 2 or more transistors individually on a single d.c. control line. On the left side of the drawing we have a 12 volt or 6 volt source that can be chosen by the switch and on the right side, some transistors and zener diodes. We have chosen 12 volts for our example as that is the value commonly found in mobile installations, however, other voltages can easily be accommodated by the proper selection of components. Let us first assume that the switch is in the 6 volt position. We can see that CR_1 will not conduct as it is an 11 volt zener and therefore the two transistors that it feeds, Q_1 and Q_2 will remain cut off. The other zener, CR_2, is a 5 volt zener and it will conduct allowing current to flow through R_5 and to the base of Q_3. This will cause Q_3 to turn on activating whatever its collector load happens to be.

*5 Melville Lane, Great Neck, N.Y. 11023

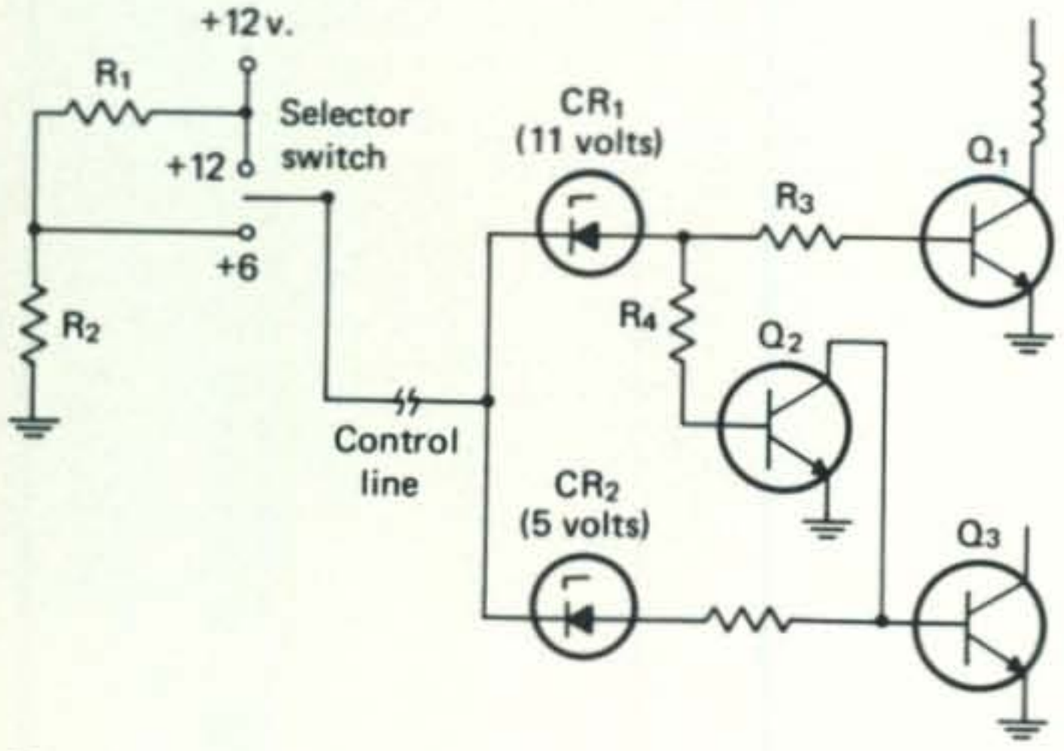

Fig. 1—A method of control for two transistors on one line.

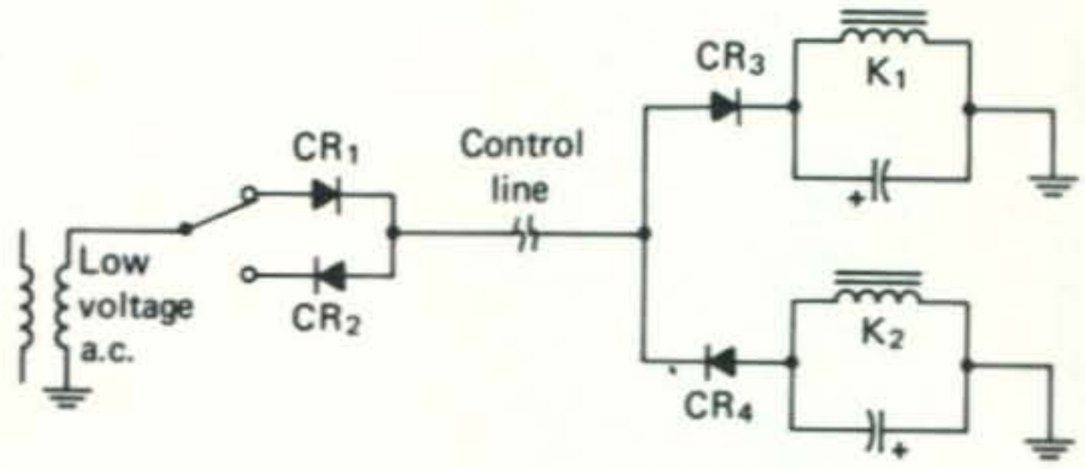

Fig. 2—An a.c. version of a similar function to fig. 1. The diodes can be common silicon rectifier units.

Now let us switch to the 12 volt position. We know that CR_2 will continue to conduct but so will CR_1. This will cause Q_1 to turn on energizing its load and Q_2 to turn on shorting the base of Q_3 to ground. Therefore, even though CR_2 is conducting, Q_3 is cut off. This simple scheme can be expanded to handle many transistors as long as the choice and tolerances of zeners, stability of the initial voltage source, and general circuitry are carefully considered.

A simple a.c. version of the above control, limited to two relays, is shown in fig. 2. Here, positive half cycles flow through CR_1 and CR_3 energizing K_1 while CR_2 and CR_4 only allow negative half cycles to pass to energize K_2. The two capacitors serve as filters for the d.c. relay coils and will have to be fairly high value electrolytics for proper operation. At 24 volts, a value of 50 mf is a good starting point.

In fig. 3, we have taken a typical transistorized crystal oscillator stage and, with the addition of CR_1, R_1, and R_2 made it into a remotely controllable stage. When S_1 is open, R_1 causes CR_1 to be reverse biased as it puts full B+ on the cathode while the normal bias divider, R_3 and R_4 only allow a smaller than B+ voltage to be present on the anode. Since a reverse biased diode does not conduct, the crystal is not connected to the transistor, and no oscillation occurs.

When S_1 is closed however, the d.c. voltage at the junction of R_1 and R_2 drops to a very low value (100K and 2.2K) and CR_1 now conducts.

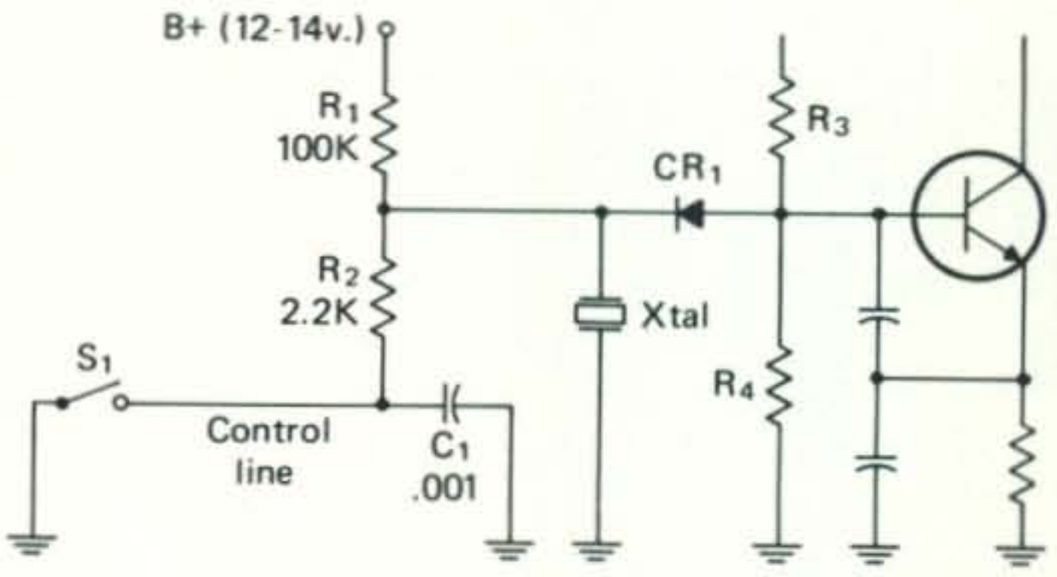

Fig. 3—A transistor oscillator stage modified for remote switching. C_1 is a bypass capacitor to keep possible r.f. out of the control line.

This produces a complete path from crystal to transistor and the circuit oscillates. Remember, however, R_2 and R_4 are in parallel when CR_1 conducts and the values for correct bias should be chosen accordingly.

In fig. 4, we have expanded the scheme of fig. 3 to produce remote switching of 2 or more crystals to an oscillator. By the same operating principle of fig. 3, grounding the appropriate resistor enables either crystal to be switched in with the other out of the circuit by virtue of its associated reverse biased diode. Any number of

[*continued on page 73*]

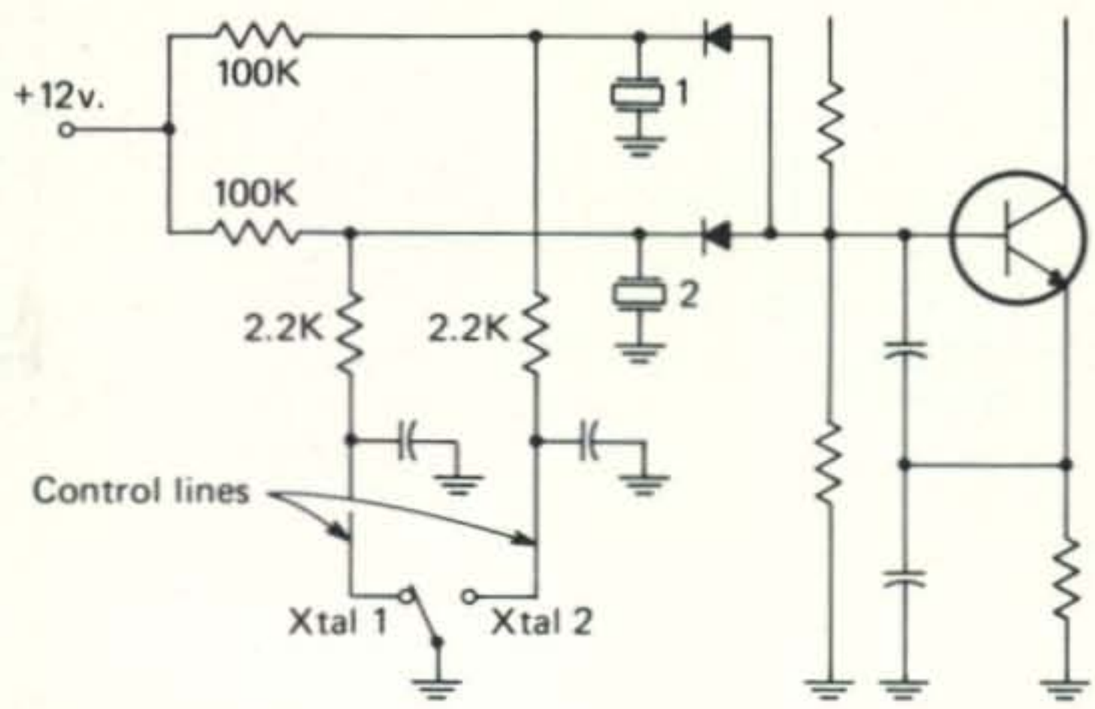

Fig. 4—An expandable crystal switching scheme described in the text. Any reasonable number of crystals could be switched by this method.

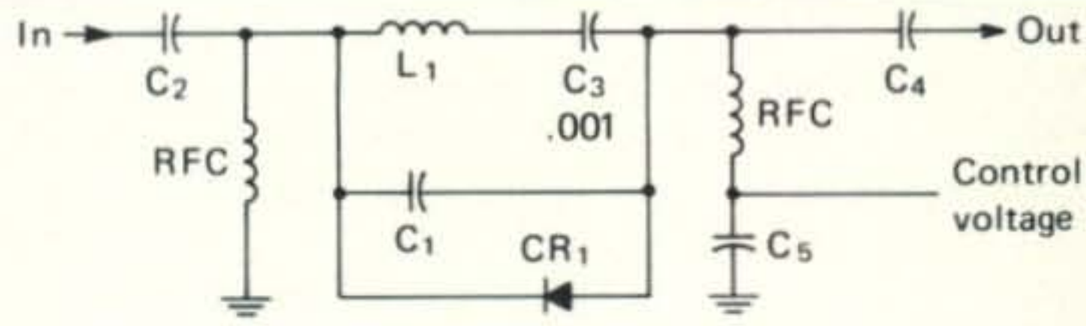

Fig. 5—Using a diode to switch r.f. C_3 allows r.f. to pass through L_1 but not d.c. C_2 and C_4 are coupling capacitors while C_5 is a bypass.

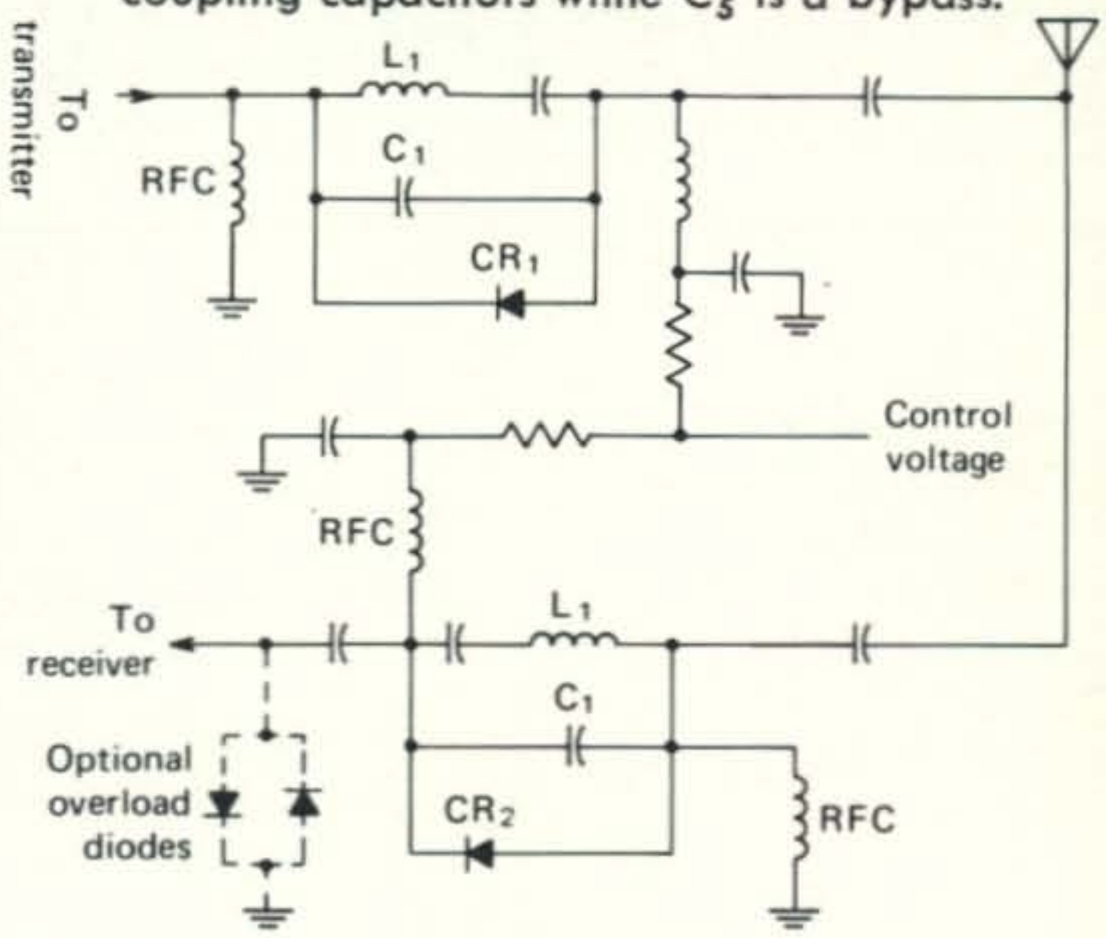

Fig. 6—A diode antenna change-over "relay" discussed in the text. Note that the diodes are reversed so that when one conducts, the other is cut off.

QRPp

LOW-LOW POWER OPERATING

BY ADRIAN WEISS,* K8EEG/ø

This is the plush operating position at W8NDG/8 (at the key) during the 1973 FD effort. W8KRR logs in the photo and spelled W8NDG at the key. The HW-7 was operated 80-15 meters for the following totals: 80m—61 QSO's; 40m—74 QSO's; 20m—20 QSO's; 15m—17 QSO's for a grand total of 172 contacts. That's not bad for the HW-7!

WELL lads, about a month is left for Field Day preparations, so it's high time to get the gear in top condition, pick an operating site, and plan for the annual bash that takes thousands of amateurs out into the field for a day of operation under simulated emergency conditions. If you've never done it before, give yourself a break—there's nothing in the world to compare with sitting at the rig out in the open skies, with warm breezes wafting down the meadow, birds chirping, and an ample stock of brew in the ice-cooler. Add to the setting a successful batch of QSO's and you've known the best hamming has to offer. This column will outline the preparation that goes into a successful outing.

Site Selection

The major criteria for a perfect site is the possibility of getting a good antenna up high *and in the clear*. In an upcoming article in *The Milliwatt* (April, 1974), I1RBA reviews Bell Telephone work which indicates that a bank of trees (with leaves) will cause about a 2db loss to signals below 30 mHz. A QRPp signal can't afford that during FD! The ideal site would include a single 100 ft. tree in the middle of a vast plateau! Good luck on finding it. The other option is to use a cheap TV telescoping mast plus a 15-20 ft. bamboo pole to put the center of an inverted vee dipole up 65-70 ft. and in the clear. Stay clear of potential sources of QRN (power lines, stations etc).

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Antenna Selection

The antenna is the most vital part of the setup, so every effort and expenditure must be directed toward getting the best possible antenna for the circumstances. A quad or beam on 20/15/10 is recommended, but admittedly exotic for a single-man operation. But there's nothing wrong with wire!

For multi-band operation and simplicity, a trap dipole is good. Another very successful multi-band antenna is the W3FQJ "Long-Wire Inverted V" described in *QST*, August, 1969, p. 30. Fig. 1 gives several possible variations. Band changing is accomplished by connecting or disconnecting the shorting clips for the desired band. Lengths shown were derived with an r.f. noise bridge at K8EEG and can be followed exactly. Don't waste time on a vertical unless you can lay at least 40 radials under it.

If possible, select an antenna with gain over a

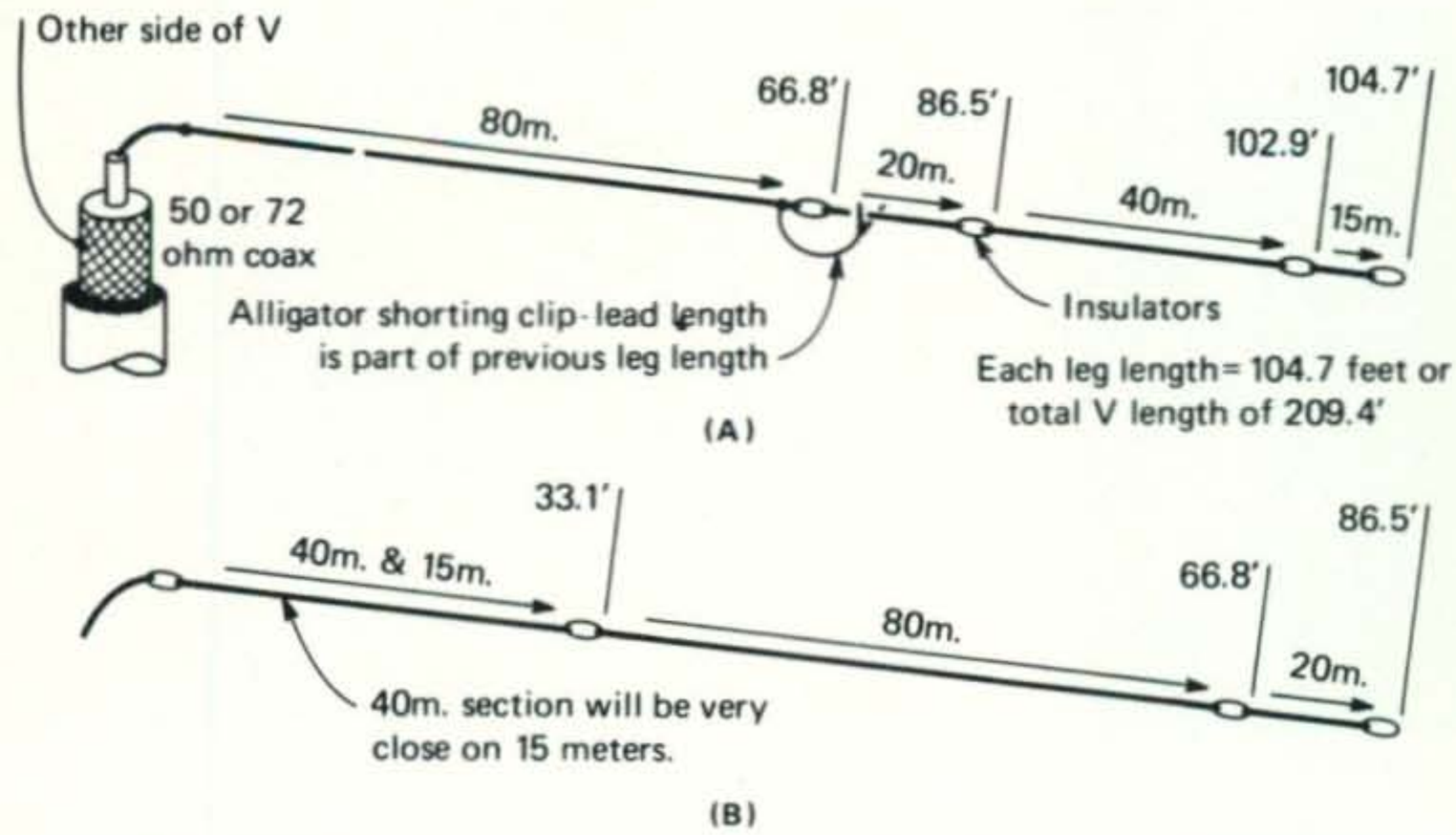


Fig. 1—The W3FQJ "Long-Wire Inverted V" for operation 50 kHz inside of each band.

