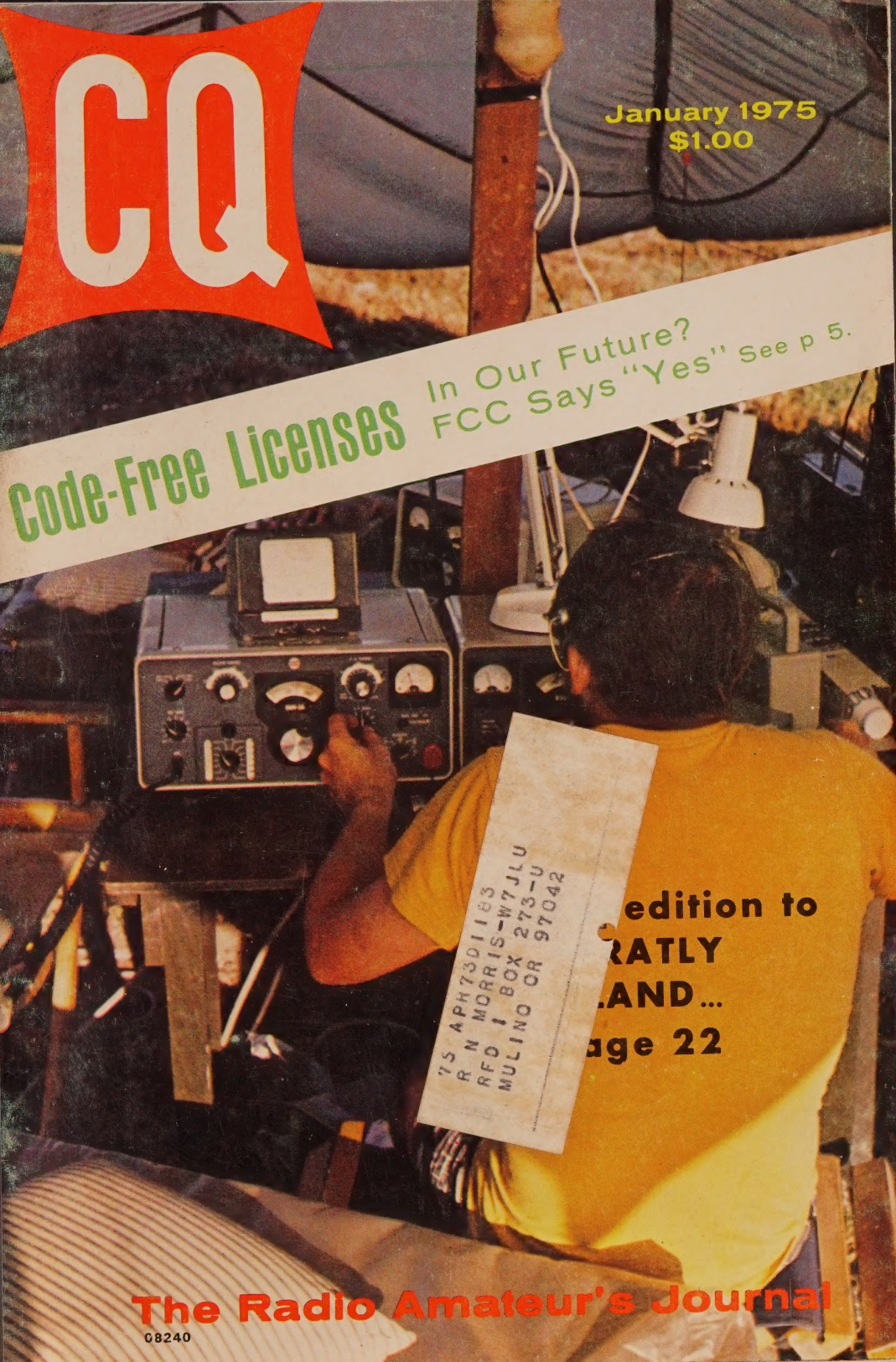

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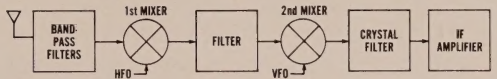
Jim Cooperider
Senior Design Engineer

Signal handling techniques in modern receiver design

Outstanding sensitivity has long been held as a receiver specification of prime importance. But it's time to re-examine this view in terms of today's operating requirements. Most amateur bands are characterized by strong signals which can create problems that minimize or mask the effectiveness of very sensitive receivers. In addition, atmospheric noise is so strong on some bands, particularly 80 M and 40 M, that signals below one microvolt are difficult to receive.