Height (ft)	Height in wavelength	Maximum angles of radiation			E-Layer Skip (day)	F-Layer Skip (night)
33	.25	90 degrees			175 miles	225 miles
40	.30	60			175	300
46	.35	50			175	350
53	.40	40			200	450
59	.45	35			235	525
66	.50	30			265	600
72	.55	28	65		280	630
79	.60	26	55		295	690
85	.65	24	50		305	740
92	.70	22	45		320	860
98	.75	20	40	90	350	900
106	.80	19	39	70		970
112	.85	18	36	64		1015
119	.90	17	34	56		1080
126	.95	16	32	52		1120
132	1.0	15	30	50		1200

(note: as secondary lobes appear at .55 wavelength and after, two and then three areas of maximum coverage occur)

Table I. Computed correlations between antenna height, angle of maximum radiation, and predicted single "hop" distances for either E-layer or F-layer conditions on 7 mHz.

dipole. The 8JK array used by K8EEG/Ø last year for 272 QSO's on 40/20 meters was described in *CQ*, November, 1971, p. 16. A stable center support is all that is needed, although the array may be hung between two end supports if desired. A longwire antenna (over 400 ft. for 40 meters and up) is a good performer. A single wire feedline through an L-network coupler will tune the antenna to all bands (adjust for maximum feedline current as indicated on a proper size bulb as in fig. 2). Next, a Vee beam shows very good gain when leg-lengths are over 2 wavelengths (4.2db) and is bi-directional. See *ARRL Antenna Book*, p. 176. It needs only three supports plus an antenna coupler.

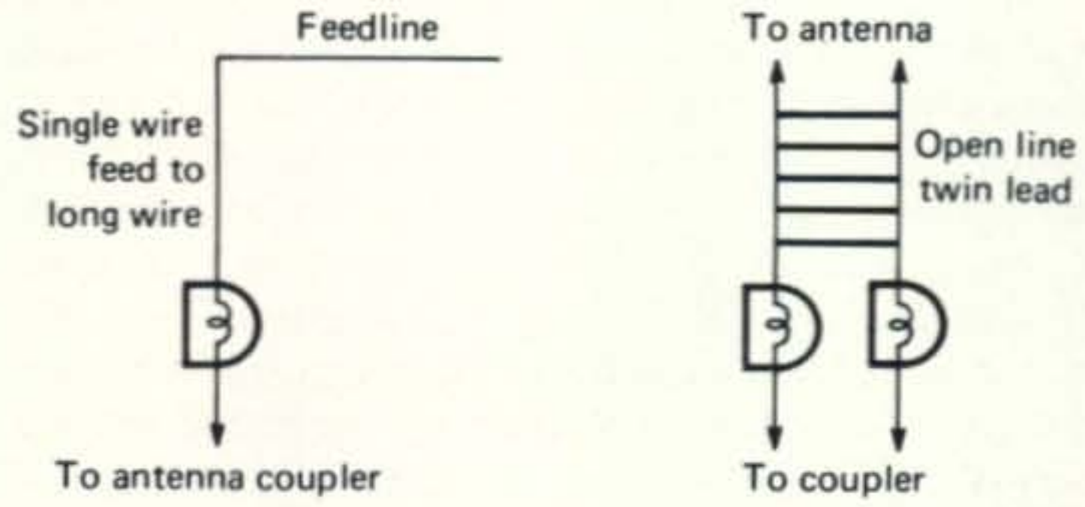
Antenna Height

If you can achieve a one wavelength height, you will have two maximum lobes of radiation for both long and short coverage. Table I shows calculated figures for the 40 meter case. If you live in the crowded coastal areas, you can probably get by on 40/80 meters with a low antenna. It is easy to achieve at least one wavelength on 20/15/10 for wide coverage.

Bands

Daytime: 20/15 and 10 (if open) are best for U.S. wide coverage. 20 usually stays open for several hours after darkness. 40/80 are hopeless

(A) Direct insertion for initial peaking:



(B) Shunted for final peaking:

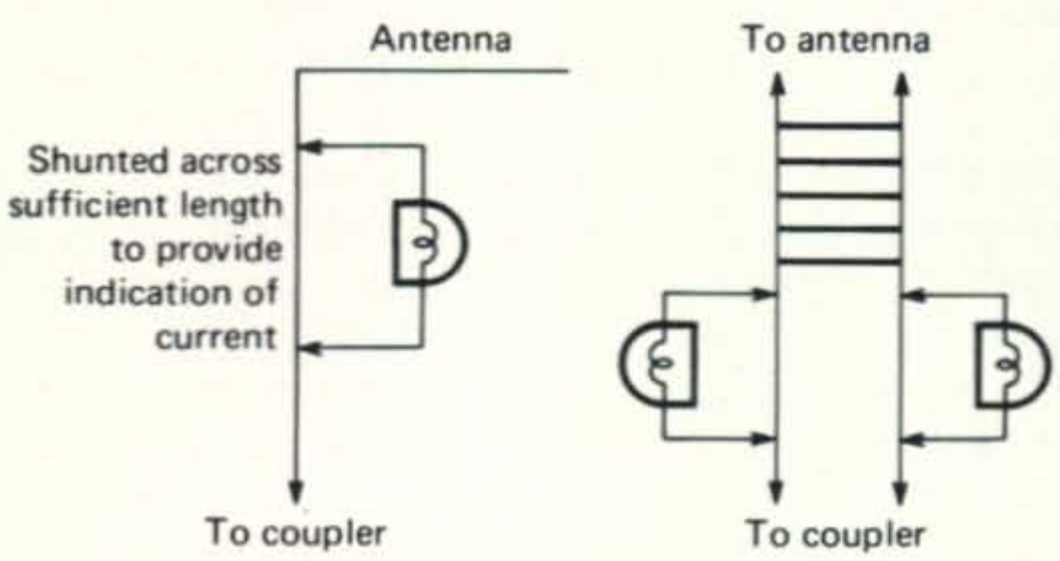


Fig. 2—A feedline current indicator using #47 and #49 bulbs. The #47 is used for 5 watt levels and the #49 for 1 watt levels.

Harhar! Guess again maties! Tain't Cap'in Long John Silver 'atall! Tis that old salt WA8DDI swinging at anchor and doing his thing with one watt to the vertical on 40 meters. Claims that the lake provided a good ground plane. After working QRPp WAS and 50 countries with one watt out in six months at the land-locked home shack, Dennis decided it was time to head out to sea for a bit of adventure. Anyone for this approach?

during the day unless you have a really good, high-gain antenna, and are close to crowded areas.

Darkness: 80/40 meters best a couple hours after sunset. 80 depends entirely on the QRN level—if it is low, you can really work out on 80. Will be especially good during "wee hours" (0100 on) when stations thin out.

Receiver

FD conditions impose a severe test on any receiver, especially the direct conversion type which many homebrewers and owners of HW-7's and PM series transceivers use. The receiver should be corrected for front-end overload problems. An r.f. gain control in the antenna lead is a help. Secondly, link coupling of antenna to mixer tank circuit is essential—replace the series capacitor in the HW-7 with a two-three turn link over the mixer coil. Next, some form of incremental tuning flexibility is desireable (see last month's QRPp column).

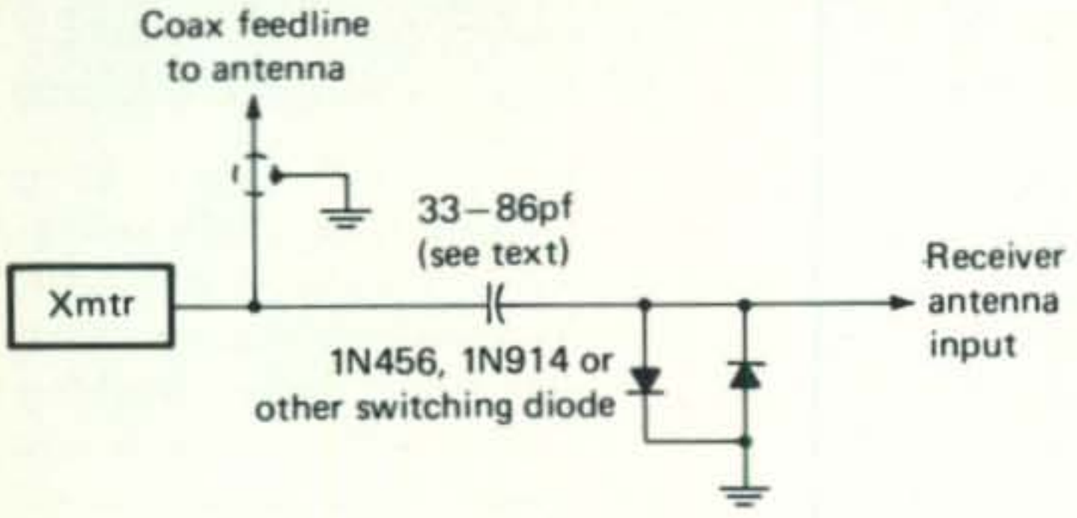


Fig. 3—The "Simplest TR Switch" remains connected to the antenna at all times.

Most important if a transceiver is being used is mastering the technique of rapidly zero-beating one's transmit frequency with the station being called (see last month's column for discussion of receive-transmit frequencies relationship.) Responses to a CQ FD usually must be zero-beat or you'll miss a QSO. Preparation for FD should include practice at rapidly zero-beating another station's frequency. Develop the habit of tuning across the band so that the transmit frequency is "out in front" of the receive frequency—that way your transmit frequency will be closer to the calling station and eliminate the need to "tune through zerobeat" to get to the other side of the station for the proper transmit-receive relationship. There's no time for that during FD!

Further, complete break-in is essential. Fig. 3 shows the "Simplest TR Switch" published in *CQ* some years ago. It works and permits complete break-in—you can monitor the frequency between dots and dashes. Any kind of switching diode will function. The size of the capacitor depends on the sensitivity of your mixer stage—use the smallest size that will produce full audio output (about 33-86 pf or so).

[*Continued on page 73*]

NOVICE SHACK

BY HERBERT S. BRIER,* W9EGQ

FLASH!

FCC's plans to increase amateur license fees, effective May 1, have been suspended until further notice.

WHEN the amateur Novice license was first issued over 20 years ago, almost any applicant with no previous electronic knowledge could pass its written examination after reading the questions and answers in Novice study guide a few times without understanding anything he memorized. But not today! Today, trying to pass the Novice written exam simply by studying the questions and answers of the appropriate study guide is doomed to failure on at least the first or second attempt, unless the student already has a pretty good electronic background. The difficulty is that the study guides supply the facts upon which the examinations are based, they do not supply the explanations necessary to understand the facts.

For example, the latest Federal Communications Commission Novice study guide asks the student to draw a schematic diagram of a circuit containing a battery with internal resistance, a resistive load, a voltmeter, and an ammeter. (Figure 1). The following questions are then asked: "From the values indicated by the meters, how can the value of the resistive load be determined? How can the power consumed by the load be determind?"

In an actual examinaiton the diagram would already be drawn, and the applicant would be asked to identify the components, determine where a missing component should be in the diagram, or possibly whether the diagram is correct.

To answer the first question intelligently requires using Ohm's Law, which states: *In a resistive circuit, the current (I) in amperes through the load is equal to the electro-motive force (E) in volts divided by the resistance (R) of the load in ohms.* Or, expressed as an equation: I = E/R, E = IR, or R = E/I, where **E** is the electromotive force in volts. **I** is the current in amperes, and **R** is the resistance in ohms.

Substituting the assumed values of three volts and 1.5 amperes in R = E/I, R = 3/1.5 = 2.0 ohms.

The answer to the second question is found by using the electrical power formula, which states: *In a resistive circuit, the power (P) in watts consumed is equal to the electro-motive force (E) in volts across the load multiplied by the current (I) in amperes flowing through the load,* or P = EI, where **P** is the power in watts, **E** is the electro-motive force in volts, and **I** is the current in amperes.

Substituting the given values of current and voltage in the power equation: P = 3 × 1.5 = 4.5 watts.

*385 Johnson St., Gary, Ind. 46402

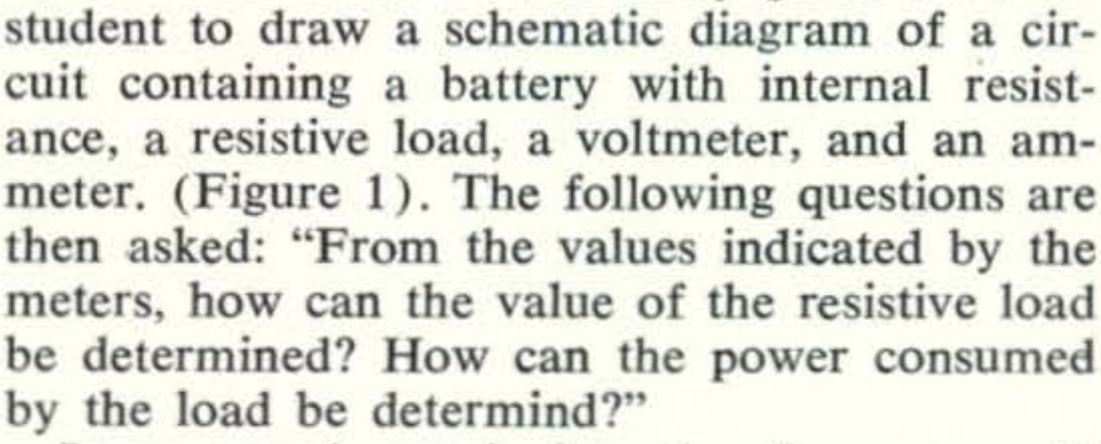


Fig. 1—Schematic diagram of a simple resistive circuit illustrating the discussion in the text of how to use an FCC amateur license study guide.

License Manuals

The *Radio Amateur's License Manual,* $1.00 from the American Radio Relay League, Inc., Newington, Conn. 06111, or amateur supply houses provides similar answers for every question in the Federal Communications Commission amateur license study guides, as well as the text of the complete FCC amateur regulations. And similar information is available in booklets from other publishers. It might seem that the availability of these study aids would make failing any amateur written exam difficult. Don't believe it! The study guide questions and answers only tell the student the *areas* of amateur knowledge and techniques the examination questions will probe and how thoroughly they are examined. In contrast, the examination questions are designed to test the license applicant's *understanding* of the subjects covered. Unfortunately, many students study as if they think that the aim of the examination is to determine how well they have memorized the questions and answers in the study guides.

The better method of study is to use the license manuals strictly as study guides and *study* books like the ARRL *Radio Amateur's Handbook,* Bill Orr, W6SAI's *Radio Handbook,* AMECO's *Radio Amateur Theory Course,* and similar texts. And don't overlook your old school books to brush up on decimal points and manipulating simple equations. Don't let

the tremendous amounts of information in the handbooks intimidate you. Use their indices to locate the pages that refer to the subject of a study-guide question and study those pages until what they say begins to make sense. Start with the lowest page numbers; so that you get in on the discussion from the beginning. For example, if you started looking up the key words connected with fig. 1 in your handbook, you would be able to glean all of the following information:

Electron Theory

All matter consists of an innumerable number of *atoms*. A normal atom consists of a *nucleus* containing one or more *positively-charged protons* and neutrons with no charge. Around the nucleus orbit *negatively-charged electrons* in the ratio of one electron per proton. Like boys and girls, these positively and negatively charged particles are strongly attracted to each other, while like charges repel each other. Although the *mass* of an electron is only 1/1840th of the mass of a proton, their negative and positive charges are equal. Consequently, a normal atom has no net charge. If an atom loses an electron in any way, however, it loses a bit of its negative charge to become a positive *ion*. Conversely, an atom that gains an electron becomes a negative ion.

Current

When a measurable number of electrons (or similar ions) move in the same direction for a measurable length of time, an electric *current* is produced. This current is measured in *amperes*. The atoms in many metals, especially silver, copper, and aluminum, take a tolerant view of electron swapping, and electrons are constantly zipping back and forth between the

Val, WN7ULU, whose Novice experiences are described in the text, is a Computer Programmer Analyst and spent two years in Australia as a missionary and met several VK's.

Lisa M. Hoover, WB9IFW, 407 West Adams St., Washington, Ill. 61571, operating her Johnson Adventurer transmitter on 3.7 mHz shortly before her Novice license expired. She plans on getting her General license during summer vacation.

atoms. But, as the electron motion is completely random, no net current flows.

Electromotive Force

The force that causes electrons to move in unison to produce an electric current is called an *electromotive force* and is measured in *volts*. One source of electromotive force is a battery. Chemical action in the battery creates an oversupply of electrons at its negative terminal and a deficiency of electrons at its positive terminal. If its two terminals are connected together with a length of copper wire, the excess electrons at the negative terminal will force themselves into the wire; at the same time, an equal number of electrons will be pushed out of the wire into the electron-deficient positive battery terminal. As stated above, copper atoms do not put up much *resistance* to swapping electrons. Therefore, a heavy current will flow through the wire connecting the battery terminals together. So much current will flow, in fact, that the battery will be quickly chemically exhausted or the wire may melt.

Resistance

Good conductors do not offer much resistance to current flow through them. But some materials, such as tungsten, some metal alloys, and mixtures of carbon, offer considerable resistance to the flow of current. The unit of resistance is the *ohm*. We have already discussed Ohm's Law, the relationship between electromotive force, and resistance, and the relationship between electromotive force and current and power consumption in watts.

Items From Here And There

The month's bad news is that the Federal Communications Commission has raised the basic amateur license fee to $10.00, effective May 1. The good news is that there is still no fee for the Novice license. And if you want to shed a tear, shed it for the Citizen Band operators. Their license fee is now $25.00... Mark Argo, WN4DPM, 389 W. Central Ave., Madison, Ga. 30650, has operated from two locations as a Novice. In Atlanta, he made 340 contacts in 36 states and 14 countries; in Madison, he already has worked 32 states and 12 countries in 128 contacts. Mark is disappointed by his poor percentage of returns on QSL cards—39% in Atlanta, 19% in Madison, and well he might be! We note that Mark works many foreign amateurs. The long time that it takes for QSL cards from them is undoubtedly a partial explanation for the low percentage of replies from the new location. WN4DPM keeps his Drake 2-NT transmitter and Heathkit HR-10B receiver on 15 meters, where he uses a 15-meter dipole antenna... Mike McCormick, WN9LXZ, 917 Allen St., Gary, Ind. 46403, complains about the General and higher-class amateurs with "big" signals who persist in coming into the 15-meter Novice band to take DX away from the Novices. He cited waiting an hour for a JA's (Japan) signal to become loud enough to call, only to have a west-coast "General" call and ragchew with the JA until the latter faded back into the noise. Mike also takes a dim view of higher-class licensees who ragchew with each other in the Novice bands. But he appreciates those who come into the Novice bands to work Novices. WN9LXZ transmits on a Heathkit DX-60 transmitter controlled by a HG-10B variable frequency oscillator (v.f.o.) and receives on a Heathkit SB-301. A ground-mounted Hy-Gain 18-AVT vertical antenna does the radiating. Forty-one states and 12 countries worked are the results ...L. "Val" Hanney, WN7ULU, 918 North 1200 West, Salt Lake City, Utah 84116, credits Bud, LU5HFI's encouraging words in the November NOVICE SHACK for giving him the confidence enough to visit the FCC and pass General class exam. WN7ULU has the 50 states and 27 of 28 countries worked in five continents confirmed. A Heathkit HW-16 transceiver, HG-10B v.f.o., HD-10 keyer, and a Hustler 4-BTV vertical antenna all did their bits. Val will sked you if you need a Utah contact.

Will we see your opinions, news, and suggestions and picture in *your* column next month? The first step is up to you. Mail your contribution to the NOVICE SHACK at the address at the beginning of the column.

73, Herb, W9EGQ

DX

BY JERRY HAGEN,* WA6GLD

By this time, a large number will have attended the two largest gatherings of DXers in the country; namely the Dayton Hamvention and the California DX Conference which were both held in the last week of April. Hopefully, the fuel shortage did not hamper the attendance and enthusiasm for DX that is usually present at these outstanding DX affairs. In a subsequent column we hope to feature some photos and report of the DX activities at these conventions.

International Goodwill—"SIRA"

The "SIRA" or Sociedad Internacional De Radio Aficionados, which was founded in Miami during 1971 is a group largely composed of Spanish speaking amateurs in Florida. During late 1972 and 1973 the "SIRA" was heavily involved in two activities which demonstrated the International Goodwill which can result from amateur radio and DXing. In December of 1972 the SIRA organized "Operation Rescue" to aid the earthquake victims of Nicaragua. Through the cooperation of radio station WFAB, appeals were made for clothing, food, medicine and plasma to be donated for relief. By Christmas Day (1972), over $71,000 of cash, equipment and articles had been collected and were delivered to Managua by "Lanica," the Nicaraguan Airline. The SIRA then sent a communication team with amateur equipment and generators to Managua and provided messages to relatives outside of Nicaragua. Frequencies used for this traffice were 3810, 7160, 14205, and 21285 kHz and the call YN1SIRA was used. Operators were YN1AEO/W4, WB4TED, LU2DZ/W4, HK4BXY/W4, VE3DPQ/W4, WN4BFL and Francisco (an ex-CO8). In Miami, coordination of the effort was handled by WA4ZZG/KP4DNI, HK3CDJ/W4 and K4CAG.

In May of 1973 the SIRA helped provide communications and information for the scientific raft expedition from Guayaquil, Ecuador to Australia. Amateur equipment on the 3 rafts were assigned the calls HC9BA (raft *Axtlan*), HC9BG (raft *Guayaquil*), and HC9BM (raft *Moluluba*). The daily net control was handled by XE1NF with assistance from XE1CI and XE1EB. As the rafts approached Australia in November of 1973, VK2SG/4 assisted in communications. Upon arriving in Australia the raft crew members, from 12 different nations, were greeted as guests of honor and toured several cities in Australia.

In December of 1973 the SIRA held a dinner meeting to celebrate the Second Anniversary of the founding of the Club.

DXCC List Changes

Effective April 1, 1973, the operation of VK9JW on Mellish Reef was credited as a New Country on the DXCC List. The actual operation

The WAZ Program
S.S.B. WAZ

1171.....K30TY
1172.....ZS6DW
1173.....I2SLA
1174.....LA2CQ
1175.....W9MCR
1176.....JR1NRP
1177.....OE2GKL
1178.....W8COG
1179.....W9CPD

C.W.—Phone WAZ

3657.....WA2MBP
3658.....JW5NM
3659.....K9WJU
3660.....HB9ADP
3661.....W4PRO
3662.....9V1OK
3663.....I3LAV
3664.....G3OKA
3665....WB9DRE
3666.....WA2EAH
3667.....YU2RAM
3668.....DL3XG
3669.....DL3BC
3670.....DJ2DI
3671.....W2BZL
3672.....G3JFF
3673.....DJ8FW
3574.....W2MB

Phone WAZ

494.....ZE1BP

Complete rules for the Single Band WAZ program are shown on pgs. 57-58 on the December, 1972 issue. Complete rules for regular WAZ may be found on pages 64-66 of the June, 1970 issue. Application blanks and reprints of both sets of rules may be obtained by sending a self-addressed, stamped envelope to John A. Attaway, K4IIF, P.O. Box 205, Winter Haven, FL 33880.

*P.O. Box 1271, Covina, California 91722

The CQ checkpoint for Switzerland is Joe, HB9PQ who has this nice layout.

took place in July of 1972, but credits were not allowed pending an investigation of operating ethics by the ARRL. Standards of conduct and proof of actual and legal operation are of vital importance to the DXCC List; however, there should be a more expeditious way to credit an operation! In case you can't find Mellish Reef on a map, it is located midway between Townsville, Queensland (Australia) and the New Hebrides, or just east of Willis Island. Mellish Reef was given Country status under the separate administration criteria.

The DXCC countries of Papua and New Guinea have combined under Self-Government and are now using the P29 prefix. The former New Guinea was annexed by Germany in the 1800's, but was made a Trust Territory of Australia by the League of Nations in 1921. After World War II the United Nations affirmed Australia's jurisdiction, but planned for eventual self-rule. Papua was claimed by Britain in 1884 and was subsequently placed under Australian administration. In 1962 the United Nations urged that the preparation for Self-Government be accelerated and on December 1, 1973 Self-Government was proclaimed for the combined state of Papua, New Guinea.

By the time this column is published, the deletion of Papua and New Guinea and the addition of Papua-New Guinea may be effective on the DXCC Country List.

At the beginning of the year there was some indication that Lybia and Tunisia would combine into one country; however, at this writing no action has been completed. If this combined nation was formed, the DXCC Country List would most likely reflect deletions of Tunisia and Lybia and the addition of the New Nation.

An operation from Palmyra Island and Kingman reef is being considered by WØYVA and WB2EXK. Kingman Reef is located about 35 miles northwest of Palmyra and is under the jurisdiction of the Department of the Navy. The island of Palmyra is administered by the Department of the Interior thus Kingman Reef would be considered a separate country on the ARRL DXCC List. Kingman Reef is difficult to locate as it reportedly measures only 35 by 150 feet at high tide!

Jim, WN7UMU is our Novice DX expert who coordinates Novice DX reports. Notice Jim's WPNX Award # 57 on the wall!

The CQ DX Award Program

C.W. DX

144—W9DWQ
145—DL9RT
146—LA7FJ

SSB DX

322—HS3AIG
323—W7GYP
324—WA1RDH/VQ9
325—ZS6DW
326—ZL1SZ
327—DL9XW
328—DK5AI
329—DL9RT
330—DK4OG
331—W8JAQ

Endorsements

C.W.: 310—W4YWX, 300—W9DWQ
SSB: 300—OE2EGL, ZL1AGO, 150—W7GYP, ZL1SZ 28 mHz—W8JAQ

Complete rules and application forms for the CQ DX Award Program may be obtained by sending a business size, self-addressed, stamped envelope to DX Editor, P.O. Box 1271, Covina, CA 91722.

WPX News

VX1-VX2—Newfoundland and Labrador (VO1 & VO2) have been authorized to sign VX1 and VX2 for 1974 to commemorate 25 years as part of Canada which occurred on April 1, 1949 when the VO's elected to become a province of Canada. WPX catches including VX1KE and VX2AB and VX2AS have been active.

P29—is the new prefix for the self-governing Papua-New Guinea. P29JK and P29RY are reported as active.

WS6MVM, WS7MVM—The WS6 and WS7 prefixes were authorized to commemorate man's first dual-planet space mission. The JPL Ama-

Henry, VE7WJ has this FB setup with single band finals and a large antenna farm. Henry and Lee, VE7BDJ have also used the special prefix call VA7WJ.

CQ DX Award Honor Roll

The *CQ* DX Award Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more countries for the mode indicated. The ARRL DXCC Country List, LESS DELETED COUNTRIES, is used as the country standard. This listing reflects the addition of Mellish Reef raising the total number of current countries on the DXCC list to 322.

CW

W6ID 317	W8LY 308	VK3AHQ 303	DL3RK 300	WA6EPQ 290
K6EC 316	W4IC 305	ON4QX 302	W4BQY 296	WA6MWG 290
W8KPL 313	W6ISQ 304	W9DWQ 301	W6NJU 295	WA8DXA 287
W4YWX 310	K6LEB 304	WØAUB 301	K1SHN 291	DJ7CX 278

2XSSB

W2TP 321	W9DWQ 314	XE1AE 308	W6FW 299	W9OHH 285
I0AMU 319	W9JT 314	F2MO 307	K4HJE 298	W3CRE 284
WA2RAU 319	SM5SB 313	OZ3SK 307	W9KRU 298	W8ZOK 284
W2RGV 319	SM6CKS 313	K6EC 307	G3RWQ 297	K1KNQ 283
DL9OH 318	WA2EOQ 313	W9QLD 307	W0YDB 297	WØSFU 282
TI2HP 318	K4MQG 313	KH6BB 306	YV1KZ 297	OE3WWB 281
K2FL 318	K6WR 313	VE2WY 306	K1SHN 296	HP1JC 281
W3NKM 316	W6EL 312	WA6MWG 306	YS1O 296	WA2VEG 281
W9ILW 316	W6NJU 312	W2CNQ 305	ZL3NS 296	DJ7CX 280
G3FKM 315	ZS6LW 312	G3DO 304	WB6DXU 295	OK1MP 280
IT9JT 315	F9RM 311	WA6AHF 304	I8YRK 291	W6FET 280
W3AZD 315	VE3MR 311	ZL1AGO 304	G3KYF 290	W6TCQ 276
W4SSU 315	W3DJZ 311	VE3ACD 303	WB2RLK 290	K6GUY 275
W6EUF 315	W4IC 311	VE3GMT 303	XE2YP 290	I1WT 275
W6KTE 315	W6YMV 311	SM6CWK 302	YV1LA 290	VE7HP 275
W6RKP 315	IØZV 309	WA2HSX 302	DL6KG 288	WAØCPX 275
I8AA 314	K4RTA 309	W6KZS 302	WAØKDI 288	
I8KDB 314	F9MS 308	OE2EGL 301	OE1FF 287	
W6REH 314	K3GKU 308	WA3IKK 300	K8GQG 287	

teur Radio Club in Pasadena, California used WS6MVM and the Boeing Group in Renton, Washington used WS7MVM during the Mariner Venus Mercury encounter in February and March.

KK6WSL—This special call was used in February to commemorate the first anniversary of the opening of the Foothill College Electronics Museum in the San Francisco Bay area.

KE2TAE—This special call was used to commemorate the birthday of Thomas A. Edison during the period of February 8-11.

VA4RRC—Operation from Canada was conducted for the Centennial of the City of Winnipeg. This station may be active all year.

CF3—Several CF3 Canadian prefixes have been active to commemorate the work of Alexander Graham Bell.

Here And There In The World Of DX

Ernie, W6KQY has just submitted QSL's for phone WAZ with the latest QSL dated 1957! All 40 zones were worked on 14 mHz a.m. phone with rare QSL's such as: Zone 22-AC3PT, 14 December 1951, Zone 24-AC4NC, 21 June 1949, Zone 24-C3EA (China), 10 September 1949, Zone 34-SU1MR, 12 June 1953 and Zone 39-VK1RA (Heard Is.) 23 September 1949. Wow! Congratulations, Ernie!

Ron, EX-VK9RY is now signing P29RJ from Papua New Guinea. Ron states: "In view of the relatively short term contract system of employ-

Tom, ZF1TW (WB2JYM) on the 7 mile beach, Cayman Is. Tom was celebrating receiving his MS EE from M.I.T.

Jim, ZF1JW (WB2VPZ) at the rig which fed a 14AVQ vertical. A total of 4000 QSO's were made with the ZF1JW and ZF1TW calls.

ment that applies generally in this part of the world and the lack of local outwards bureau facilities, operators should deal with QSL managers or at least satisfy themselves at the outset that they are going to get some reasonable return by QSLing direct or via the bureau."

Ron, WB4ASV has now obtained his general ticket after receiving WAS, WAC and WPNX as a Novice. Ron's final prefix count as a Novice was 130 with 49 countries worked.

The DXpedition of the month is still headed by W2GHK/4; however, many other DXers assist in QSL duties. The latest list of logs available may be obtained by sending an SASE and request to W2GHK, P. O. Box 7388, Newark, N. J. 07107.

Bob, WA1RDH/VQ9 was left the Chagos Islands and is now operating from SVØWPP. While on Diego Garcia Island WA1RDH/VQ9 earned the *CQ* SSB DX Award!

Gerry, ZE6JL plans to operate daily on 3778 kHz at 0315 Z, 7078 kHz at 0500 Z, and on 21310 kHz at 1830 Z. ZE6 is a nice prefix for WPX!

Riki, 4X4NJ put Israel in 160 meters for the first time in the ARRL 160 meter contest. Riki worked W1BB and PY1RO and heard KV4FZ and WA2WLN/2.

Denver, 4S7DA reports QSO with KV4FZ in December 1973 for the first KV4/4ST on 1.8 mHz. Several other 4S7 stations including 4S7GV and 4S7JA also have 160 meter operation planned in the near future.

The Warren brothers, Tom and Jim teamed up for a DXpedition to the Caymans and signed ZF1TW and ZF1JW during November of 1973. The highlight was operation in the *CQ* WW CW Contest when they were joined by W4ZMQ/ZF1FOC for a Multi Op-Single TX operation. Tom reports some S-9 JA's on 80 meters and a peak hour of 170 QSO's on 10 meter c.w. during the Test.

Wandering George On The Move

George, WB2AQC, and wife Eva, WA2BAC, who in 1972 organized a West African DXpedition, are leaving again. Between April 17 and May 23 they will visit radio amateurs in Yugoslavia, Romania, Bulgaria, Turkey, Greece and Hungary. They have applied for special YU7 calls in Yugoslavia. In Turkey they hope to operate the rigs of local amateurs, but using their own calls. All QSLs will be answered via their home QTH. At the ARRL National Convention (July 19, 20 and 21) in New York City, George and Eva will present programs.

QSL Information

EA9AA (Jan. '74)—Via WA6AHF
CF3DTG—P. O. Box 756, Bradford, Ont.
FGØAYO—via W2JKN
FM7WF—via WB4HQO
HK7BDA—via WA1QBH
HS3AIG—via WA4BKC
KC4USX—via K7WPZ
KE2TAE—via WB2FVO
KK6WSL—via WB6WSL
PJ8HR—via W2JKN

THE WPX PROGRAM

Mixed

424—I2PHN
425—PY2ELV
426—IØUY
427—PAØABM
428—W1LQQ
429—JA1FDU
430—JA8MS

SSB

786—JA6RCH
787—JA1FDU
788—DK4SY
789—WB4TPU

C.W.

1299—JA1FDU
1300—JA1CKE

VPX

63—WDX2OBU

WPX ENDORSEMENTS

Mixed: 1150—W9DWQ, 1100—W2NUT, 750—WA2EAH, 700—PAØLRK, 650—W5LPO, W2OVC, PAØABM, 550—JA1FDU, JT8MS, 500—W6KYA 450—PY2ELV, W1LQQ.
S.S.B.: 750—W6TCQ, 550—WB4SIJ, 400—SV1EN, JA1FDU, 350—WB9DVV
C.W.: 1050—W8LY, 950—W2HO, 850—W9DWQ, 500—KØJPL, HB9PQ, 450—W1DMD, WA2EAH, 400—I2BVS, I6BQI, KH6HC, 350—JA1FDU, JA1CKE
VPX: 400—W4—10646, 350—WDX2OBU
80 Meters: I8KDB, PAØABM
40 Meters: WB2FMK, G3OCA, I8KDB, PAØABM
20 Meters: WB2FMK, G3OCA, I8KDB, WA4LDM, PAØABM, JA1FDU
15 Meters: WB2FMK, G3OCA, I8KDB, PAØTBM
10 Meters: WB2FMK, G3OCA, I8KDB
Africa: WA2EAH, WB2FMK, I8KDB, JA8MS
Asia: WB2FMK, I8KDB, PAØABM, JA1-FDU, JA8MS
Europe: WB2FMK, I8KDB, PAØABM, JA1-FDU, JA8MS, DK4SY, DK5AI
North America: WB2FMK
Oceania: WB2FMK, I8KDB, JA1FDU, JA-8MS
South America: WB2FMK, I8KDB

Complete rules for WPX, WPNX, and VPX may be found on pg. 67 of the February, 1972 issue of *CQ*. Application forms and reprints of the rules may be obtained by sending a business size self-addressed stamped envelope to WPX Award Manager, P.O. Box 1271, Covina, CA 91722.

P29RJ—via JH3HPX
TA2BK/1—via DJØUJ
TJ1EZ—via PAØEZ
TR8SS—via DJ5IO
TU2EN—via F6CEE
VA4RRC—via VE3GCO
VE3AII/SU—via VE1AL
VK9RY—via JH3HPX
VO2AB—Andy McLellan, P.O. Box 232, Goose Bay, Lab. Canada
VP2MOP—via VE4OP
VP2MUS—via VE4OP
VP2SV—via K3GYD
VP5GS—via W4BRB
VP8MS—via K4MZU
VR1PD—via W6LUV
ZF1BR—via W4KA
ZF1JW—via WB2JYM, 325 Fair Haven Rd., Fair Haven, N.J. 07701
ZF1TW—via WB2JYM, 325 Fair Haven Rd., Fair Haven, N.J. 07701
ZE6JL—P.O. Box 605, Gwelo, Rhodesia
7Q7DW—via G3AWY

73, Jerry, WA6GLD

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

*May	4-5	Bermuda C.W. Contest
†May	11-12	USSR C.W. DX Contest
*May	11-13	Georgia QSO Party
*May	11	World Telecomm. C.W.
*May	11	YL ISSBers C.W. Party
*May	18-19	YL ISSBers Phone Party
*May	18	World Telecomm. Phone
May	18-19	Tennessee QSO Party
May	18-19	Armed Forces Day
May	18-20	Connecticut QSO Party
May	25-26	One Land QSO Party
May	25-26	New York State QSO Party
May	31-June 3	CHC/FHC/HTH QSO Party
June	2	Minnesota QSO Party
June	8-9	ARRL VHF QSO Party
June	9-15	Mass. Amateur Radio Week
June	15-16	All Asian Phone Contest
June	22-23	ARRL Field Day
July	6-7	Venezuelan Contest
July	20-21	Space Net VHF Contest
July	27-29	County Hunters C.W. Party
Aug.	10-11	Argentina Phone Contest
Aug.	10-11	European C.W. Contest
Aug.	24-25	All Asian C.W. Contest
Sept.	14-15	European Phone Contest

†Not officially announced yet.
*Detail's in last month's Calendar.

Tennessee QSO Party

Starts: 2200 GMT Saturday, May 18
Ends: 2200 GMT Sunday, May 19

This is the 4th annual party sponsored by the Tennessee Council of Amateur Radio Clubs. Tenn. stations may work in-state stations for QSO and multiplier credit. The same station may be worked on each band and mode, and portables and mobiles if they change counties.

Exchange: Signal report and QTH; county for Tenn., state or country for others.

Scoring: *Out-of-state*: Tenn. QSOs × Tenn. counties worked. (max. of 95) *For Tenn.*: QSOs × states + VE districts + Tenn. counties. This total plus a special bonus. (Since this bonus applies to Tenn. stations only it is recommended you write to WB4QLT for details.)

Frequencies: C.W.—3550, 7050, 14050, 21050, 28050. Phone—3980, 7280, 14280, 21380, 28580, Novice—3725, 7125, 21125, 28125. (Avoid all traffic nets.)

Awards: Certificates to the highest scorer in each state, VE district and the many Tenn. categories. An achievement certificate for each contestant working ten or more Tenn. stations. Two plaques, for the overall Tenn. and out-of-state winners.

Logs must be postmarked no later than June 21st and go to: Keith Smith, WB4QLT, Box 3483, Kingsport, Tenn. 37664

Connecticut QSO Party

Starts: 2100 GMT Saturday, May 18
Ends: 0200 GMT Monday, May 20

This one is sponsored by the Candlewood ARA. The same station may be worked on each band and mode, and in-state QSOs permitted for Conn.

Exchange: QSO no., RS(T) and QTH. County for Conn. and ARRL section for others.

Scoring: *Out-of-state*: Conn. QSOs × Conn. counties worked. (max. of 8) *For Conn.*: QSOs × ARRL sections worked.

Frequencies: C.W.—3540, 7040, 14040, 21040, 28040. Phone—3925, 7250, 14300, 21375, 28540. Novice—3725, 7125, 21125, 28125.

Awards: Certificates to the highest scorer in each ARRL section or province, and in each Conn. county. (min. of 6 QSOs) In addition the WACC certificate to each station, in or out of state, working all 8 Conn. counties.

Logs must be postmarked by June 20th and go to: Candlewood A.R.A., c/o Donald Crosby, W1EJM, 10 Royal Road, Danbury, Conn. 06810

One Land QSO Party

Starts: 1600 GMT Saturday, May 25
Ends: 1600 GMT Sunday, May 26

This activity is co-sponsored by the "Murphy's Marauders" and the M.I.T. Radio Society. In order to create more participation all of the states in the 1st call area are included as a group.

The same station may be worked on each band and mode, and W1's may work other 1st district stations for QSO and multiplier credit.

Exchange: Signal report, county and state for W1's. Signal report plus a progressive contact number starting with 001 and ARRL section for others. (DX will use country as their QTH)

Scoring: Two points per QSO, 4 points if its

*14 Sherwood Road, Stamford, Conn. 06905.

with a Novice. Multiplier for W1's, ARRL sections and DX countries. (Mass. counts as one section) Others will use counties in 1st call area.

Frequencies: C.W.—3560, 7060, 14060, 21060, 28100. Phone—3890, 7225, 14275, 21350, 28600. Novice:—3710, 7120, 21120, 28110. (Check 15 on the hour between 1600—2200, and 10 on the half hour between 1630—2130)

Mobile and portablees may be worked on the same band for each county change. Crossband or QSOs thru a repeater do not count. Only single operators entries eligible for awards.

Awards: Certificates to the highest scorers in each ARRL section, DX country and 1st call area county (min. of 15 QSOs). There are two Trophies, one for the Top scorer in the 1st call area, and one for outside the area.
15 QSOs)

Mailing deadline June 21st to: "Murphy's Marauders," P.O. Box 11331, Newington, CT 06111. Include large s.a.s.e. for results.

New York State QSO Party

Two Periods (GMT)
1700 Sat. May 25 to 0500 Sun. May 26
1200 to 2359 Sunday May 26

This year's party is sponsored by W2SZ, the Radio Club of Rensselaer Polytechnic Institute.

The same station may be worked on each band and mode, and N.Y. stations may work other N.Y. stations for QSO and multiplier credit.

Exchange: QSO no., RS(T) and QTH. County for N.Y., ARRL section or country for others.

Scoring: One point per QSO times the multiplier. ARRL sections plus countries for N.Y., and N.Y. counties for others. (max. of 62)

Indicate each new multiplier as worked. Check sheet required from stations making over 100 contacts.

Frequencies: C.W.—1810, 3560, 7060, 14060, 21060, 28060. Phone—3975, 7275, 14285, 21375, 28575. Novice—3725, 7125, 21125, 28125.

Appropriate certificates to winning scores.

Mailing deadline for logs July 1st to: John C. Yodis, WA2EAH, 43 Beacon Avenue, Albany, N.Y. 12203. Include large s.a.s.e. for results.