The most prevalent problem caused by strong signals is third-order intermodulation distortion. This is produced by two strong, in-band signals mixing due to nonlinearities in the stages preceding the IF crystal filter and producing an on-frequency signal. In highly sensitive receivers the two signals need be only 50 dB stronger than the desired signal to produce an equivalent output. This kind of distortion makes the band appear to be full of undesired signals and splatter. A similar phenomenon occurs due to cross-modulation, the modulation of the desired signal by a strong adjacent signal. Blocking and desensitization are other ways in which strong signals can mask and diminish performance.

Two measures can be taken to reduce these problems: gain preceding the crystal filter is held to a minimum, and all active devices preceding the filter are operated as linearly as possible. The SB-104 receiver design incorporates such measures. No RF stage is used; instead, the antenna input is fed directly to diode-selected, computer-designed, broadband preselector filters. These filters require no tuning or adjustment within a band and provide the necessary selectivity to reject the image frequency and other out-of-band signals. The block diagram below illustrates the SB-104 design.



The first and second mixers are MOSFETS. These devices maintain linearity over a wide range of input levels and the conversion gain has been carefully selected to provide good sensitivity without creating problems of excessive front-end gain. With this approach, intermodulation distortion in the SB-104 receiver is typically better than −65 dB so that the undesired mixing signals must be approximately three times the level required in a typical highly sensitive receiver to produce the same level of distortion.

A low noise IF featuring a dual-gate MOSFET and a broadband IC follows the crystal filter and provides sufficient amplification to maintain necessary overall gain. These devices are gain controlled so that the SB-104 is capable of handling signals in excess of 3 volts.

Through use of these techniques, the SB-104 is able to accommodate the wide range of signal levels encountered on the amateur radio bands today.

Jim Cooperider

Next month:
Broadband, solid-state transmitter design



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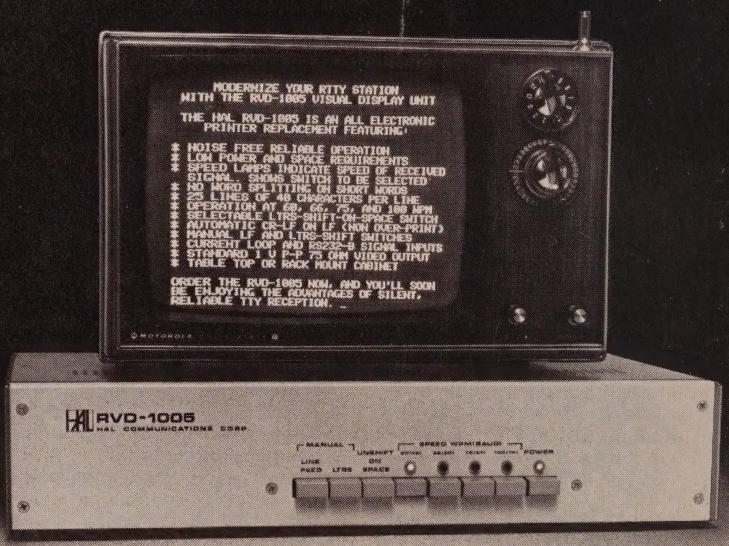
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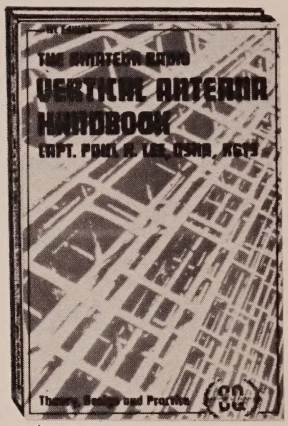
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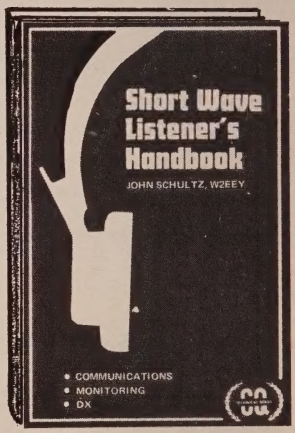