IARS/CHC/FHC/HTH QSO Party

Starts: 2300 GMT Friday, May 31
Ends: 0600 GMT Monday, June 3

A s.a.s.e. to K6BX will get you detailed information about this one. Rules in brief:

Exchange: QSO no, report, name, CHC/FHC no., state, county or similar division. Non-members omit no. and send HTH instead.

Scoring: *For CHC*—1 point per QSO with other CHCers, 2 points if its a HTHer, 1 additional point if its a YL, B/P, FHC, Novice, CHC-200, Merit or Club station, or if it on vhf/uhf. Double above points if QSO is out of own country. *For HTH*—Contacts with other HTHers 1 point, with CHCers 3 points. Rest same as above. S.w.l. use same scoring system as for HTHers.

Multiplier: Each continent, country, ITU zone and U.S. state. (counted only once)

Final Score: Total QSO points from all bands times the sum of the multiplier. Multi-opr. stations divide score by number of operators. The same station may be worked on each band and mode for QSO points but not multiplier.

Frequencies: C.W.—3575, 3710, 7070, 7160, 14075, 21075, 21090, 21140, 28090. Phone—3770, 3790, 3943, 3960, 7090, 7210, 7275, 14320, 14340, 21360, 21440, 28620, 28690. And 50.1-50.5, 145-147. For US and DX as allowed.

Awards: The party supports hundreds of certificates and Trophies, in all categories and divisions. A s.a.s.e. will get you a list. Include extra postage for ITU, IARU, IARC, IARS country,

1973 WAEDC Contest Results

USA Winners

C.W.

WA1ABV/1	**357,369**
W2GXD	**330,078**
W1PL	**307,944**
W8AB	**184,620**
W9DD	**170,097**
K4PQL	**164,703**
W1BPW	142,740
K1OME	114,750
W7IR	**100,080**
W6DGH	**80,196**
K1JYN	71,185
W1RML	61,074
W2FVS	54,858
W6BIP	54,672
W3CRE	**52,809**
WB9BPG	48,116
WA5ZWC	**44,330**
WA1LKX	38,448
W6PLH	35,492
K6SDR	34,030
W3ARK	33,784
WB8EUN	27,454
W8DSO	27,462
WAØKDI	**24,862**
WA1JZC	23,576
WA5VDH	23,464
K4PGM	22,878
W6DQX	21,384
W4HOS	19,314
WB9BXX/3	15,435
WA6GLD	9,476
W3AXW	8,911
W7LNG	8,480
WA5STI	7,104
WA3DMH	6,384
K6ZCL	5,328
WB4BAA	4,464
W4JUK	3,484
W6RQZ	3,168
W1CNU	3,132
W4WSF	2,860
W1OPJ	960
WA3UHJ/2	306
WB4RUA	84
W6MAR/6	8

Phone

WA2BVU	**504,132**
WB2SQN	**488,394**
W3AU	**401,220**
(Opr. WA3IAQ)	
K1CSJ	**321,772**
W4WSF	**213,808**
K1CPF	159,728
W1AW	120,330
(Opr. WA9AUM)	
WA9NPM	**42,624**
W1BPW	30,810
WB8IJI	**30,800**
K1OME	28,930
WA2EAH	23,460
K2MFY	19,270
WB8EUN	19,096
K6UA	**13,144**
K6SVL	11,252
W3CRE	11,392
W3YHR	7,644
W6DGH	5,632
LU1BAR/W3	4,980
WA1PHF	4,578
W4HOS	2,574
WA3UHJ/3	2,660
WB8IAY	2,400
WØIUB	1,960
W4WRY	1,944
WA2PAT	1,190
W2FDE	342
WA3DMH	288
W6RQZ	234
W6KYA	120
W6DQX	90

Canada

C.W.

VO1KE	**183,678**
VE1AJJ	**69,920**
VE3KZ	**43,200**
VE6MP	**36,652**
VE7HQ	4,522
VE3BFK	2,070
VE3BR	1,272
VE2WA	520

Phone

VE2DU	54,600
VE3KZ	18,568
VE3BR	2,010
VE2WA	324
VE3BFU	8

Mexico

XE1IIJ	**130,872**

Trophy Winners

C.W.		Phone
DJ8SW	Europe	DK4TP
ZS3AK	Africa	EA8CR
UA9ACN	Asia	UA9BE
WA1ABV/1	N. America	WA2BVU
KH6RS	Oceania	—
LU5HFI	S.America	YV1YC/5

1973 H-22 Contest

US and Canada

K1OME	**5,856**	W5JFB	75
W1OPJ	84	W5BWM	36
W8CQN/2	**3,456**	**K6QPH**	**429**
K2PFC	1,215	W6ZT	36
WA2ZWH	1,168	W6KYA	27
W2BZL	432	**W9OHH**	**8,208**
W2AXZ	288	K9YQK	702
K4KQ	**7,922**	WB9EAQ	612
W4WSF	6,231	**VE1AIH**	**2,625**
WB4OGW	2,838	VE1AE	780
K4FJC	1,776	**VE3BR**	**1,116**
W4JUK	312	**VE5RA**	**462**
WA5ZWC	**3,078**		

prefix and zone lists.

Send all requests and your logs to: International Amateur Radio Society, K6BX, P.O. Box 385, Bonita, Calif. 92002

Minnesota QSO Party

0000 to 2400 GMT Sunday, June 2

Rules as received from the Viking ARS were rather brief. No time or frequencies were indicated. It is assumed that operation will be for for the full 24 hour period on June 2nd.

The same station may be worked on each band and mode, in-state contacts are permitted.

Exchange: QSO no., RS(T) and QTH. County for Minn., ARRL section or country for others.

Scoring: Total QSOs times the multiplier. The multiplier for Minn., ARRL sections worked on phone plus sections worked on c.w. For out-of-state stations, Minn. counties worked on phone plus counties worked on c.w.

There is a low power multiplier of 1.25 if power input is maintained below 250 watts.

Awards: Certificates to highest scoring station in each section. (min. of 10 QSOs) And top scorer in each Minn. county (min. of 20 QSOs) Special certificates to the Minn. and out-of-state leaders.

A check sheet for each band is required for stations making more than 50 contacts.

Mailing deadline is June 25th to: Viking Amateur Radio Society, Box 3, Waseca, Minn. 56093. Include large s.a.s.e. for results.

Mass. Amateur Radio Week

Starts: 0001 GMT Sunday, June 9
Ends: 2400 GMT Saturday, June 15

This week has been proclaimed Amateur Radio Week by the Governor of Massachusetts. If you fulfill the following requirements you will earn a certificate signed by the Governor.

1. Mass. work 16 other Mass. stations.
2. New England work 8 Mass. stations.
3. Rest of U.S. work 5 Mass. stations.
4. DX (inc. KH & KL) 2 Mass. stations.

Exchange will be signal report, county and state. Certificates will be endorsed for band upon request.

Applications must be received no later than July 31st. Include a #10 s.a.s.e. and send to: William C. Holliday, WA1EZA, 22 Trudy Terrace, Canton, Mass. 02021

Editor's Notes

Sorry I cannot give you any details on the USSR "CQ-M" contest. Inquiries to Box 88 are very slow coming through. Its safe to assume it will be a c.w. affair on the listed dates, starting and ending at 2100 GMT. Suggest you check the rules as published in the May CALENDAR last year if you are interested.

A new Trophy is being added to the French Phone contest that took place last February. It is being awarded by VE2AFC to the world leader whether or not the winner is a member of the French Union.

Also note that the JARL is now running an All Asian Phone Contest. This is in addition to the annual c.w. contest the last week-end in August. The first one will be on June 15-16. Details next month.

Information about "Armed Forces Day" will be found elsewhere in this issue.

73 for now, Frank, W1WY

PLEASE USE YOUR ZIP CODE

The Radio Amateur Satellite Corporation (AMSAT) is a non-profit, tax-exempt organization founded in the greater Washington, D.C. area five years ago. It is a membership organization open to all radio amateurs and interested non-amateurs. AMSAT's satellite programs are supported entirely from donations, membership dues, and grants.

Join AMSAT. Learn more about how you can participate with the exciting AMSAT OSCAR 6 communications satellite, and with the exciting AMSAT-OSCAR 6 communications satellite, and with OSCAR 7 which promises to be even better! Receive the quarterly AMSAT News letter with the latest information on this new ham radio frontier. For membership information, write the Membership Committee, AMSAT, P.O. Box 27, Washington, D.C. 20044.

1973 SP-DX Contest

US and Canada

All Band		21 mHz	
W1PL	**61,106**	**WB4NRI**	**1,518**
VO1AW	**44,010**	WA5ZWC	1,386
WA1NVR	40,180	WB4SPG	300
VE3EVK	16,343	**14 mHz**	
WA0KDI	9,828	**WB2FMK**	**12,836**
WA3ENM	5,472	**VE3EDC**	**7,812**
W4JUK	1,800	W8VSK	7,740
VE4MF	1,540	WA2DLV	2,340
VE2QJ	1,010	KL7HDX	1,026
		WA2ZWH	90

Propagation

BY GEORGE JACOBS,* W3ASK

LAST MINUTE FORECAST

Day-To-Day Conditions Expected For May, 1974

	Rating & Forecast Quality			
Propagation Index .....(4)		(3)	(2)	(1)
Date *May*				
Above Normal: 2, 10, 14-15, 27, 30	A	A	B	C
Normal: 1, 3, 7-9, 11-13, 16-17, 22-23, 25-26, 28-29, 31	B	C	D	E
Below Normal: 4-6, 18, 21, 24	C	D	E	E
Disturbed: 19-20	D	D	E	E

Where *forecast signal quality is:*

A—Excellent opening, exceptionally strong, steady signals.

B—Good opening, moderately strong signals with little fading or noise.

C—Fair opening, signals between moderately strong and weak, with some fading and noise.

D—Poor opening, signals weak with considerable fading and noise.

E—Opening probably not possible.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.

2. Using the above table, locate the appropriate *forecast signal quality* at the intersection of the *propagation index* found in step 1, and the appropriate date. For example, all openings shown in the Propagation Charts with a *propagation index* of (3) will have a *forecast signal quality* of C on May 1, A on May 2, C on May 3, D on May 4-6, etc.

For updated information dial Area Code 516-883-6223 for DIAL-A-PROP, or subscribe weekly to MAIL-A-PROP, P.O. Box 86, Northport, N.Y. 11768

DURING May, optimum frequencies for DX propagation are *lower* during most of the daylight hours, but *higher* during the late afternoon, early evening and nighttime hours, than were observed during the winter months. A considerable increase is expected in sporadic-E ionization during the month, and this should result in more frequent short-skip openings on the h.f. bands, and on 6 meters as well. A seasonal *increase* in the static level is also normal for May.

The following is an overall picture of h.f. amateur band openings expected during May, 1974. For specific times of DX openings, refer to the *DX Propagation Charts* which appeared in last month's column. This month's column contains *Short-Skip Propagation Charts* valid for May and June, as well as Charts centered on Alaska and Hawaii. The Short-Skip Charts contain propagation forecasts for openings varying in distance between 50 and 2300 miles. For day-to-day propagation conditions expected during the month, see the "Last Minute Forecast," which appears at the beginning of this column.

10 Meters: Except for an occasional daytime opening to some southern or tropical areas, not many DX openings are forecast for this band during May. The afternoon hours are the best time to check for DX openings. Frequent short-skip openings between distances of approximately 750 and 1400 miles, however, should be possible.

15 Meters: A seasonal decrease in DX openings is normal for May. Some fairly good openings still possible towards the south during the late afternoon and evening. Numerous short-skip openings, between approximately 600 and 2300 miles, should be possible almost daily.

20 Meters: This should be the best band for DX during May. Opening shortly after sunrise, good DX conditions are expected to one area or another, through the evening hours. The band may also remain open to southern and tropical areas through much of the nighttime hours as well. DX conditions should peak during the late afternoon and early evening, with openings possible to almost all areas of the world. Very frequent short-skip openings are also forecast for distances between approximately 350 and 2300 miles. Quite often, especially during the late afternoon, optimum conditions may exist for both short and long skip, and stations a few hundred miles away will be heard at the same time as DX stations from several thousand miles away, causing considerable QRM.

40 Meters: Fewer DX openings are expected becacse of the shorter hours of darkness and the higher level of static. Fairly good openings should still be possible, however, to several areas of the world from shortly before sunset, through the hours of darkness, until shortly after sunrise. Good daytime short-skip openings can be expected over distances of between approximately 150 and 750 miles, with nighttime openings extending up to the one-hop limit of 2300 miles.

80 Meters: Fewer hours of darkness and higher static levels are also expected to reduce DX openings on this band, but a few fairly good ones should still be possible. Check during the hours of darkness. Excellent short-skip openings are forecast for the daylight hours over distances ranging between 50 and 250 miles. During the hours of darkness, the short-skip range should increase up to approximately 2300 miles.

160 Meters: Propagation conditions on this band have passed their seasonal peak, and should decline until the early fall. Opening up to a distance of 1000 miles, or so, should be possible this month during the hours of darkness. An occasional opening well beyond this range may also

*11307 Clara Street, Silver Spring, Md. 20902

How To Use The Short-Skip Charts

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular Meter band (10 through 160 Meters), as shown in the left hand column of the Chart. For the Alaska and Hawaii Charts, the predicted times of openings are found under the appropriate Meter band column (10 through 80 Meters) for a particular geographical region of the continental USA, as shown in the left hand column of the Charts. An * indicates 80 Meter openings. Openings on 160 Meters are likely to occur during those times when 80 Meter openings are shown with a *propagation index* of (2), or higher.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of *days* during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) " " " between 14 and 22 days
(2) " " " between 7 and 13 days
(1) " " " on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

3. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. On the Short-Skip Chart appropriate *daylight* time is used at the *path midpoint*. For example, on a circuit between Maine and Florida, the time shown would be EDT; on a circuit between NY and Texas, the time would be CDT, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones, *add* 3 hours in the PDT zone, 4 hours in MDT zone; 5 hours in CDT zone; and 6 hours in the EDT zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 15 or 3 P.M. in Los Angeles; 18 or 6 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart are given in GMT. To convert to *daylight* time in other areas of the USA, subtract 7 hours in PDT zone, 6 hours in MDT zone, 5 hours in CDT zone, 4 hours in EDT zone. For example, at 20 GMT it is 16 or 4 P.M. in NYC.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; The Alaska and Hawaii Charts are based upon a transmitter power of 250 watts cw or 1 kw p.e.p. on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level; for each 10db loss, it will lower by one level.

5. Propagation data contained in the Charts has been prepared from basic data published by the Institute For Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado, 80302.

be possible when static levels are exceptionally low.

V.H.F. Ionospheric Openings

Sporadic-E ionization should increase considerably this month, and this is expected to produce some fairly good 6 meter short-skip openings over distances between approximately 1000 and 1400 miles. They are most likely to occur between 10 A.M. and 2 P.M. and between 6 and 10 P.M., local daylight time, although they can also occur at other times. During periods of intense and widespread sporadic-E ionization, two-hop openings considerably beyond 1400 miles may occasionally occur on 6 meters, and openings between approximately 1200 to 1400 miles may be possible on 2 meters! Refer to "V.h.f. Ionospheric Propagation," which appeared in the November, 1969 issue of *CQ* (page 37), for a do-it-yourself method for predicting v.h.f. sporadic-E short-skip openings.

The *Eta Aquarids* meteor shower should permit some fairly good meteor-burst openings for short durations on the v.h.f. bands between May 4 and 6. This is a major meteor shower, and it is expected to reach maximum intensity at about noon on May 5, with a predicted hourly meteor count in excess of 20.

While there is generally little auroral activity during May, some displays may occur during the radio storminess expected on May 4-6, 18-21 and 24, which may permit occasional auroral-type short-skip openings on 6 and 2 meters.

Sunspot Cycle

The Swiss Federal Solar Observatory at Zurich has published the definitive, or official monthly sunspot numbers for 1973, as follows:

Jan— 43.4	May— 42.4	Sep— 59.3
Feb— 42.9	Jun— 39.5	Oct— 30.7
Mar— 46.0	Jul— 23.1	Nov— 23.9
Apr— 57.7	Aug— 25.6	Dec— 23.3

The yearly mean was 38, the lowest since 1965. The highest level of solar activity during 1973 was observed on September 3, when the sunspot count reached 130. There were 27 days during the year when no spots at all were visible on the sun's surface.

These monthly numbers result in the following 12-month running *smoothed sunspot numbers,* upon which the sunspot cycle is based.

Jan. 1972	— 71	Jan. 1973	— 51
Feb. "	— 71	Feb. "	— 47
Mar. "	— 72	Mar. "	— 44
Apr. "	— 73	Apr. "	— 43
May "	— 73	May "	— 41
June "	— 71	June "	— 39
July "	— 68		
Aug. "	— 66		
Sept. "	— 62		
Oct. "	— 61		
Nov. "	— 59		
Dec. "	— 55		

A monthly mean sunspot number of 28 was reported for February, 1974. This results in a smoothed sunspot number of 36, centered on August, 1973.

A smoothed sunspot number of 21 is forecast for May, 1974, as the present sunspot cycle continues to decline slowly towards a minimum value.

73, George, W3ASK

CQ Short-Skip Propagation Chart

May & June, 1974

Local Daylight Savings Time At

Path Mid-Point

Band (Meters)	Distance Between Stations (Miles)			
	50-250	*250-750*	*750-1300*	*1300-2300*
10	*Nil*	08-09 (0-1) 09-13 (0-2) 13-17 (0-1) 17-21 (0-2) 21-23 (0-1)	08-09 (1) 09-13 (2) 13-17 (1-2) 17-21 (2) 21-23 (1) 23-07 (0-1)	08-09 (1-0) 09-21 (2-0) 21-23 (1-0) 23-07 (1-0)
15	*Nil*	07-09 (0-1) 09-13 (0-2) 13-17 (0-1) 17-21 (0-2) 21-00 (0-1)	07-09 (1-2) 09-13 (2-3) 13-17 (1-2) 17-19 (2-3) 19-21 (2) 21-00 (1) 00-07 (0-1)	07-09 (2-0) 09-16 (3-1) 16-19 (3-2) 19-21 (2-1) 21-22 (1) 22-07 (1-0)
20	09-20 (0-1)	07-09 (0-2) 09-12 (1-3) 12-17 (1-4) 17-19 (1-3) 19-20 (1-2) 20-23 (0-2) 23-07 (0-1)	07-08 (2) 08-09 (2-3) 09-12 (3-4) 12-17 (4) 17-19 (3-4) 19-20 (2-4) 20-22 (2-3) 22-23 (2) 23-07 (1)	07-08 (2) 08-09 (3-2) 09-15 (4-3) 15-20 (4) 20-22 (3) 22-23 (2) 23-07 (1)
40	08-10 (1-2) 10-19 (2-4) 19-21 (1-3) 21-23 (0-2) 23-08 (0-1)	08-10 (2-4) 10-15 (4-2) 15-17 (4-3) 17-19 (4) 19-21 (3-4) 21-23 (2-3) 23-08 (1-2)	08-09 (4-3) 09-10 (4-2) 10-15 (2-1) 15-17 (3-1) 17-19 (4-2) 19-21 (4) 21-23 (3-4) 23-02 (2-4) 02-04 (2-3) 04-08 (2)	08-09 (3-1) 09-10 (2-1) 10-17 (1-0) 17-19 (2-1) 19-21 (4-3) 21-02 (4) 02-04 (3) 04-06 (2) 06-08 (2-1)
80	08-10 (4) 10-18 (4-3) 18-22 (4) 22-00 (3-4) 00-06 (2-3) 06-08 (3-4)	08-10 (4-1) 10-16 (3-0) 16-18 (3-1) 18-20 (4-2) 20-00 (4) 00-06 (3-4) 06-08 (4-3)	08-09 (1) 09-10 (1-0) 10-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-3) 22-02 (4) 02-06 (4-3) 06-08 (3-2)	08-09 (1-0) 09-18 (0) 18-20 (1-0) 20-22 (3-2) 22-02 (4-3) 02-06 (3-2) 06-08 (2-1)
160	06-09 (4-1) 09-10 (2-0) 10-19 (1-0) 19-21 (3-1) 21-23 (4-2) 23-06 (4-3)	06-09 (1) 09-19 (0) 19-21 (1-0) 21-23 (2-1) 23-01 (3-2) 01-04 (3) 04-06 (3-2)	08-09 (1-0) 09-21 (0) 21-23 (1) 23-01 (2-1) 01-04 (3-2) 04-07 (2) 07-08 (1)	08-21 (0) 21-01 (1) 01-04 (2) 04-06 (2-1) 06-07 (1) 07-08 (1-0)

ALASKA

May & June, 1974

Openings Given in GMT†

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	*Nil*	*Nil*	00-02 (1) 02-04 (2) 04-05 (1) 12-14 (1)	*Nil*
Central USA	*Nil*	23-02 (1)	01-03 (1) 03-05 (2) 05-06 (1) 13-15 (1)	08-12 (1)
Western USA	*Nil*	00-02 (1) 02-04 (2) 04-05 (1)	00-02 (1) 02-04 (2) 04-06 (3) 06-07 (2) 07-08 (1) 14-15 (1) 15-18 (2) 18-20 (1)	08-09 (1) 09-14 (2) 14-15 (1) 11-13 (1)*

†See "How To Use Short-Skip Charts" in box at the beginning of this column.

*Indicates predicted 80 Meter openings. Openings on 160 Meters are also likely to occur during those times when 80 Meter openings are shown with a forecast rating of (2), or higher.

Note: The Alaska and Hawaii Propagation Charts are intended for distances greater than 1300 miles. For shorter distances, use the preceding Short-Skip Propagation Chart.

HAWAII

May & June, 1974

Openings Given In Hawaiian Standard Time†

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	*Nil*	12-14 (1) 14-16 (2) 16-18 (1)	06-08 (1) 10-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-22 (1)	19-20 (1) 20-23 (2) 23-02 (1) 21-23 (1)*
Central USA	*Nil*	12-15 (1) 15-18 (2) 18-20 (1)	04-06 (1) 06-09 (2) 09-14 (1) 14-16 (2) 16-17 (3) 17-19 (4) 19-20 (3) 20-21 (2) 21-00 (1)	19-20 (1) 20-21 (2) 21-01 (3) 01-02 (2) 02-04 (1) 20-21 (1)* 21-00 (2)* 00-03 (1)*
Western USA	13-17 (1)	09-14 (1) 14-18 (2) 18-20 (1)	04-06 (1) 06-07 (2) 07-09 (3) 09-11 (2) 11-16 (3) 16-19 (4) 19-20 (3) 20-21 (2) 21-00 (1)	18-19 (1) 19-20 (2) 20-22 (3) 22-02 (4) 02-04 (3) 04-05 (2) 05-07 (1) 19-20 (1)* 20-22 (2)* 22-02 (3)* 02-04 (2)* 04-05 (1)*

THE awards PROGRAM

BY ED HOPPER,* W2GT

Special Honor Roll
All Counties

#116—Wilbur F. Wilhelm, Jr., WA6OTV, 1-14-74.

USA-CA Honor Roll

1000		500	
WA4EPH	320	OK2-4857	990
K8SWW/ WØJSW	321	WA8RYT	991

THE May "Story of The Month" as told by Bob, is:

Robert G. Bosbach, K1CXP/W1BHV

(*All Counties #17, 1-2-70*)

"There are so many of you guys and gals responsible for my attaining *All Counties*, that individual acknowledgement would exceed Ed's allotted column space. However events surrounding the kickoff and final gun, really tell it all.

"In the summer of 1962, Bob, K1PMY, suggested operating portable from some rare New England County to help out the 'County Hunters'. Well I wasn't quite sure what those "County Hunters" needed help out of, but it sounded like a lark, so off we went. What fun, so before the year was out, Bob and I had a couple more CX-peditions in out logs. Typically we chose a county where the ham population was close to zero, and on a weekend convenient to us both, we would publicize our venture, including dates, time and frequencies. Often, setting up the portable would consume more time than contemplated, so frequently our times were a bit off.

"Most of the County-hunting in those days centered around the c.w. portion of the 40 meter band the c.w. pileups that greeted us on those portable operations won a new disciple for County-hunting. There were many portable operations in the early days of the program as the s.s.b. transceiver equipped mobile was still a novelty and it would be some time before the CH'ers would discover this new source for running up their county totals. But discover it, they did and when I stumbled on to the 40 meter s.s.b. mobile net in the fall of '63, they were already in full swing. These were the Independent County Hunters and you could search to the ends of the earth and not find a greater bunch of people.

"During the mid-60's there were fewer portable operations and more and more mobiles showing-up in the distant and exotic counties.

"About that time, Bob, K1PMY, moved on to better things out in Illinois so future operations were billed as a single on K1CXP.

"One of my last more ambitious trips was a four-day expedition thru central Maine, ending up in Oxford County. All had been running smoothly until arriving in that last stop. I experienced a little more than the usual difficulties stringing up the temporary antennas and was a little late meeting the 40 meter c.w. sked. Bushed and low on enthusiasm by this time, I half heartedly flipped the receiver bandswitch to 40 and tuned to 7035. My spirits sagged further as I was greeted by a commotion that covered 5 kHz each side of the sked frequency. Oh well, I thought, some DX stations had no doubt beat me to the frequency.

*P.O. Box 73, Rochelle Park, N.J. 07662.

Bob, K1CXP and "Future County Hunters," children of friends.

But then it registered, they were calling W1CXP/1 . . . blind. They had been waiting . . . all the stations I had worked on previous nights of the trip . . . the folks that made these trips worthwhile . . . chorusing their calls, holding the frequency and letting me know they were there. Needless to say the adrenalin started flowing again and I spent the most enjoyable evening of the entire trip, logging QSOs for Oxford County.

"In the meantime, the Independent County Hunters Net was growing and started a gradual move to 20 meters. The net really expanded on 20 and soon DX stations were checking in to work the mobiles. County Hunting had arrived.

"All the while #3079 began to look more and more attainable. Cliff, WB4FBS and Bill, K4LRX turned the trick when they undertook a major mobile CX-pedition thru eastern Kentucky just before Christmas of '69. The last three needed were on their itinerary, and Martin and Lawrence counties were worked, no problem. But by the time they reached Lewis, 20 had shifted and there was no-copy from one-land. I was resigned to waiting for another mobile-trip to pick up my last one and turned my attention to some last-minute Christmas shopping. I hadn't counted on Cliff and Bill chasing that one down for me though, and on December 21 at 2:15 A.M. EST, a ring of the land-line woke me from a sound sleep. Bart, K1IJJ up in Vermont passed the info that WB4FBS/M was in the area of Lewis and would swing over there if I showed up on the 75 net. I mumbled something that I hoped sounded like thanks to Bart and immediately checked into the 75 meter net with Clyde, WØYLN holding forth as NC. The early morning 75 meter static was building, but at 0814 GMT, with many thanks to Cliff and Bill, #3079 was worked. Some Christmas present!".

Awards Issued

Wil Wilhelm, WA6OTV hit the jack pot with *All Counties,* the 7th from the 6th call area to do this.

Charlie Lambert, WA4EPH sent along some interesting information (as usual) with his application for USA-CA-1000.

Arthur Geyer, K8SWW/WØJSW acquired first USA-CA-1000 endorsed All Novices (All A-1, naturally). He had received USA-500 which was #2 endorsed All Novices. Oh yes, Art also operates as ZF1AG and WR8AAA.

Josef Cech, OK2-4857 won USA-CA-500-#990, endorsed All A-1. Josef is the 1st s.w.l. outside US call areas/Canada to receive the Award and he wants to thank all who were kind enough to QSL to him, most difficult for s.w.ls.

Jim Baird, WA8RYT was issued USA-CA-500-Mixed.

Josef Cech, OK2-4857.

Awards

WØRR Two-Letter WAS Award: An Award certificate has been established by the Heart of America Radio Club of Kansas City, Missouri. It is available to those amateurs supplying proof of two-way contact with at least one other amateur radio station in each of the fifty United States having a two-letter call. A special endorsement is available where all contacts are made on a single band. Special acknowledgement is given where the Missouri contact is made with Club Memorial Station WØRR. Proof of contact may be established by any of the following means: 1. Direct submittal of qualifying QSLs to the Awards chairman, include sufficient return postage. 2. Submit original or duplicate copy of ARRL WAS certificate having two-letter endorsement. Copy will be returned with certificate. 3. Letter of application endorsed by officer of local radio club or two licensed amateurs who have verified proof of contacts. Submit application to Awards Chairman, Raymond D. Metcalf, WØJU, 4005 Red Bridge Road, Kansas City, Missouri 64137. Enclose one dollar or


WØRR
TWO LETTER CALLS
ALL STATES
The Heart of America Radio Club
recognizes and congratulates amateur radio operator
for his diligence and skill in establishing confirmed two way radio communication with at least one amateur radio station holding a two letter call in each of the fifty United States of America.
awarded this day. ,in Kansas City, Missouri

WØRR Two-Letter WAS Award.

Hall of Science Achievement Award.

equivalent in IRCs to cover cost of postage and handling.

Hall Of Science Operating Achievement Award: The Hall of Science of the City of New York, one of the Nations largest Science Museums, hosting over one million visitors each year, operates amateur radio station WB2JSM as a public exhibit where these visitors can see and participate in a station actually on the air. Many visitors are invited into the station and are permitted to go on the air, usually for the first time in their lives.

An attractive, free, award certificate will be mailed to those amateur stations who work WB2JSM and participate in these activities by talking to visitors, thus aiding in bringing the wonders and fascination of amateur radio to the public. The certificate is 8×10 and suitable for framing.

WB2JSM is on the air daily except Mondays, beginning at 10:00 A.M. EDST. On weekdays it is in operation until 2:00 P.M., but on Saturdays and Sundays until 5:00 P.M.

The station uses a tribander for 20 and 15 dipoles on 80 and 40 meters, up 165 feet, and fed by a 2 kw P.E.P. linear. Frequencies worked are usually in the General portion of the bands, with 20 and 15 the most used. All amateurs are invited to participate and win this certificate for their efforts in introducing amateur radio to the general public.

All stations having participated can obtain the certificate on request, noting QSO date to Box 1032, Flushing, New York 11352. Kindly send your QSL card for possible display.

Notes

In order to include some important items by Skip, WAØWOB, that appeared in the January *MARAC News-Letter*, please excuse me if I cut them to the bone. In a discussion with a local FCC Engineer, who is an active amateur, it was brought out that we as an amateur fraternity are fighting to retain the special privileges we enjoy on the air. FCC Commissioners see an item across their desks saying that the CB people had 900 citations against them and the amateurs had 800 during the same period. They do not realize that the CB citations are for serious and flagrant violations, while most amateur citations are for very trivial & minor infractions. One good example is for a mobile to sign "WAØWOB" Mobile, it should be "WAØWOB" Mobile /Ø or what ever district in which he is operating. Also the proper signature includes *both* station identifications. And regarding interference on the CH Nets. Regardless of provocation, you are responsible for your station and you most operate in compliance with FCC rules. We *don't* own any frequency and others have a right to be on the air. Most amateurs will respond to a polite request to QSY. If they refuse, perhaps it may be necessary for us to QSY. If we feel other amateurs are causing deliberate interference, someone *Must Record* that interference if enforcement action is to be taken. *Ask yourself* how your transmission would sound on that recording in court. We should be known by the good examples we set, *not* the bad examples we follow.

Last March when we recommended an article by Dr. J. Blasi the publication was inadvertently left out. I still recommend that you read the article called "The QSL from BY Land" which can be found on page 79 of the December 1973 issue of *73* magazine.

Through the kindness of Carter Glass III, W4JUK, I have received this information and newspaper clipping, that *Nansemond* City/ County of Virginia is no more! On January 1, 1974 *Suffolk* became the fourth largest city, in area, in the U.S. Totaling 430 square miles it is now smaller only than Los Angeles (458), Oklahoma City (647), and Jacksonville, Fla. (827). However, even when it officially merged with Nansemond, it had less than 50,000 residents. So *now*, the Independent City of *Suffolk* should count for Isle of Wight *or* Southampton. Complete data on Independent Cities was in Septemper 1973 issue of *CQ* with corrections/additions in January 1974 issue of *CQ*.

Now regarding *Ormsby* County/*Carson City*, Nevada. Although the 1973 edition of *P O D 26*, still lists Ormsby as a county and the Capitol of Nevada, Carson City as it's only municipality, starting back in 1972 I was receiving information that Ormsby no longer existed. Telephone calls to the City Fathers confirmed the fact that Ormsby was no more, but no one understood what an Independent City was, so I continued to count Carson City *or* Ormsby the same. Now via the courtesy of Jack, WØSJE and Joe, W7ABX I have some additional data and will consider *Carson City* as an *Independent City*

[*Continued on page 70*]

SURPLUS sidelights

BY GORDON ELIOT WHITE*

A "new" item has surfaced in the surplus markets recently, the Collins' R-648/ARR-41 receiver. After a long run of over-specialized surplus, the ARR-41 has finally turned up, an eminently usable piece of gear for amateurs or s.w.ls.

This receiver is of course not really new; it came along in the mid-1950's as an aircraft set for general purpose use in multi-engine planes which carried radio operators. It is capable of receiving a.m., c.w., or FSK (RTTY). Frequency coverage is 190-550 kHz and 2-25 mHz.

The design sprang from the same roots as the familiar Collins' R-389, R-390, R-390-A, R-391 and R-392, a family of low and high-frequency sets based on the permeability-tuned oscillator which Arthur Andrews Collins designed some twenty-five years ago. Like the R-390, the R-648/ ARR-41 has a digital tuning readout and great accuracy in tuning along with excellent stability.

Collins, incidentally, has lost control of Collins Radio, and the company is now part of Rockwell International. Like many radio investors, Arthur Collins cared more for his brilliant technical work than for the mundane business of business. Technological supremacy carried Collins Radio through the post World War II era, but it floundered when inflation, military spending cuts, and tight money struck together in recent years. There is still a Collins Radio, but it is now a division in the Rockwell conglomerate empire.

Back to business.

The ARR-41 has begun to appear in surplus bid lists, and in dealers' hands. I hesitate to mention prices, but since it requires 28 volt power, and is designed for an aircraft mounting, the ARR-41 probably will not command the high price of the R-390. There will not be as many around as there have been of the long-lived R-390, either.

I have most recently heard from reader Charles Minot Jr., of Woodbury, N.J., that Selectronics, in Philadelphia, had some sets. It may be that they will have been sold by the time this column is published. But ARR-41's are appearing elsewhere.

It looks as though the ARR-41 may be a very nice set for the man who can brew up a rather simple power supply. Fig. 1 shows the original dynamotor system, which may be replaced by a transformer-rectifier set reasonably easily. Note that the B+ voltage is only 250, standard dynamotor supply. The receiver requires a regulated 150 volts d.c., and a small amount of 31 volt d.c. bias.

Tube filaments may be re-wired for six or twelve volts, or a 24 volt transformer used to supply the original voltage. Twenty-four volts are required for the ovens.

The ARR-41 is, of course a superheterodyne design. Double-conversion is used throughout its coverage except single-conversion on band two, 2 —4 mHz. (For those who think it is unnecessary to mention "superhet" these days, I can only say that it is not all *that* long ago that tuned-radio-frequency sets went the way of the dodo. Some are still turning up in surplus. Radio design engineers will tell you that for absolute ultimate sensitivity. TRF had it all over a superhet.)

Sensitivity of the ARR-41 is rated at 5 microvolts for 100 milliwatts audio output. For an h.f. receiver this is about all the sensitivity that you can use. Unfortunately I don't have signal to noise figures on the set.

Old-timers will recognize the ARR-41 as rather like the BC-348 WW II aircraft "liaison" sets in general appearance and dimensions. This is probably not a coincidence, since the ARR-41 was the liaison set of the 1950s and 1960s.

Unlike the BC-348, the ARR-41 has mechanical intermediate-frequency filters and 100 kHz crystal checkpoints.

Tuning is via the usual Collins' variable i.f.-multi-crystal system, a veritable forest of cams, tuning slugs, rods and springs. Hopefully, no one will twiddle with the adjustments and need to do a full alignment. It must be possible, but like re-calibrating a BC-221 frequency meter—you wouldn't want to try it.

heated thermostatically controlled over (HR-750), while over HR-1500 stabilizes the permea-

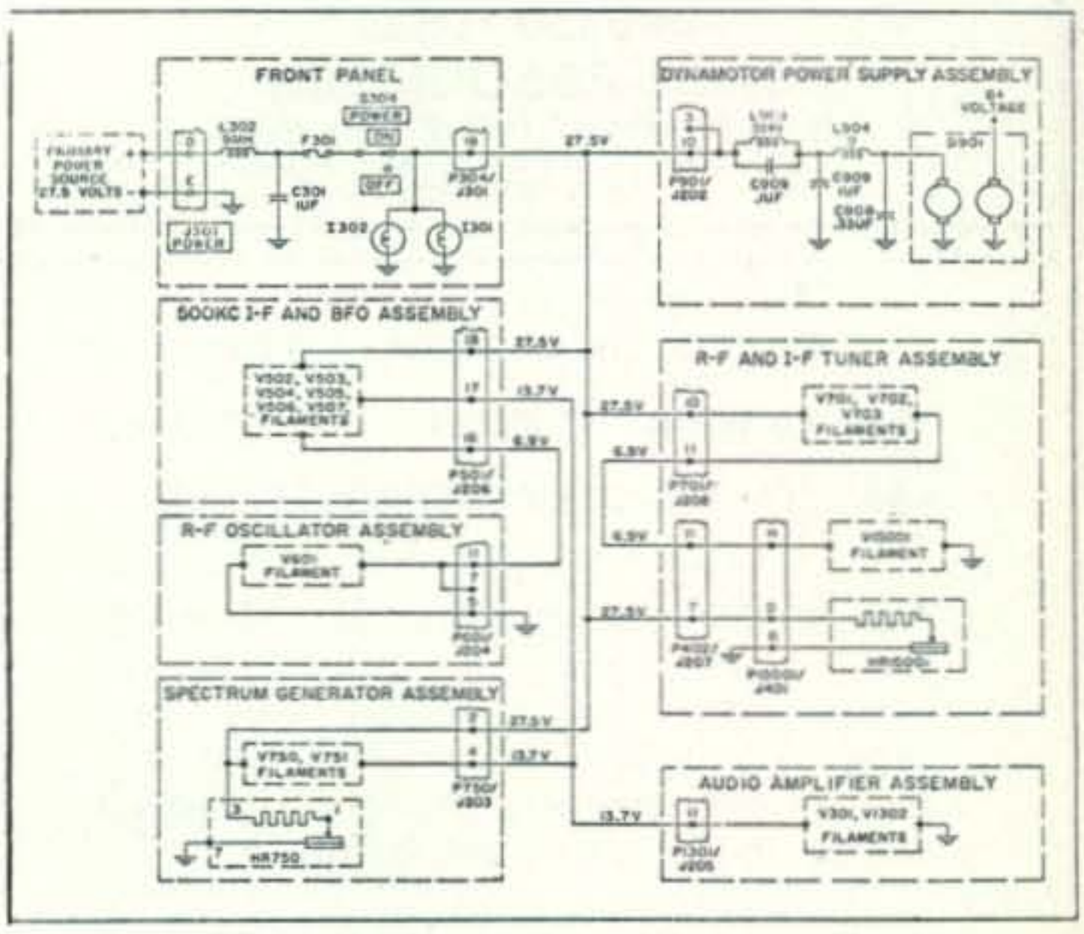


Fig. 1—Primary voltage distribution.

*1502 Stonewall Rd., Alexandria, Va. 22302

bility tuner. The ovens do require 28 volts, by the way.

In disassembly, if required, by the way, the permeability-tuned Collins oscillator must be set for 190 kHz for removal. One of the set screws of coupler 0444 is inaccessible until the tuning is rotated slightly beyond 190 kHz, but the 190 reading must be re-set before removing the assembly. Generally modules are retained by green-painted captive screws. The pesky set screw mentioned above requires a #10 Bristol (fluted Allen) wrench.

The full ARR-41 diagram is too large to be reprinted here. ■

Awards [*from page 68*]

and contacts with Carson City may be used for Douglas, *or* Lyon, *or* Storey, *or* Washoe Counties—but *only* for *one* and only *once*. Thanks to all who passed along this data.

Dave Manescu, W6CCM of 13227 Beechtree St., Lakeside, California 92040, proposes (with help from others) to compile a listing of all members of the ICHN, MARAC and any others that share our common interests as County Hunters, and make it available at a minimum price to all. In addition to the listings (hope is for at least 750 County Hunters) it is hoped to include other information of interest to all. The target date is July 1975, but all information is needed as soon as possible. The pre-publication cost is $2.50. Please send s.a.s.e. to Dave for application/questionnaire and more data.

73, Ed, W2GT

FM [*from page 47*]

distance of five miles, this would require an ERP of nearly 500 watts!

In my opinion, the antenna gain and the antenna height are probably more important in most situations and a fairly simple antenna capable of delivering a legitimate six db gain can be had for about ten bucks. A v.h.f. power amplifier capable of raising a ten watt signal to 125 watts output will run you about $190 to buy and a bunch of headaches to build. The point that I think can be drawn from all of the above jazz is simply that running high-powered amplifiers on v.h.f. may or may not buy you enough on a "dollars per watt" basis to make them worthwhile. The real value of the power amplifier in f.m. becomes clear in any situation where antenna gain cannot be increased and/or antenna height cannot be improved. What do you think???

Philosophy Of The Month

If amplitude modulation techniques were so great (including s.s.b.), how come the Unified S Band system as used in most of the Space Communications of the last ten years uses f.m. and p.m.?

73, Norm, W2JUP

Armed Forces Test [*from page 40*]

in aligning and adjusting of equipment by the operator, and serves to demonstrate the growing number of amateurs becoming skilled in this method of rapid communications. The transmission will be as follows:

Transmitting Station	Frequencies (kHz unless otherwise indicated)
WAR—Army	4030, 6997.5, 14405
NSS—Navy	4012.5, 7385, 14385
NPG—Navy	4010, 7347.5, 13922.5, 148.410 mHz
AIR—Air Force	7315, 13997.5

Submission For The Special 25th Anniversary Certificate

A special certificate in observance of the 25th Anniversary of the Armed Forces Day Communication Tests will be awarded to any participants who can show proof that they have taken part in all 25 of the annual tests. To verify the annual participation, participants should submit to the address listed below, facsimilies of one QSL card and/or certificate awarded for the receiving tests for each year. Originals should not be submitted as they will not be returned.

Submission Of Test Entries

Transcriptions should be submitted "as received". No attempt should be made to correct possible transmission errors.

Time, frequency and call sign of the station copied as well as the name, call sign (if any) and address, including zip code of the individual submitting the entry must be indicated on the page containing the test. Each year a large number of acceptable copies are received with insufficient information or the necessary information is attached to the transcription and was separated, thereby precluding the issuance of a certificate.

Entries should be postmarked no later than 25 May 1974 and submitted to:

Armed Forces Day Tests
Chief, Navy-Marine Corps MARS
4401 Massachusetts Avenue, N.W.
Washington, D.C. 20390
Mail Stop 394

Coax [*from page 39*]

on the table so that you can keep your hands off the grid dipper without affecting the dip. You can then easily tune the receiver and determine the grid dippers signal frequency.