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ZERO BIAS

News travels fast in amateur radio, as well it should, but no news seems to travel quite as quickly as news of impending FCC rule changes. By the time you read this there's a good chance that you will already be aware of the existance of Docket 20282 adopted December 4, 1974 entitled "Amendment of Part 97 of the Commission's Rules concerning operator classes, privileges and requirements in the Amateur Radio Service." It is also likely that you may not be terribly familiar with what the Docket proposes to do to (for?) the amateur service, and that's the purpose of this piece: to briefly describe what has been proposed.

Docket 20282 takes into consideration 35 individual petitions dating back over the past few years, all dealing with various aspects of amateur licensing, regulation, or the creation of a "hobby" service within either the Amateur or Citizen's Radio services.

In essence, Docket 20282 proposes to create two parallel amateur license structures, one primarily for h.f. operation; the other primarily for v.h.f./u.h.f. operation. Within each of these structures would be several grades of license enabling a person to progress in a logical fashion from the most elementary privileges to the most sophisticated. An amateur would be required to be licensed for either h.f. or v.h.f., or could, at his discretion, hold licenses permitting operation in both regions.

The v.h.f.-u.h.f. licenses will fall into three categories:
- Communicator
- Technician
- Experimenter

The Communicator license will be code-free, with an examination on fundamentals of operating procedure, rules and regulations, and simple theory. Privileges will include type F-3 (f.m.) emission only on all amateur frequencies above 144 MHz, with a power input limit of 250 watts p.e.p.

The Technician license will require 5 w.p.m. code speed and a theory exam equivalent to the present General class exam. Privileges will be expanded to include all frequencies above 144 MHz plus present Novice c.w. privileges in the h.f. bands. Power limit will be 500 watts p.e.p. output.

The Experimenter license will require 5 w.p.m. code speed, but theory exam equivalent to present Advanced class license. Privileges will include all frequencies of Technician plus h.f. frequencies above 29 MHz, with a power output limit of 2,000 w. p.e.p.

The proposed h.f. licenses fall into five categories:
- Novice
- General (Conditional)
- Advanced
- Extra

The Novice license would remain as it is today with a 5 w.p.m. code requirement and basic written exam on operating procedure, rules and regulations, and simple theory. It would, however, now be issued as a five year renewable license, with c.w. privileges in the present Novice bands. Power limit would be 250 watts p.e.p. input.

The General license would remain much as it now is, with 13 w.p.m. code requirement and present General theory. H.f. frequency privileges would remain as is, but power limit on new Generals would be set at 500 watts p.e.p. output. No v.h.f. or u.h.f. privileges.

The Advanced license would be expanded to include new phone privileges in the presently exclusive Amateur Extra phone bands. Power limits would be 2,000 watts p.e.p. output. No v.h.f. or u.h.f. privileges.

The Extra license would hold all present privileges, but would be issued for life, with a power output limit of 2,000 watts p.e.p. The station license would be renewable each five years.

Under the new docket mail order licenses would be available, but more difficult to aquire, since at least two present amateurs would be required to ascertain the new applicant's competence. It appears that only Novice and Communicator licenses will be routinely issued by mail, since all other license examinations include elements which must be administered by an authorized FCC employee or representative at locations and at times specified by the Commission. However, all classes of license up to and including the Extra may be issued by mail to individuals who, by reason of physical disability, are unable to travel to a regular Commission examination point. Volunteer examiners will be used. Such licenses will be designated Extra (D) or Technician (D), etc.

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same criteria which now apply to the issuance of current Conditional licenses will apply *i.e.,* more than 175 miles from nearest examination point, in military service, etc. But.... these licenses will not be renewable. Such licenses will be designated Advanced (C)or Experimenter (C), etc.