This 100-foot line could have been checked as a quarter wave in the 1.8 mHz range with one end of the line open. Further, you could have checked it in the 7.8 mHz range as a 1-wave length of coax with the opposite end *shorted*. You might find that it doesn't come out exactly on frequency, but usually it does.

Cutting To Specific Lengths

In most cases you will be cutting to specific lengths. For example, what length should I cut solid dielectric coax (Vel. Fac. .66) so that it will be *some* half wave multiple at 14.25, 21.375 and 28.5 mHz for a tri bander beam?

First, determine your minimum physical length. Let's assume it is 87 feet. Find what multiple of the lowest frequency half wave will just exceed 87 feet. The half wave length is 22.78 feet, and 4 times this equals 91.14 feet. Six times the 21.375 mHz half-wave length of 15.19 feet is 91.14 feet, and 8 times the 28.5 mHz half-wave length of 11.39 feet is 91.14 feet. As you can see, it is a half wave multiple on all 3 frequencies. To be certain, start with about 93 feet (with a PL-259 connector at one end). Strip back the insulation about one inch on the other end and short out the center conductor to the shield. Screw on one of the Glanzer "short-shorts" illustrated in fig. 2 (the shortest "short-short" #3) on the PPL-259 for grid dipping purposes.

Next tune the receiver to 14.25 mHz and turn on the b.f.o. Now hold grid dip coil near the "short-short" as shown in fig. 4. Tune the grid dipper through a range of 13 to 15 mHz. At a frequency somewhat lower than 14.25 mHz you should get a dip on the meter (since the feedline was cut about 2 feet longer than needed).

Just for the exercise of determining what frequency it should grid dip at with this length, lets plug the 93 feet into the formula and see what it is.

$$Freq. = \frac{492 \times .66 \times 4}{93} = 13.96 \text{ mHz.}$$

So if the meter dips at 13.96 mHz, the velocity factor is .66 and you could then cut off 1.86 feet and be reasonably sure it will be resonant at 14.25 mHz. However, cut off 1 foot and redip (be sure to short out the far end each time you make a cut). Now here is where some mental gymnastics come into play, but once you get the hang of this, you can do it quickly.

With a 92-foot length it "should" grid dip at 14.11 mHz. Set the receiver at 14.25 mHz, and set the grid dipper at about 13.5 mHz; then slowly increase the frequency to pass through the dip. Listen for the beat note of the grid dipper and the b.f.o. on 14.25 mHz. The term I use for this occurence is "dip-blip." Since the "dip" came *first* it means that the resonant frequency of the feedline is *lower* than the "desired" frequency. So you continue to cut off an inch or two (experience and a few mistakes will guide you on "how much" to cut), and repeat the measurement. The "dip" and the "blip" should be closer together as you pass the frequency range of the grid dipper through its range from below to above that of the feedline resonant length. When the right amount is cut off, you will get the "dip" and the "blip" at the same time. If you cut off too much, you will get a "blip-dip". Hence, the warning to cut off small amounts when you get close. But a small error is not serious. If you should start at a frequency higher than the desired resonant frequency and gradually lower the frequency of the grid dipper, the order of the "dip" and "blip" will be reversed. Use one method and the chances of getting your "blips" and "dips" confused are eliminated.

You could have calculated the frequency that this feedline was for a quarter wave and grid dipped it there; that would have eliminated the need of shorting out the end of the coax each time. That frequency would have been

$$Freq. = \frac{246 \times .66 \times 1}{91.14} = 1.781 \text{ mHz.}$$

Since some receivers may not tune that low, this frequency would prevent an accurate frequency measurement. The feedline would have to be checked at some frequency near 14.25 mHz as a quarter wave (odd) multiple but it would be out of the band (16 mHz) and a general coverage receiver would then be needed.

Now if foam coax was used, with a velocity factor of 0.83, 3 half waves equals 85.97 feet and the line therefore would not be enough. Actually, 114.6 feet would be needed for half wave multiples on all frequencies even though a physical length of only 87 feet was needed. These are some of the important considerations that you should keep in mind. ■

Lightweight Yagi [*from page 36*]

sions. It is much lighter and much stronger. and the wind loading is considerably less due to the size and taper of the elements. S.w.r. at resonance is less than 1.05:1 and does not exceed 1.2:1 across the band. This and the ease of adjustment are the two big advantages of wide spaced arrays. The beam has a power handling capability of 2 kw

PEP. The cost is higher than that of the all aluminum type array, the difference being offset, however, when weight, windload and strength are considered. This type of construction could lead to some really lightweight Long-Johns. When fiberglass poles become available in longer lengths spectacular low band, highly directive, full sized arrays are entirely feasable. ■

Math's Notes [*from page 49*]

crystals can be handled by this method by simply adding two more resistors per crystal.

Fig. 5 is a schematic diagram of an r.f. switch that could be used to switch various stages in a receiver or transmitter into and out of a multiplier chain for example. With negative d.c. voltage at the control input, CR_1 will be reverse biased and L_1 and C_1 which should be chosen to resonate at the operating frequency, will offer a high impedance to the energy at the input. The two r.f. choke coils are used to present a d.c. path for the diode voltages while C_3 assures that L_1 will not shunt any diode current.

Now, when the control voltage is made positive, CR_1 is forward biased and conducts. This effectively shorts out the tuned circuit allowing r.f. to easily pass through the circuit.

By coupling two such circuits together as shown in fig. 6, a very simple antenna changeover switch can be made that should be very useful in portable equipment as its power drain is minute. See you next month.

73, Irv, WA2NDM

RME Story [*from page 33*]

tional and Hallicrafters, and the company decided to make a low cost version of the RME-69 which incorporated metal tubes and a noise silencer. The new receiver was named the RME-70 and had a very short life, as production was abruptly stopped after war was declared. The company switched over to military work, producing signal generators and ship radio equipment for the Navy on a 7-day-a-week basis, employing as many as 120 employees at the peak of production.

After the war, RME brought out the RME-45 and RME-50 receivers as well as the VHF-152 converter for 6 and 2 meters, in addition to a variety of other products (fig. 9).

However, as Shaw recollects, the original owners had been in business for 22 years and by 1953 Shaw decided to return full time to Bradley University to take up the work he had so abruptly dropped in 1928. The

Fig. 8—E. G. Shalkhauser (left) and R. M. Planck examine the post-war RME-45 receiver at the Chicago ARRL Convention of 1948.

owners looked about for some sort of merger or consolidation with another manufacturer who could carry the load and allow them to live at a more leisurely pace. Finally, the company was merged with *ElectroVoice* in 1953 and Shaw returned to teach and work at the University until 1969, when he retired to devote his full time to ham radio, fishing and photography. Russ Planck stayed with the RME division of *ElectroVoice* for a number of years. The factory was moved to Washington, Illinois. Gradually, as the electronics picture changed, the name RME faded out of the picture, as happens in so many mergers, until all that was left was the memory of the fabulous receivers, still a talking point when old timers get together to review the Golden Years of amateur radio! ■

Serrana Bank [*from page 29*]

The navigator had become so lost in the Caribbean that he was not able to find San Andres, and it was only by spotting the lights of San Andres 62 hours after departure, that we were able to find the Island on our return. The navigator lost his license and was last seen scurrying for the next flight out of San Andres.

I was convinced that the trip was worth salvaging and that all we needed was a good navigator. Unfortunately, because of time and other problems, (namely XYL's), only

two others could be convinced to join me in another effort. Tod was great and decided he would cancel all other charter commitments and provide the boat again for our use. He agreed to absorb most of the expenses from the first unsuccessful effort. Just to be safe, he examined the fuel tanks and learned that there was *not* a drop in the tanks! He discovered a fuel leak and had it repaired at the last moment. Francisco located another navigator through his good friend Alfredo (also an HKØ). Now, already too late for the *CQ* contest, we set out again for Serrana Bank on October 30th, and by November 1st we arrived at the "Bank" and began loading our rubber raft with equipment. To our chagrin, we discovered the outboard motor would not start, so we were forced to devise a makeshift rope-pull system to the Bank. A contingency of four Colombian Marines had been detached to the island to protect its waters from poaching fishermen, and to welcome the American DXpedition. Fortunately for us they were extremely helpful in pulling the equipment to the higher ground near the lighthouse structure. It took almost four hours to land sufficient equipment to put a station on the air. However, we soon discovered that our generator would not function, so back out to the boat we went to get our second generator.

On The Air

By nightfall we were on the air! We had each made a contact, when, without warning we had 50 mile an hour winds and a tropical down pour. The wind blew rain into the tent and shorted our Collins equipment in a matter of minutes. Now, with three contacts in the log and pile-ups standing by, we drew straws to determine who would venture into the dark night, trek down the hill, climb into the raft, and travel back to the boat through heavy seas and shark infested waters for a new rig. Pete lost! By 11 P.M. we were back on the air to stay. However, Pete had learned from the boat crew that the engines would not start and that we may have problems in trying to return to San Andres. What an understatement that turned out to be!

Pete's uncanny mechanical abilities allowed him to fix almost everything including our generators and previous minor boat engine problems. But the boat engine prob-

lem required parts and materials unavailable on Serrana Bank. Pete was unable to return to the boat that day due to severely swollen ankles and feet as a result of sunburn and exposure. I took a look at the engines and could only shake my head in utter despair. There was considerable water in the fuel tanks and even I knew that water and diesel fuel don't mix. Besides, the pilot had run the batteries down, so there wasn't enough juice left to start anything. But, Pete spent the last day on the island trying to do the impossible, and he almost did! On October 3rd, Pete spent nearly 8 hours working on the engines, and finally he succeeded in getting it started, just long enough for us to load our gear aboard and travel about 100 yards into the dark night. Then, to our chagrin, the engine stopped and we slowly and helplessly drifted away from our only refuge, Serrana Bank. Two days later we were picked up by a Colombian gun boat. It was the trusty and reliable Signal One CX7A that kept us in maritime mobile communications with San Andres Island and Canal Zone to direct a rescue effort, that is, until the last evening when our last generator finally gave up and refused to operate.

When told by the Colombian Government on San Andres Island that a rescue operation would cost him 30,000 pesos ($1,500.00), Tod Hoffman just gulped and said "Go get the boys," and so we were picked up by a Colombian gun boat and taken, guess where? Right back to Serrana Bank. We were told that we would be put back to shore, and our hopes of seeing home seemed thwarted again. But, at the last moment, we were told that the gun boat had finally received orders to tow us back to San Andres.

The officers and crew of the Colombian gun boat were very friendly and treated us as honored guests. The Captain even made a personal visit to our disabled vessel, just to see the "wonder rig" he had heard so much about, the Signal One. He was very impressed. Captain Jerry (KZ5JF) seemed to know quite a few top Colombian officers, and this, together with his fluent Spanish, facilitated and made more pleasurable our return to San Andres.

In spite of all the above problems, we all came out of it healthy and satisfied with the knowledge that the three of us had given almost 2,000 Amateurs throughout the world a chance to work KS4 for possibly the last and final time.

Oh yes, one thing remains, a settlement or lawsuit with a certain large United States Oil Company that was responsible for providing watered fuel to a bunch of hams on a DXpedition. An examination of the engine and fuel tanks by Colombian officials revealed 30 gallons of fresh water in the fuel tanks. This last matter is my responsibility.

On the return trip to Panama from San Andres Island the two engine aircraft developed engine problems and had to make the trip on a single engine, and, in landing, had to cut even that engine and glide to a landing. The sight of the runway filled with ambulances, fire equipment and other rescue equipment seemed an ironic, yet appropriate way to conclude our trip. ■

Announcements [*from page 8*]

swap tables. Prizes for the entire family! Contact: Lee L. Kanarian, K4WXS, 6100 Gulfport Blvd., So. St. Petersburg, FL 33707.

Wabash, Indiana

The Wabash County Amateur Radio Club presents its 6th annual Hamfest on May 19th, 1974. It will be held at the 4-H Fairgrounds, Wabash, Indiana. Rain or Shine! Flea Market, Bingo, & Hourly prizes from 10am to 2pm. For more information contact: Jerry Clevenger, WA9ZHU, RR 4, Wabash, Indiana 46992.

Trenton, Tennessee

The Annual Humboldt ARC Hamfest is Sunday, May 19, at Shady Acres City Park, Trenton, TN. Ladies Activities, Flea Market, and a playground for the children. For information contact: Hugh Wardlaw, WB4SLI, 2678 Cole Drive, Humboldt, TN, 38343.

Covington, Kentucky

The Northern Kentucky Amateur Radio Club Ham-o-rama will be held Sunday, May 26, 1974, at Boone County Fairgrounds, Burlington, KY. The hours are from 8am to 5pm. Indoor exhibits, Prizes and Flea Market. For more information contact: W4PII, 601 Rosemont Ave., Covington, KY 41001.

Greenville, South Carolina

The Blue Ridge Radio Society of Greenville, S.C. will hold its annual Hamfest on May 5, 1974, at the Recreation Building in Cleveland Park, Greenville, S.C. Prizes and Flea Market, from 9am til 3pm, for more information contact, Don Rose, W4ZKH, 11 Ivanhoe Circle, Greenville, S.C. 29607.

Kansas City, Missouri

The P.H.D. Amateur Radio Association would like to announce that the Fifth Annual North West Missouri Hamfest will be held at Kansas City, Missouri on Sunday, May 5th. Activities will begin from 9am to 4:30pm at the Kansas City North Community Center, 3930 No. Antioch Rd. For more information, contact: Gordon Wright, KØHAS 5404 N. Bennington, Kansas City, MO 64119.

The 2 meter leader that's crystal clear!

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POWER REQUIREMENTS: 12 to 14 VDC
Current Consumption at 13.5 VDC:
Receive: 4 amps squelched, 1.2 amps unsquelched.
Transmit: 6 amps max.

DIMENSIONS: 7⅜" x 3½" x 9¼" deep; 4 lbs. net weight.

RECEIVER

TUNING RANGE: 146.00 to 148.00 MHz, continuously tuneable with reset capability of approx. 1 KHz to any frequency in range.

SENSITIVITY: .35 μv max. for 20 db quieting; .1 μv for reliable squelch action.

SELECTIVITY: 11 KHz at 3 db; Less than 30 KHz at 70 db. Adjacent (30 KHz spaced) channel rejection more than 70 db.

AUDIO OUTPUT: 2.0 watts (min.) at less than 10% THD into internal or external ohm speaker.

TRANSMITTER

TUNING RANGE AND CONTROLS: Same as RECEIVER.

POWER OUTPUT: 25 watts Min. into 50 ohm load. P/A transistor protected for infinite VSWR.

MODULATION: Internally adjustable up to 10 KHz deviation and up to 12 db peak clipping.

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SEND MAIL ORDERS TO DEPT. SQ-1
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QRP [*from page 52*]

Operating Techniques

Generally, your signal will be weaker than most others—except for stations right in your "hop" touchdown point—you may be 57-59 for them. Develop a sense of where to operate under existing band conditions. When 20 and 15 are open, don't fear to wade right into the thick of battle if you have 5 watts out to a high gain antenna. With 1 watt output, it is best to stick to the fairly uninhabited parts of the band. On 40 and 80, unless you have a really hot antenna and 5 watts, stick to the uninhabited edges of the crowded portion of the band. Last year I was able to fight it out right in the middle of the thickest part of the battle—but consider that 8JK up 50 ft.!

Use the highest band that is open at the time. Switch down to the next lower band once the QSO average slows down over a half-hour period. During darkness, one can hop between 80 and 40 meters at will—again, QRN on 80 will determine this.

Some stations do give honest reports, but most don't—it'll be 599 regardless. If a guy does give you a lower report, he may be honest, so base your exchange speed and repetition accordingly. If a weak report is received, *do* repeat both elements of your exchange several times to avoid the need for a repeat transmission. If the station snaps right back to your call, give a quick 2×2 report. Clean keying is important, usually about 15-20 w.p.m., unless QRM is high, in which case a slower, deliberate speed will be more effective. Don't be sloppy at any speed!

When you sense that the path has optimized to a certain area, run it for all it is worth.

Expectations

Frustration and fatigue are two common experiences of the QRPp operator in the field. Both are psychological. The important thing is to keep your eye on the *hourly average* as it stretches over several hours. It is typical to run "dry" for twenty minutes, and then all of a sudden make up for it with a few rapid contacts. The average is the thing to watch!

1 watt: With a dipole and good band conditions, should run about 10-12 QSO's per hour on 20/15 meters. When band peaks, can go as high as 20-25 QSO's per hour. Expect "dry" stretches. but make up for them during "peak" periods each hour. Expect a rougher time on 40/80 meters. No guarantees for daytime operation—although I've had one run of 29 QSO's in an hour when a "pipeline" opened to NJ when I was in OH. Nightime—8-12 QSO's per hour is good.

5 watts: About 15 QSO's per hour on 20/15 is good. Peaks can run into a contact every minute or two—and can go as high as your skill will

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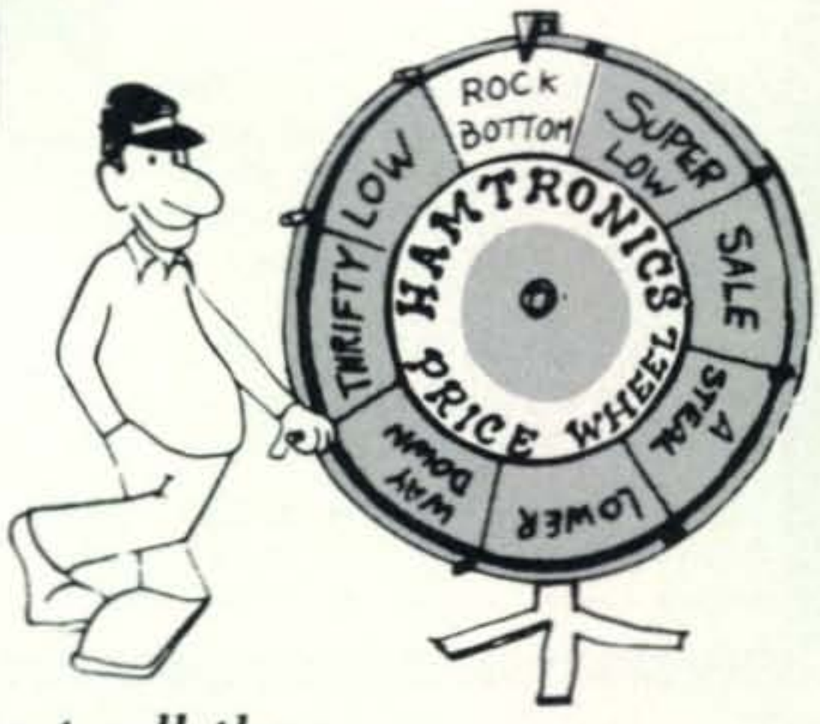

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hmmmm . . . oh yeah, ahem, the point of this picture is, ah . . . bikini . . . ah, no, *The Milliwatt* Field Day Trophy is on the left, or right . . . or beautiful . . . and in front of the other side is QRPp DXCC Trophy #1. Oh yeah, in case you overlooked her while drooling over the trophies, that's former *Milliwatt* staffer Karen Thomas holding them. In case your overlooked her . . .

permit. If you have a really good high gain antenna up in the clear, you can expect to run at your limit of endurance for a couple of hours at least. On 40, daytime should net at least 10 per hour. Night should push that up to 15-18 per hour.

I cannot stress the importance of the antenna too much. The difference between operating with a dipole and an antenna exhibiting 7dB gain is immense—like the difference between night and day! So concentrate on the antenna and erect one that will boost your signal if at all possible.

Milliwatt Field Day Trophy

For those of you who need a bit more motivation than can be provided by the beauty of nature, *The Milliwatt Field Day Trophy* can provide that motivation. This handsome award goes to the QRPp station posting the highest score. Scoring same as ARRL, except that the one watt output category uses a $\times 5$ power multiplier (five watts out uses $\times 4$), with a 1.5 full battery power multiplier, plus a 150 point bonus for full portable setup away from the home shack. Send only a duplicate of your ARRL contest entry sheet, and indicate power output category and multipliers claimed. To K8EEG at address elsewhere in this column. Whatever your bag, be sure to get out under the blue sky and enjoy amateur radio at its best during Field Day!

73, Ade, K8EEG/Ø

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FLEA MARKET/AUCTION/PICNIC! Hall of Science Radio Club annual event Saturday June 8, 10a.m. - 4p.m. Flushing Meadow Park Queens, 111th St. 48th Ave. Rain date June 15. Admission $1.00 sellers $2.00 no commissions. Auction service at 10% fee. Free parking. Zoo, Childrens' Farm, Golf, Boating, Museums adjacent. Info, (212)-699-9400 or write Box 1032, Flushing, NY 11352.

FCC test answers general, advanced, extra, $5.00. Specify. Dixie Tec Box 8352 Savannah, GA 31402.

Urgently need for school science project: Hammarlund HR-10 or SP600 VLF; any ARC-5 receiver, especially BCB or 6-9; Rustrak tape and recorder. Call person-to-person collect, Bob Ammons, (406)-543-5359 or write 411 Keith, Missoula, Montana, 59801. Any reasonable price.

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SELL: Mint Condx. Knight TR-106 6m Xcvr with 3 xtals. $69. WB6AKE, Ron Trostel, 2113 Havemeyer Lane, Redondo Beach, CA 90278.

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VACUUM VARIABLES: Jennings CUFC/CVHC 650, 800, 1200, 1600pf. .014UF 50KV pulse caps. Smith Co. 1220 S. 49th St. Richmond CA 94804.