How does all this effect existing licensees? We're not completely sure of all the effects, but in the area of renewals, credit for examination elements for current licenses will be granted according to a published schedule. For instance, current General class licensees will be granted credit for elements 1(A), 1(B) 2(A), 2(B), 3(A) and 3(B). It just happens that the new General license will require 1(B), 2(A) and 3(A), while the new Technician will require 1(A), 2(B) and 3(B). Thus the holder of a current General license will be eligible for both a new General and a new Technician license when it comes time to renew. The net result is that current Generals will retain all their current privileges with the exception that they will be restricted to 500 watts p.e.p. output.

Docket 20282 does not specify what effects the enactment of the proposed rules will have on current licensees during the remaining terms of their licenses. This may be a deliberate ommission on the part of the FCC, in hopes of receiving some guidance from amateurs, or perhaps any anticipated enactment of the proposed rule changes would incorporate a "gradual compliance" feature such as we have experienced with repeater licensing. We hope to be able to report on this later.

Certainly a great deal of discussion is bound to center on the proposed power limitations, and while we have our own opinions, the Commission's comments regarding power are thought provoking. "In proposing maximum transmitter power levels, we have taken into consideration a number of factors. Amateur transmitters have not been a significant source of interference to other services, and where there has been a problem, amateurs have been very cooperative. Also, amateurs, by and large, do use the minimum transmitter power necessary to conduct their communications. Therefore, there should be no real problem if the limits were to be increased in some instances. We would like to improve the technique specified in the Rules for determining power. Modern communications requires better methods for determining transmitter power than the "plate voltage times current" method. We are proposing to specify the maximum transmitter output in terms of peak envelope power (PEP), except at the beginner level where the emissions authorized do permit a fairly accurate measurement to be made of the input power using the method now specified. Under current rules and practices, the maximum output peak envelope power that could be developed would be on the order of 2000 watts (100% modulated, full carrier, double sideband A3). Specifying this level as advanced amateur practice, and 6 dB (approximately one "S" unit) as intermediate amateur practice (500 watts PEP output) is the method used to establish these proposals. An additional 6 dB lower step (250 watts input approximates 125 watts output PEP for A1 and F3 emissions) would be the beginner level."

A footnote elsewhere invites comments: "This is one proposal under consideration. The Commission is also considering alternatives such as PEP input, average power input, ratios of peak to average power output and limitations on dissipation ratings of final power amplifier devices or a combination of these. Specific comments on the practicality of these proposals, alternate proposals and the practicality of attendant power measuring techniques by amateur stations are requested.

"We request comments on the need for rules limiting the use of techniques which increase the average power in A3 single sideband supressed carrier transmissions, without increasing the peak envelope power. The comments should discuss the various techniques utilized for the purpose in the Amateur Radio Service, the engineering standards that must be observed for unnecessary interference that can be caused by the improper use of these techniques, and the capabilities of amateurs to make measurements necessary to proper usage."

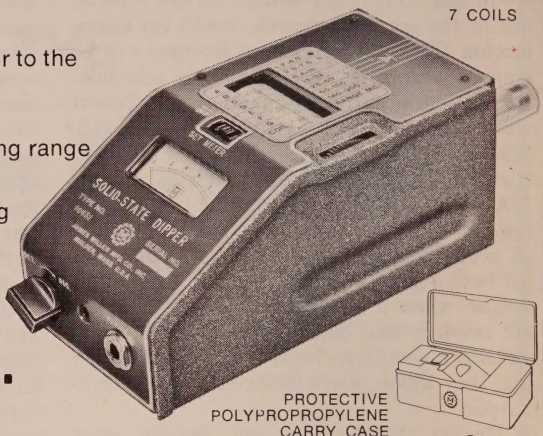
A full discussion of the ramifications of these far-reaching proposed rule changes is both warranted and necessary. Fortunately an extended filing date for comments has been attached to Docket 20282: June 16, 1975, with reply comments due on or before July 16, 1975. This allows ample time for good exposure and analysis in the amateur press, and we intend to help towards that end. The full text of Docket 20282 will probably appear in February *QST* and elsewhere. We encourage you to *read it all,* and let us know your feelings. We, in turn, will share our thoughts with you. 73, Dick, K2MGA

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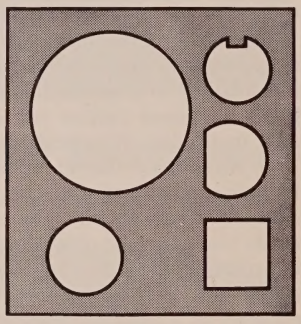
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Wheaton, Illinois

The 13th Annual WCRA Mid-Winter Swap & Shop will be held Sunday, February 9, 1975, 8am at the County Fairgrounds, Manchester Road, Wheaton, Illinois. Please direct all inquiries to: Oran A. Hiscox, 2N456 Ethel Street, West Chicago Illinois 60185.

Davenport, Iowa

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World Radio Club

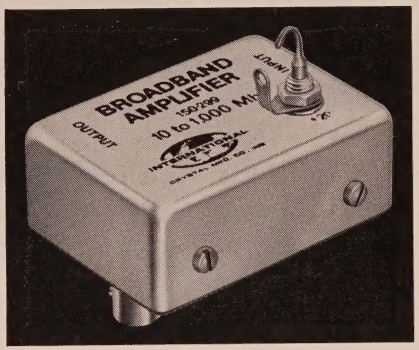
Beginning January 4th 1975, these are the new transmission times of the World Radio Club, a long-standing BBC amateur and s.w.l. broadcast service.

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0815-0830 GMT

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223.26	224.74	146.19	146.72	52.82	52.68
223.30	224.86	146.22	146.76	52.88	52.72
223.34	224.90	146.25	146.79	52.92	52.79
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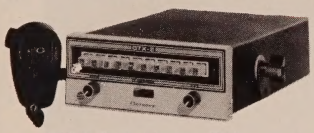
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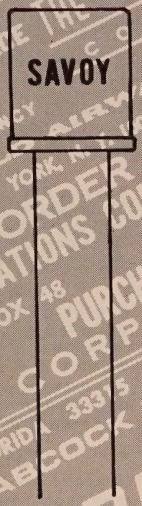


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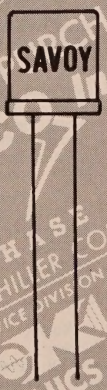
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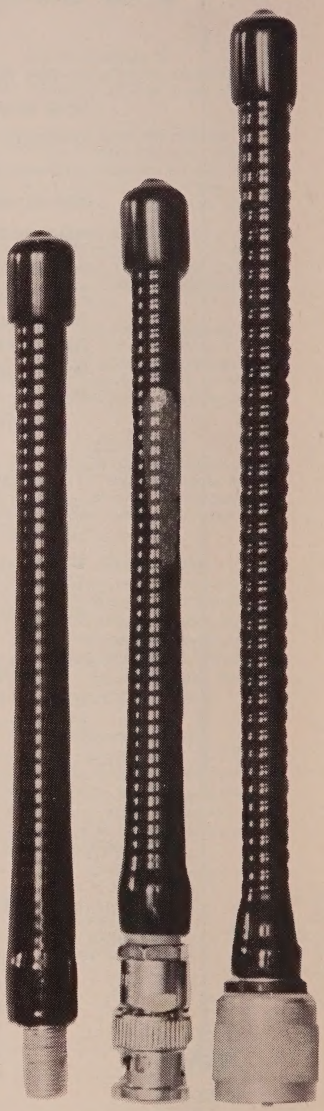