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WANTED: 75S3B or C. 312B5. Teruo Fujimoto, 96A Prospect St. Manchester NH, 03104.

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SELL: Sixer $29. Speech processor, $10. Color TV converter $50. E-200C signal Gen. $40. Bob Sherman, K2SJP, 350-65th St., Brooklyn, NY, 11220.

FOR SALE: SB200-Excellent condition; $185.00. or trade for HR2. Deliver within 200 miles. WA4SIH 3914 Haley Road, Martinez GA 30907.

WANTED: CW Filters for Collins 75S-3B. I'll pay shipping. WA9UCE/6, 555 W. Middlefield, H-103 Mountain View, CA 94043.

WANTED: A used all band Ameco Converter CMA and a Ameco Model-PT Tranceiver Preamp. 160 thru 6. Billy Mobray, K5YBQ, Box no. 1 Keys, OKLA, 73947.

FOR SALE: 1 Swan 260 Cygnet AC/DC/Speaker built in; $285.00. 1 Swan 500 transceiver AC Power Supply; $454.00. 1 Swan 350C with AC Supply/Speaker/DC Mod; $463.00. Postage/Insurance paid. May consider trade; all letters answered. Ron Conley, K7LTV, 37 Wyoming Ave., Billings, MT 59102. (406)-259-9554.

WANTED: Swan BHF-150; Sell/trade SSTV, VHF/UHF and Test Gear, list SASE. W4API, Box 4095, Arlington, VA 22204.

SELL: Collins KWM2A, KWM2, PM2, and 312B5, 32S3, 516F2. All Round Emblem. Marty (215)-884-6010. WA3IFQ.

SELL: Hammarlund HX50 SMTR $160 FOB. Johnson TR Switch $15 FOB. List SASE. WB9BXX Box N, Gridley, IL 61744.

WANTED: Books and used correspondence courses on transformer design. Donald E. Chapman, 1621 W. Division St., Chicago, IL 60622.

FOR SALE: Receivers, HQ-140C, $75; 75A1, $100. Both, $150. Long Island vicinity deal preferred. K2GMF, (516)-473-1261. Tom Lopez.

WANTED: Collin, Drake rcvr late ser. or R 390 and an/Air 5, perfect condition. H. Ottosson, Box 2104, Gothenburg 2, Sweden.

WANTED: Call book Amateur U.S.A. 1972-1973, (Last year), Good condition (Mint). Will pay $4.50 PPD. Edwin T. Buttner, 156 Jackson St., Garden City, LI, NY 11530.

WANTED: Old radio parts, tubes catalogs, equipment from 1928 and earlier. Will pick up within 300 miles of Kingston, NY or will pay shipping. Quote price in first letter. J. Doak, W2GHF, 45 Allen Dr. Woodstock NY 12498.

FOR SALE: Conar-25 watt xmtr, 80, 40 and 15 meters, $20. JG Swaney, W8UAB, 10534 California Ave., Aurora, OH 44202.

FOR SALE: Star 700 rcvr & Star 300 watt pep xmtr, 80-10 mtrs, xclnt condx, $790, yours for $395. Silbert, White Sulpher Springs, NY 12787.

REWARD for missing QSL cards sent to my QSL manager "Scotty". Jack Daugherty, 9V1QJ, 45 W. County St., Hampton, VA 23663.

SELL: Magnum six processor, TR4 series. Never used plus postage. W6TCQ, 5014 Mindora Dr. Torrance, CA 90505

FOR SALE: Viking Challenger Transmitter, 80-6 with Viking 6N2-VFO, $75.00. WA9AXA, 201 E. 59th St., Westmont IL 60559.

WANTED: Filter for 75A1 500Hz or info. on converting for other filters. Also, 75A1 for parts. M. Schweigert, W9MTT, R1 Box1 Fults IL 62244.

WANTED: Hammurland Super Pro SP-200 or military version, working or not. W9FOC, 1616 Campbell St., Joliet, IL 60435. Wayne Storch.

SELL: Clegg Venus 6mtr-xcvr, with P.S. spkr/cab. $240. AMECO 6mtr. conv. CN-50 with P.S. 14-18MHz i.f. $30. Sorry can't ship. Call WA1DFL at (617)-284-2881 or 545-2519.

95% DX QSL Return. Write in 54 languages! K3CHP's DX QSL Guide, $3.95. Joe Mikuckis, 6913 Furman Pkwy., Riverdale, MD 20840.

FOR SALE: B&K Model 415 Solid State Sweep/Marker Generator, brand new w/cables, manual $300 or best offer. WANT: Latest callbook and VHF Scanner Monitor Hi/Lo Band. WA3NMW, 410 N. Third St., Minersville, PA 17954.

FOR SALE: Apache & SB10 w/manuals, cables. $140.00, plus shipping. Certified check or money-order. WA0GKP, 480 S. Lewis St., Lakewood, CO. 80226.

TRI-BAND BEAM, MP-33, perfect; locals only no shipping. WA6ENV, (714)-838-4766.

WANTED: Manual &/or Schematic for A Solar Capacitar Analyzer, Model C.E. Will pay for copy, etc. R.L. Poad, 1021 Bryce Rd., Aurora, OH, 44202.

FOR SALE: Collins 30L1 Linear in Mint Condtion. $350, or best offer. Joel, WA2K2D, (516)-485-5103.

SELL OR TRADE: CQ's from '45, QST's from 1916. Call books from '21, Handbooks from the 30's. Have some Radio News, Radio Broadcast and popular radio. List for stamp. Erv Rasmussen, W6YPM, 164 Lowell St., Redwood City, CA 94062.

WANTED: QST 1921 Jan., Feb., Dec., 1922 Jan., March, Sept., ARRL Handbook Edition 5. Please Airmail. Jock White, ZL2GX, 152 Lytton Rd., Gisborne New Zealand.

FOR SALE: Knight R-100A Manual in readable condition; with schematic & 3 separate pictorials. $5.00. WB5KLB, JP Weger, Box 940, Cabot, AR, 72023.

MAGAZINES FOR SALE: CQ/73/QST/Ham Radio Send S.A.S.E. for list. WA1BFD, RFD 2, Box 480, Middleboro MA 02346.

WANTED: "S" meter for Collins 51J-2,3, or 4, receiver. Must be original equipment type. A. Wardean 930 ½ Venice Blvd. Venice, CA 90291.

WANTED: For HRO-60 rec., NFM-83-50 adaptor. Also, 2m FM trans.-30watts or more. RH Horn, W9NES Rt. 1 Box 271 Shore Dr., Marinette, Wis. 54143.

FOR SALE: Nice condition, T4XV, R4A, AC3, & MS4 supply, $660.00, FOB. A. Bill Lawson Jr., K4IOP, 1325 Highland Rd., Chattanooga TN, 37415.

SWAP Stamp Collection of Ships-$155, for Heath SB-610, VO2AS, P.O. Box 232, Goose Bay, Labrador, Canada. Stan Parsons.

SELL: Drake 2B, 2BQ, 2BC, $197.00. National 1-10A, $78.00. FB-7XA, $79.00. SW-3, $69.00. W0KC, 10 Taylor Estates Kirkwood, MO 63122.

HEATH SB-630 Station Console professionally wired $75. Fred Roberts, K2AMN, Old Mill Road Nissequogue, NY 11780. (516)-681-8600.

FOR SALE: Motrac T73MHT3100 with head, cable, and speaker $700. Motrac U43MHT3100 with head, cable, and speaker $575. M. Tewksbury Jr. 4361 Clarkwood Pkwy, no. 425 Warrensville Hts, OH 44128. (216)-951-8671.

FOR SALE: Perfect novice station. Heath Cheyenne Transmitter and Commanche Receiver with power supply only $100. Both in good condition. You pay shipping. Joe Roberts, W7DRR, 9251 N. 37th Ave., Phoenix, AZ. 85021. (602)-973-5035.

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PLEASE SHIP THE FOLLOWING HIGH QUALITY FIXED ANTENNAS:

QTY.	MODEL #	DESCRIPTION	UNIT PRICE	AMOUNT
	TB-4HA	Heavy Duty 4-element multiband beam for 10, 15 and 20 Meters. 24 foot boom. Average forward gain = 9 dB. Front-to-back ratio = 24–26 dB. Withstands winds up to 100 MPH.	$189.95	
	TB-3HA	Heavy Duty 3-element multiband beam for 10, 15 and 20 Meters. 16 foot boom. Average forward gain = 8 dB. Front-to-back ratio = 20–22 dB. Withstands winds up to 100 MPH.	$159.95	
	TB-3A	Economical 3-element multiband beam for 10, 15 and 20 Meters. 14 foot boom. Average forward gain = 7.5 dB. Front-to-back ratio = 20–22 dB. Withstands winds up to 80 MPH.	$139.95	
	TB-2A	Economical 2-element multiband beam for 10, 15 and 20 Meters. 6½ foot boom. Average forward gain = 5 dB. Front-to-back ratio = 16–18 dB. Withstands winds up to 80 MPH.	$119.95	
	MB-40H	Heavy Duty 2-element beam for 40 Meters. 16 foot boom. Average forward gain = 4 dB. Front-to-back ratio = 16–18 dB. Withstands winds up to 100 MPH.	$179.95	

NOTE: ALL SWAN BEAM ANTENNAS ARE RATED FOR 2000 WATTS, and require 52 ohm coaxial feedline.

	1040V	"GOLDEN SWAN" Heavy Duty trap-vertical for 10, 15, 20 and 40 Meters. Patented large High-Q coils, precision tuned for maximum radiation efficiency on each band. Low SWR across width of each band. Withstands winds up to 100 MPH. 2000 Watt power rating. 21 foot height.	$ 99.95	
	75 Meter Add-on Kit for 1040V	Modifies "GOLDEN SWAN" trap-vertical for full 5-band use. Adds 5 feet to antenna height.	$ 38.95	
	80-40	Inexpensive trap-dipole for 40 and 80 Meters.	$ 39.95	

ALL PRICES F.O.B. OCEANSIDE, CALIFORNIA.
Antennas will be shipped best way, collect, unless otherwise specified in writing.

SUB-TOTAL	
5% SALES TAX (Calif. Only)	
TOTAL	
DOWN PAYMENT	
BALANCE DUE	

Method of payment (Check one):

- ☐ Full amount enclosed
- ☐ 20% deposit enclosed; Balance C.O.D.
- ☐ 20% down payment enclosed; Charge balance to BANKAMERICARD # _____ Exp. Date _____
- ☐ 20% down payment enclosed; Charge balance to MASTERCHARGE # _____ INTERBANK # _____ Exp. Date _____
- ☐ 10% down payment enclosed; Charge balance to SWAN CREDIT ACCOUNT # _____

SIGNATURE: _____ DATE: _____

FOR SALE: RCA Fleetline 450MC, 9 mobile units $75 each. 1 base unit $150. James Wolf, WB8FWE 402 Grand Pass, Sandusky OH 44870.

WANT: KWM-2A and/or 75SB. State: Round Emblem? CW Filter? Price and/or interest in photography. Col. EG Arnold, 367 North West St., Vacaville, CA 95688.

WANTED: Old Zenith 4R radio receiver and radio magazines of early 1920's. W7KE, 1109 S2, Hamilton, MT 59840.

SELL OR TRADE: 4X5 Speed Graphic, case, flash holders, etc., like new. Also 4X5 enlarger, misc. foto equip. Need beam or quad, xcvr., good CW rig & rcvr. FT Frentz RT 1 Box 12 Deerwood MN, 56444.

WANTED: Player Piano Rolls labeled AMPICO or Duo-Art. $2.50 ea. or ham gear. W1BSV, 155 Waban Hill Rd., No., Newton, MA 02167.

SELL: MINT BC610, Globe King 500A, 32V-1, Antique RCA Rcvr & Xmtr, 75A4, Viking I, 20A and VFO, 3EL Tribander, rotor, 40 foot Tower. Make offer, including delivery. WANT: Viking KW Desk, 4K, 3KA, KW-1, KWS-1. R.C. Shelar, K8CCV 5471 Norquest Blvd., Youngstown, OH 44515.

FOR SALE: Teletype Tape, yellow oiled, 1 1/16" wide 1" core, 10 roll box $2.00. 40 roll case $6.00 Plus Postage. Jim, K0YLY, 8620 W. 74th St., Over-Park, KS 66204. (913)-432-7566.

FOR SALE, TEST EQUIPMENT: EICO no. 315, $20, Sweep Gen. no.360, $5., Pyramid Cap. Res. Analyzer CRA-1, $10. Meissner SIG CAL 10Kc-50Kc-100Kc, $15. WJ Kinne, 1163 Ingerson Rd., St. Paul MN 55112.

WANTED: HA-16 Vox Control Unit for Hallicrafter. Please write: Larry, WB9AZQ, 404 E. Emmons St., Robinson IL 62454.

FOR SALE: RCA WO-91B Scope-All Components for 4-1000 Amplifier. W4GD, 3087 Carnes Ave., Memphis, TENN 38111.

FOR SALE: Hallicrafters SX-101A Receiver, new condition and recently checked on air, original carton/w/manual. $210 FOB Richmond. $180, delivered locally. D.P. Shafer, W4AX, RFD 4 Box 71, Glen Allen, VA 23060.

WANTED: Loran Receiver APN-9 or APN-9A, plus any acess. equip. K3MND, Jack Myers, 408 Tasker St., Ridley Park, PA 19078.

Custom Speaker Cabinets, Tubes, Meters, Parts: TS-418, 622, 147, TA-1 phone monitor adapter. Best offers. 10lb-parts $10.00. Will trade electronics for U.S. Stamp Collections etc. Bill Williams, P.O. 7057, Norfolk, VA 23509.

FOR SALE: Pagel VHF counter preamp as new, $20.00. Vernon Fitzpatrick, WA8OIK, McLain-Park M203, Hancock MI 49930.

FOR SALE: Drake TR-4C MS-4 AC, $595.00. Bought in Nov. 1973, Paul Skidmore, 1612 Stone Ave., Crossville TN, 38555.

FOR SALE: B&W Matchmaster Model 650 (52-ohms) 125 Watt-Dummy Load/SWR/RF Watt Meter with manyal. W8FLA, 248 Western Ave., Allegan, MI 49010.

FOR SALE: 2mtr AM/FM SR42A with AMEC. VFO & Preamp, $110. Bob Massey, P.O. Box, 4501 Norton AFB, CA 92409.

WANTED: Swan 410 auxiliary VFO, Model 22 adapter, and Swan Xtal calibrator. Ludwig, 9 Hereford Lane, New City, NY 10956.

SELL: HP23, $40; B&W 5POS Coax SW, $6; EICO 710 GD, $20; AMECO PV144 Pre Amp new, $10; DOW DKC-TRV-1 TR SW, $10; Collins 148C-1, NBFM Adapter for 75A, $20; National NFM 83 $20; Hallicrafters CRX 107 FM RX New, $25; WRL AT3 100W ANT Tuner, $5; ELMAC AF 68 & M1070, $50.00. FOB Art Ford, 56 Gildare Dr., East Northport NY 11731.

28KSR Floor Console Cabinet, with or without LESU and Cabling. For more info. contact: D.C. Harrington, 1620 Gardena Ave., Fridley MN 55432.

WANTED: Cabinet for Heath SB-200. Write stating condition & price to: F.C. McElroy, 431 Libnel Ave. Syracuse, NY 13209.

SELL: SX-101 with 6EH7 RF 6BY6 prod. det. manual, $125; PM-3A with RF am meter, $60; EICO 460 scope low cap probe manual, $85 or trade for FM gear. W5RC, RM Terrill, 3706 Alta Vista, Dallas, TX 75229.

SWAN 1200W, VOX phone patch, wattmeter Hammarlund HQ110, Siltronix 1011B, shure mike. For more info. contact: J. West, P.O. 4158 Los Angeles, CA 91607. (213)-939-6468.

WORLD'S LARGEST DX-Certificate Hunters' Club CHC, FHC, SWL-CHC publishes world's Awards Directory. $5.00. Box 385, Bonita, CA 92002.

SELL: Drake R4A, T4X, AC4, MS4-Clean, $575. K2KNV, A.B. Buscaglia, 2497 W. River Rd., Grand Island, NY 10472.

FOR SALE: 3-400Z linear w/power-supply similar description, Sept. 1969 73, $150. Pictures available for SASE. Shipping charges extra. Bill Taylor, P.O. Box 485 Bettsville, OH 44815.

SELLING OUT! CHANGING HOBBIES: Complete SSB Station Swan 270B, Swan 1200W linear, Carengilla ACP-1 compressor, Heath HM-102 Wattmeter, Vibroplex bug, Shure hand mike, Hy-Gain 10-80 vertical, 50 foot triangular tower, Miniproducts miniquad, 200 ft. RG58, handkey, code oscillator. Package Deal Only. Nothing Sold Separately. Write best offer to: HAM, P.O. Box 163, Lufkin, TX 75901.

BUILDER KIT: York 35B final using EIMAC 8160 Ceramic Tube, Includes complete schematic, part layout, blueprints, manufacturer list w/adress,-and price. Any or all parts can be supplied. Price $10. Bill Brown, W0SYK, 28 Marine Lane, Hazelwood, MO 63042.

WANTED: Early ARRL Handbooks, catalogs and literature on early B.C. and short wave equipment-1928 or earlier. W2GHF, 45 Allen Dr., Woodstock, ny 12498.

WANTED: Early ARRL Handbooks, catalogs and literature on early B.C. and short wave equipment-1928 or earlier. W2GHF, 45 Allen Dr., Woodstock, NY 12498.

FOR SALE: Sprague KT-1, in-circuit condition, tester $30.00. EICO 944 Yoke & Fly tester $34.95. 584 VOM $15.00. All FOB. R.Wendel,WB2YYX, 160-20 Grand Central Pkwy. Jamaica, LI, NY, 11432.

WANTED: DeForest spherical Audio, or other old tubes. Will trade old battery radios. Leo Gibbs, 701 Brookfield Rd., Dayton OH 45429.

WANTED: Kw. Johnson Matchbox. RJ. Tappehorn, 2536 Kings Highway, Louisville, KY 40205.

WANTED: High voltage transformer Collins KWS-1 Jule Gordon, W8HBQ, Box G, Moundsville, WV 26041.

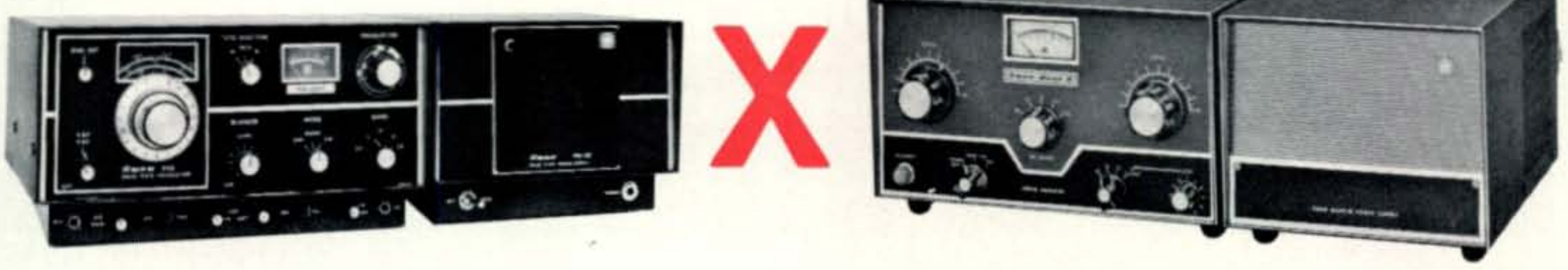
FOR SALE: Heathkit Apache and Viking Challenger, $50.00 each, Collins Transmitter, receiver, & power supplies; for 160, 80, 40 meters, AM-CW, working, $55.00. Also Regency 30-50 MC receiver $50.00. Local pick-up only. WA1MYZ, 18 Sonrel ST., Woburn MA 01801.

FOR SALE: New Leader, Grid Dip Meter Model 810. $32.50. R. Hansen, WN7TZU, 26 S. State, Preston, ID 83263.

SELL: (2) Motorola, 6mtr, Mobile TRNCURS, TA104(H-M)s, May be used Comm. or Ham, Less Xtals, Best offer on single or both takes. H.M. Sims, WA5LTI, 608 N. Greenwood Ave., Fort Smith, AR 72901.

Squires-Sanders SS-1 R with noise Blanker, $400. W1FZY, (617)-249-9890.

POWERFUL EQUATION R_x :



SS-200 + PS-20 X Mark II = 2000 WATTS

For explosive results, under controlled conditions, simply combine the best of the old with the best of the new — both from SWAN — of course!!

Add *one* PS-20, 115V AC power supply, to *one* SS-200, fully solid-state transceiver, and multiply the drive signal by *one* Mark II linear amplifier for the full legal power limit. A proper dose of this solution is sure to cure the DX blues, but be careful as this prescription is habit forming.

SS-200 SPECIFICATIONS

Frequency Ranges: 3.5—4.0 MHz; 7.0—7.45 MHz; 14.0—14.45 MHz; 21.0—21.45 MHz; & 28.0—29.7 MHz + 10 MHz WWV Receive.
Power Input: 200 watts P.E.P. SSB on all bands; 200 watts DC input for CW on all bands.
Carrier Suppression: Greater than 60 dB.
Unwanted Sideband Suppression: down more than 50 dB.
CW: Equivalent to grid-block keying; plus semi-break-in with VOX; built-in monitor.
VOX: Built-in with variable VOX gain and anti-trip controls.
Receiver Sensitivity: Less than 0.5 microvolts at 50 ohms impedance for a signal plus noise to noise ratio of 10 dB.
Power Source: Operates directly off any 12V DC automobile battery; AC operation requires PS-20 for 115V AC or PS-200 for 220V AC, 50/60 Hz., applications.