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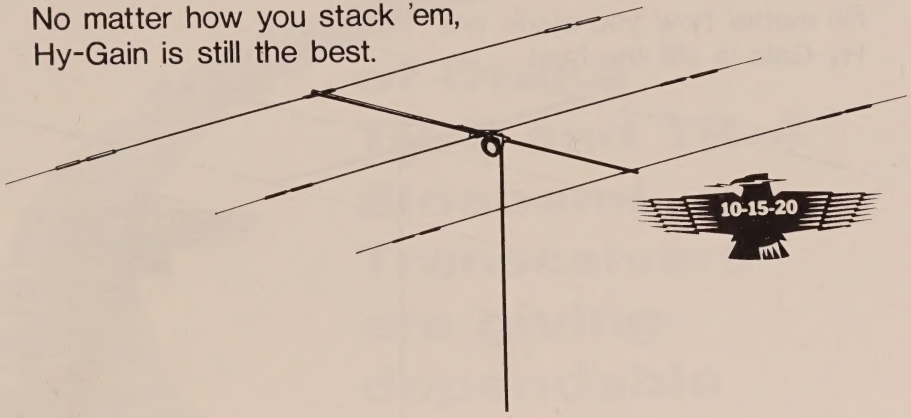
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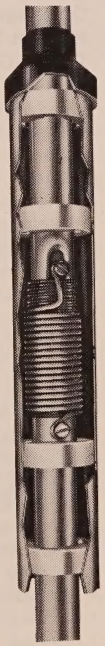
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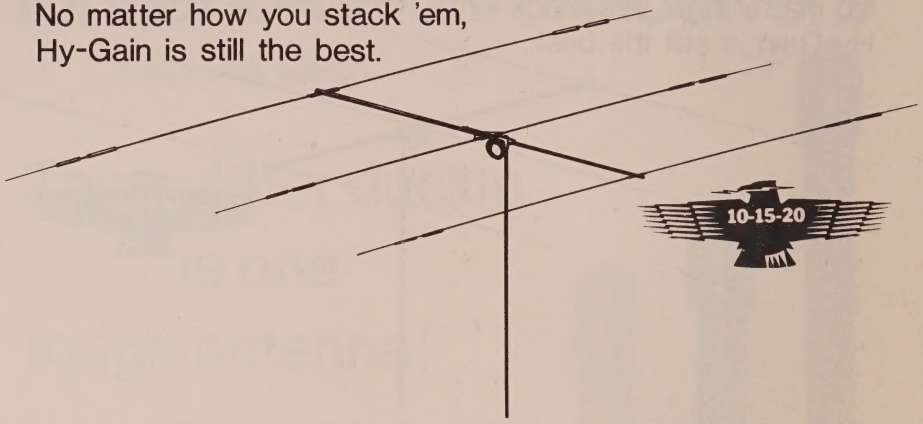
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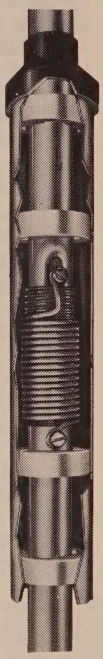
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August 24, 1974

Mr. Al Ka.
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Dear Al:

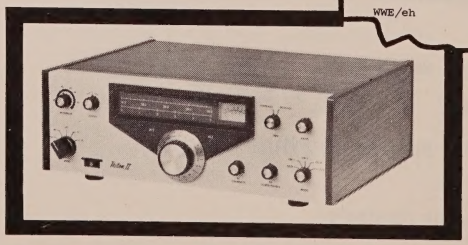
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I would recommend the Triton to anyone interested in MODERN CW operation.

73,
Bill
Bill
WA7LRU/W6UF

WWE/eh

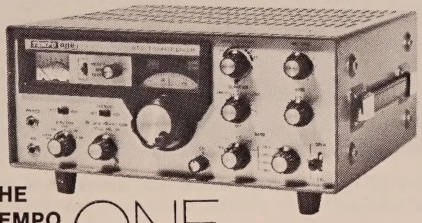


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1S1A - Spratly Island Expedition - 1973

BY DONALD R. RIEBHOFF,* K7CBZ/XU1DX

The approach to Spratly gives some idea of the density of the bird population. The entire dark area above the island is birds!

HAVE you ever laid aside a Michener novel with the lust for high seas adventure running so thick in your blood you can feel the sand of the islands between your toes and the tropical sun beating down on your back. Does it lure vivid dreams of the yacht you would build and tempt you to cash your stakes in now and pursue the likes of Hays, Bligh, and Leeteg in their century of enviable wanderings in search of the true island paradise. That dream, my friend, is not unlike the ones we all come to know as a common part of life passing by. I have had numerous of these dreams over the past few years and each attempt to curb the desire has met with resounding failure. I eventually joined a crew bound for the Central American island Cocos. This trip merely kindled the spark of adventure into a full flame. If these words hit a familiar note and tend to set your dreams adrift again let me spin you a yarn of the sea the shock of which will wash away the sand, turn the tropical sun to ice, and otherwise crush the image of wonderland paradise for all time; of a trip so close on my heels the coins in my pocket still bear the rust from the often waist-deep salt water that became our course of travel in the spring of 1973. Believe it if you can, doubt it if you want to, call it fiction if you will. To the crew of the *Yankee* in February 1973, this story is as real as the breath of life.