MARK II SPECIFICATIONS

Frequency Ranges: 3.4—4.5 MHz; 6.0—9.0 MHz; 11.0—16.0 MHz; 16.0—22.0 MHz; & 22.0—32.0 MHz.
Power Input: 2000 watts P.E.P. on SSB; 1000 watts DC input on CW, AM or RTTY.
Transceiver Operation: Accomplished with Transmit-Receive Relay.
Final Stage: Employs two Eimac 3-500Z grounded grid triodes.
Output Impedance: Matches antenna load with wide-range "Pi" network.
Power Supply: Separate matching unit with 4½ foot cable for convenient use. Utilizes computer grade 40 mfd electrolytic capacitors filtering at 2500V DC and silicon rectifiers which supply more than 1.2 amps. All high quality components.

SS-200 (200 watt Solid-state Transceiver)	**$799.95**
SS-200/SS-16B (Includes Super-Selective I.F. Filter)	**$869.95**
PS-20 (110V AC Power Supply)	**$149.95**
PS-220 (220V AC Power Supply)	**$159.95**
Mark II (2000 watt Linear Amplifier with matching Power Supply)	**$749.95**

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SELL: Galaxy GT550 with xtal calibrator, AC supply and speaker, $350. W8IIT, 281 Jenny Lane Dayton OH 45459.

FOR SALE: Hammarlund 110A receiver with 24 hour clock, $99. WA2SGN, 16 Peppermill Drive, Cherry Hill, NJ 08034.

WANTED: 455 KHz quartz crystals in HC6/U holders. Advise quantity and price. J.A. Worcester, R.D. 1, Frankfort, NY 13340.

FOR SALE: Electronic Calculator-MITS no.908M. Latest model, slide rule type. Original box, brand new, never used. Xmas present; $129.95. Sell for $85 plus postage. H. Marhoff, P.O. 569, Largo, FL 33540.

SELL: Six-Meter Telrex 4 element beam, $10. WA2PCL, 101-23 Lefferts Blvd. Richmond Hill, NY 11419. (212)-849-8458.

WANTED: Schematic or information for 1940 Stancor Model "60-P" transmitter. Alley, W1DMD, 48 Judson St., Raynham, MASS 02767.

FOR SALE: Drake %A receiver, Knight T-60 transmitter, Antenna relay, Key, for 15 meter novice-xtals. Will ship package anywhere in USA for $150. W7WOX, Box 427 Tracyton, WA 98393.

WANTED: Heathkit SB-500, SB-610, SB-200, General Radio 1602-B. Have GR1932A % distortion meter. Bob Houston, KA2AX, Box 73, APO San Fran 96522.

FOR SALE: Knight 2mtr TR108 xcvr & VFO, A-1 condition, $75. K6THQ, 1205 Cloverglen Dr., Valinda CA 91744.

WANTED: External FFO's-FV400 for Yaesu FTDX 400 and 410 for Swan 400. K5ENL, Ed Block, Rt. 4, Grandview TX 76050.

Your non-commercial swap-n-sell ads run FREE in TRADIO. Send ads to TRADIO, in care of Wichita Amateur Radio Society - P.O. Box 4391-Wichita Falls, TX 76308.

SELL: Courier Lin. S.S. power supply w/100-C.F.M. Muffin fan built in. HW-16 & spkr., no manual. Both F.B. cond. Best offer. WA8QBJ, 6305 Redbird Terr. Dr., Clinton, OH 44216.?

CALL LETTERS RUBBER STAMP! 24 hour service. $1.50 postpaid. Jack Mullarkey, 2604 Chesterfield Pl. Anderson, IN 46012.

SELL: Tektronix Scope 535 with plug in 34/35K, $300. Sig Gen Measurement 80, $225. FM Dev-Meter Marconi 791C, $125. W2ANT, D. Marx, 32 Farm Road, St. James, NY 11780.

WILL TRADE: HP-13A Heath DC power supply. Need: Hp-23A AC supply. Joda, WB5GNP, Box 225 Los Fresnos, TX 78566.

FOR SALE: AC adaptors, 6VDC 150MA, Standard plug, brand new, $3.00 ppd. K2MFY, Nutley Court, Plainview, NY 11803.

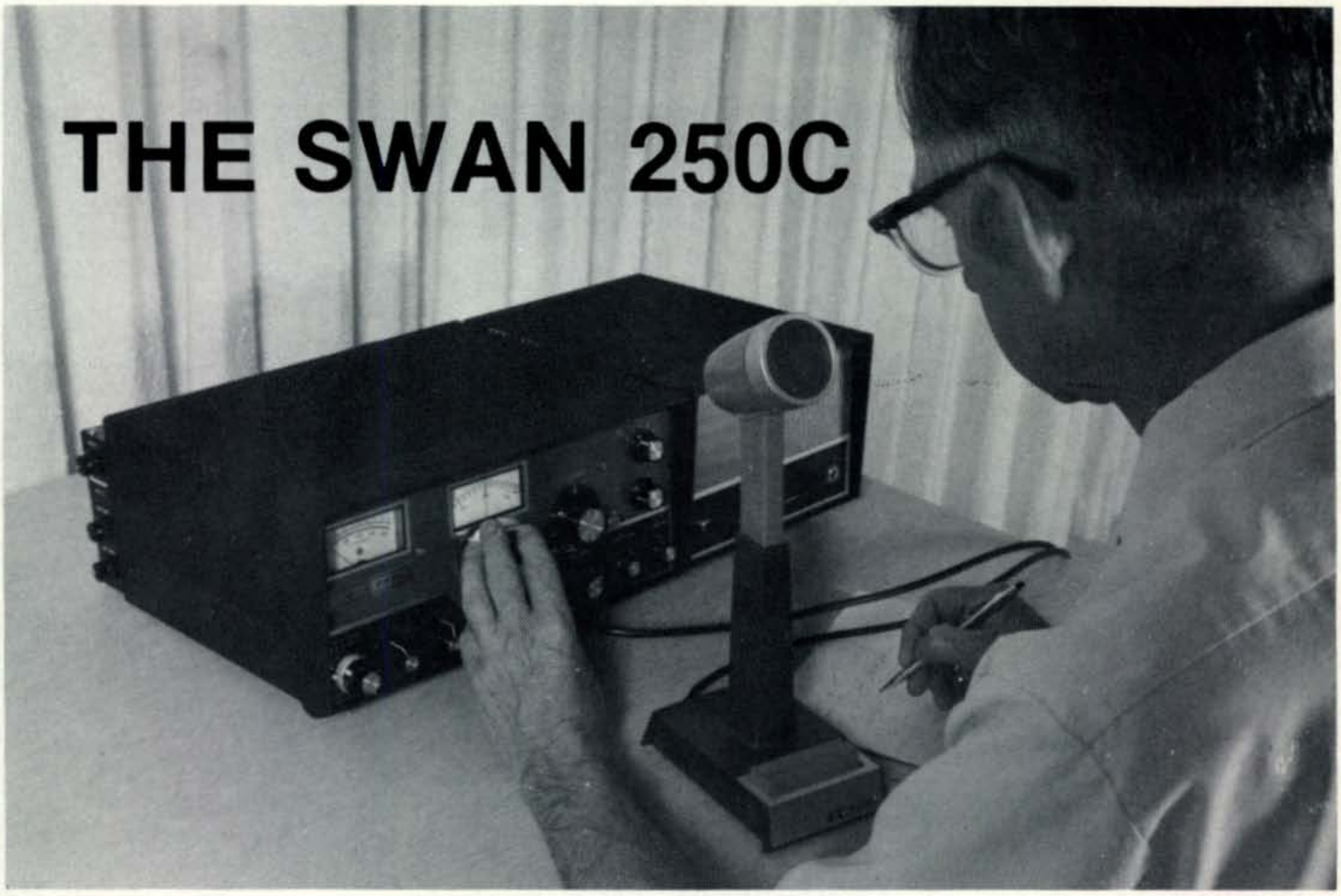
FOR SALE: Drake 2B, 2BQ Mult., xtal cal., extra xtals, manual, excellent. $150. WA2PPV, (516)-RO4-9077.

QSO'S WANTED: June 8th and 9th during the A.R.R.L. VHF QSO party. SKEDS welcome 50-432 MHz. K8HWW, 33727 Browniea, Sterling Hgts, MI 48007.

FOR SALE: HT 32B, MINT condition with manual. $225, plus shipping. Mike, WA2WXJ, 49 Hollywood, Ave., Massapequa, NY 11758. (516)-PY8-6492.

WANTED: Clegg Cruiser 2 meter tranvertor, Model IIA, 50Mc input. State Price. Henry Vander Waarden, 66 Meridian Rd., Levittown LI, NY 11756.

WANT: HA-2, HA-6, 160m coil for 100v. SELL: NC-303 & converters, TX-62 & VFO, SX-99 & Q-multiplier. Bill, WA9CYW, Box 247 Cannelton, IN 47520.



STILL THE BEST ON SIX METERS

There's no transceiver like a Swan transceiver and when 6-meter operation is your special pleasure, you won't be satisfied with less than the perfection found in a Swan 250C. For P.E.P. input, the 250C gives you a full 240 watts on SSB, 180 watts in on CW and 75 watts input on AM. And, you get the same deluxe features and benefits that have made other Swan HF rigs so popular, including the famous Swan ultra-smooth dual-ratio planetary tuning control that eliminates irritating backlash reactions. Here is complete coverage from 50 to 54 MHz with an internal 250 kHz calibrator and no crystals or extras required.

To really copy the weak signals, Swan has set the sensitivity of the 250C to a fine level of just .1 microvolt while the receiver noise figure registers better than 3 dB through the use of two 6CW4 Nuvistors hooked up in cascode. Maximum readability is achieved, under adverse noise and QRM conditions, with an exclusive 10.9 MHz 8-pole crystal lattice filter. The audio response is virtually flat from 300 to 3000 Hertz across a 2.8 kHz passband at 6 dB down. There is no other 6-meter rig that will sound any better, and few if any that will sound as good.

DO YOURSELF A FAVOR. INVESTIGATE THE TRUE PLEASURE OF THE 6-METER EXPERIENCE WITH A SWAN 250C.

SWAN 250C Transceiver	**$499.95**
117-XC, matching 110VAC power supply with speaker	**$124.95**
510X, Crystal Controlled Oscillator	**$ 54.95**
VX-2, plug-in VOX unit	**$ 44.95**
FP-1, telephone patch unit	**$ 54.95**
14-117, DC power supply	**$149.95**
14C, DC converter for 117-XC	**$ 84.95**

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The Ultimate F.M. Transceiver

Here it is, the FMer's dream, a fully synthesized transceiver that'll cover the entire two meter band, PLUS a built-in scanning receiver that'll locate any repeater frequency in your area that's in use.

And get a load of these other features that make the "Dream Machine" the ultimate rig:

- **Operates on FM, AM or Modulated CW**
- **Built-in DC and AC power supplies**
- **Frequency Range of 143.5 to 148.5 MHz in 5 KHz increments**
- **Autoscan in 5 KHz steps across entire band, with adjustable speed and frequency limits.**
- **Synthesizer flexibility that offers choice of 600 KHz up or down, 1 Meg up or down, simplex, frequency split, or any nonstandard split (programmable) all from a single function switch.**
- **Receiver Sensitivity of 0.35 Mv for 12 db SINAD on FM**
- **Dual power output of 20 watts or 5 watts across entire band**
- **Adjacent channel rejection (30 KHz) 100 db minimum**
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- **10 pole, 13 KHz crystal filter**
- **Receiver Superhet, single conversion**
- **Frequency stability of 0.0005%**
- **Built-in tone burst and PL encoders and decoders**
- **Built-in touch tone pad**
- **Full LED Digital readout**
- **Built-in S Meter also serves as VSWR bridge, power output meter, battery indicator, deviation indicator and discriminator meter.**
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- **Speaker built-in to left side of cabinet for maximum mobile reception**
- **Headphone jack for noise-free mobile operation**
- **Independent selectable priority channel**
- **Built-in Auto CQ**
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GE MASTR personal (PR) series vehicular charger, 12 volt neg. gnd.
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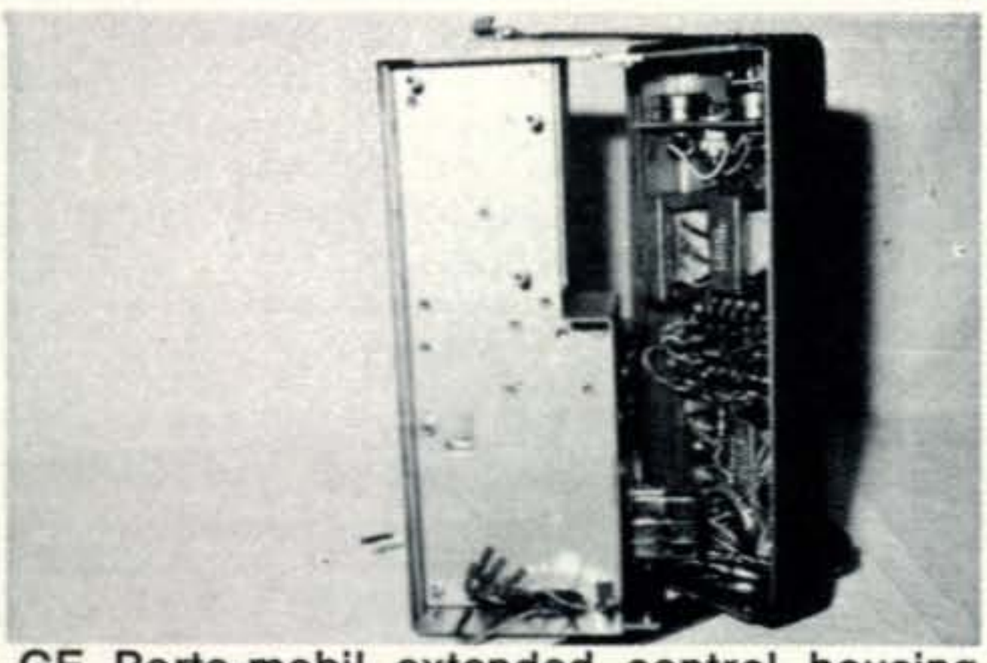
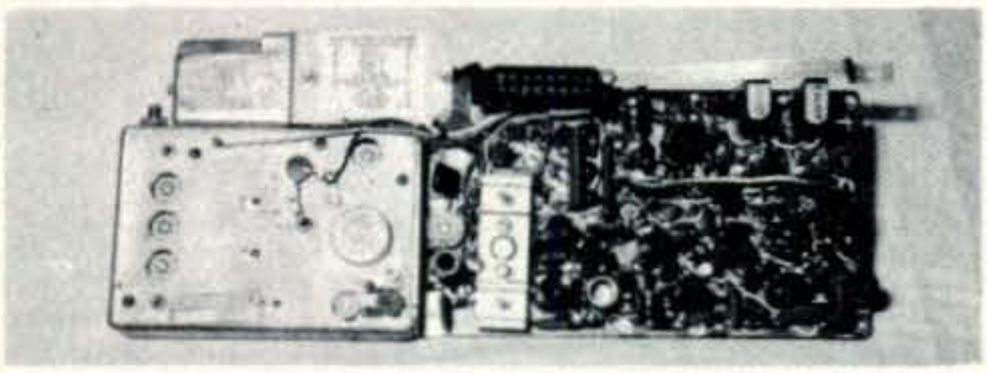
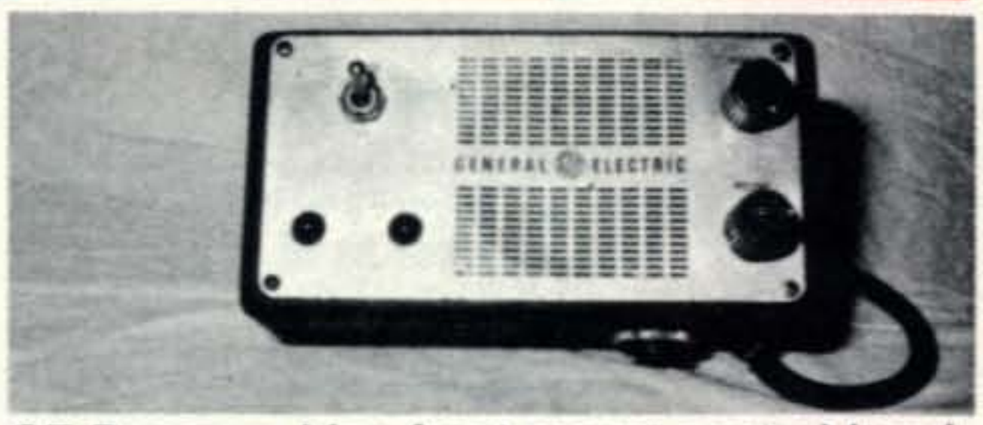


GE Porta-mobil extended control housing with 10 watt audio amplifier ..... $38.

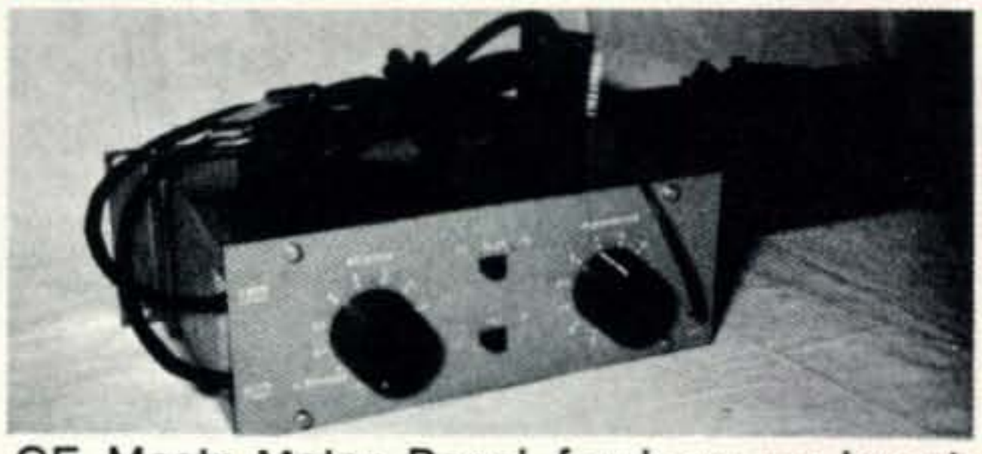


GE 4ET62A, 132-150 MHz, 8 watt, all solid state Porta-mobil, complete transmitter strip $88.

GE Porta-mobil extended control head. GE part #4EC66.
Excellent for bench and/or remote applications, less mike and brackets $17.50



GE Progress Line front mount control head, includes speaker, less mike and brackets.
GE Part #4EC29A ..... $15.



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QUADS

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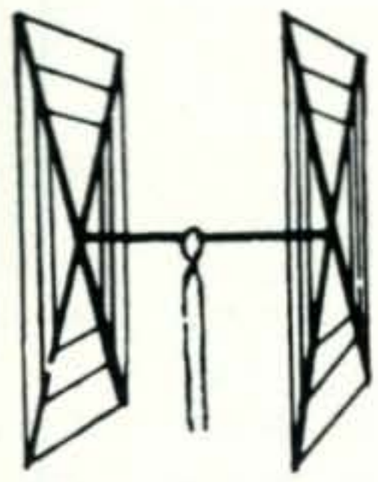

W3 CUBICAL QUAD ANTENNAS — these two element beams have a full wavelength driven element and a reflector; the gain is equal to that of a three element beam and the directivity appears to us to be exceptional! ALL METAL (except the insulators) — absolutely no bamboo. Complete with boom, aluminum alloy 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

Antenna Designation: 10/15/20 Quad
Number of Elements: Two. A full wavelength driven element and reflector for each band.
Freq. Covered: 14-14.4 Mc. 21-21.45 Mc. 28-29.7 Mc.
Shipping Weight: 28 lbs. Net Weight: 25 lbs.
Dimensions: About 16' square.
Power Rating: 5 KW.
Operation Mode: All
SWR: 1.05:1 at resonance
Gain: 8.1 db. over isotropic
F/B Ratio: A minimum of 17 db. F/B
Boom: 10' long x 1¼" O.D.: 18 gauge steel; double plated; gold color
Beam Mount: Square aluminum alloy plate incorporating four steel U-bolt assemblies. Will easily support 100 lbs. Universal polarization.

Radiating Elements: Steel wire, tempered and plated, .064" diameter.

X Frameworks: Each framework consists of two 12' sections of 1" OD aluminum 'hi-strength' (Revere) tubing, with telescoping ⅞" tubing and short section of dowel. Plated hose clamps tighten down on telescoping sections.

Radiator Terminals: Cinch-Jones two-terminal fittings

Feedline (not furnished); 52 ohm coaxial cable

Now check these startling prices—note that they are *much lower* than even the bamboo-type:

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(all use single coax feedline)

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2 EL 20	$25	4 EL 10	24
3 EL 20	31*	7 EL 10	38*
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2 EL 15	21	8 EL 6	34*
3 EL 15	25	12 EL 2	31*
4 EL 15	31*	*20' Boom	
5 EL 15	34*		

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, W2-ODH, WA3DJT, WB2FCB, W2YHH, VE3-FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YS1-MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3-KT. Moral: It's the antenna that counts!
FLASH! Switched to 15 c.w. and worked KZ5-IKN, KZ5OWN, HC1LC, PY5ASN, FG7XT, XE2I, KP4AQL, SM5BGK, G2AOB, YV5-CLK. OZ4H. and over a thousand other stations!

V40 vertical for 40, 20, 15, 10, 6 meters	$18.95
V80 vertical for 80, 75, 40, 20, 15, 10, 6 meters	$20.95
V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters	$22.95

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  RTTY
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