These few lines are from the lead of what may eventually become a novel based on the following brief summary of an adventure to Spratly Island, in early 1973.

"Spratly Island (about 8 feet high) grass covered and less than ½ mile in extent is located 43 miles north-northeastward of Rifleman Bank. Spratly was reported (1958) to be a good radar target. It had a margin of white sand and broken coral. A carin, 18 feet high, stands at the southern point of the island. A flagstaff stands near the center of the island. (U.S. Navy charts show a well at the southern point, a shed on the north beach, and palm trees near the center.) The island is surrounded by drying rocky ledges and coral heads. It lies on the south end of a coral bank over a mile long, with depths of less than 8 FM extending ½ mile northward and northeastward from the island. The east side is steep too; the west side is somewhat less so.

"Depths of less than 4 FM exist within 200 yards of the west side of the island increasing abruptly to about 34 FM about 400 yards off shore."

The 2 paragraphs, quoted from U.S. Navy Hydrographics "Sailing Directions For Western Shores of the South China Sea," is the only documented description to be found in print, giving any sort of hint as to what one might expect to find after dropping anchor at Spratly Island. Sound like a complete description? Not even close. Spratly lies 305 nautical miles E.S.E. on a bearing 110 degrees from Vung Tau, Vietnam at 8 degrees 38 mins. north and 111 deg. 55 mins. east. Sea-worthy boats charter from $150.00 U.S. per day and up these days and leav-

*c/o American Embassy Box P, TCU, APO San Francisco, CA 96346.

ing from Vietnam will automatically double the base price. In moderate seas an average speed is 10 knots. I don't have to mention that the travel time is over 30 hours each way. From the description above how would you prepare for some 5 days on this deserted island plus 2 days each way on the boat? What kinds of food and clothing? Is an island 8 feet high awash in foul weather? Is there fresh water? What about the birds?

Spratly first came to my attention some 6 years ago while working in Thailand. That is to say, in terms of actually making a journey to Spratly. For reasons that will become evident shortly this island has been of keen interest to us for many years. Men run off to desert islands for the same satisfaction they gain from climbing mountains; because they are there. My story, however, has a fourth dimension. Spratly Island falls into a small, unique group of islands throughout the world known as Unclaimed or Neutral Territories. The U.S. Dept. of State lists Spratly in this category because of its claim by several surrounding countries, none of which has exercised a right of occupation. Due to this unusual international real estate fumble Spratly could be interpreted as a country in itself. This, in fact, is exactly the case in the world listings of amateur radio countries.

Since Spratly has no radio station, no power, and no people; and since it is far out of range of the California "Sunday Sailors;" since we don't even know what we will find once we get there, except that there are only two or three months out of a year that a sensible man would try against frequent foul weather, we can readily conclude Spratly is not the most frequently heard island on the ham bands. In fact only two such exercises are said to have even taken place and there is some doubt that one was legitimate. Joining the rarity, the reward plus a radio station on Spratly sums up on one word; Chaos!

My first attempt to visit this island failed in February of 1969 when an ill planned trip was foiled before the boat was ready for loading. The participants, scattered throughout S.E. Asia, were to join a retired Navy officer in Brunei for a 350 mile voyage to Spratly. Several things came apart, not the least of which was the boat itself on a reef off Java. In retrospect the trip would have been grim at best, none of us having the experience to prepare properly for such a venture.

In February of 1971 I was fortunate to join a trip to Cocos Island, off Central America. While Cocos is a true possession of Costa Rica, it is, in distance and description, much like Spratly. Radio and adventure were again the motives, not necessarily in that order. I returned to S.E. Asia with new ambition, some experience, and a large stack of nautical charts. The product took shape as the light went out on 1972 and by the end of January all but a few details were set in place. The key to success in this case was to feed the ideas and data to the action man on this project, one Major John S. Gantt, who took the bull by the horns and in less than 90 days created the Spratly expedition. Most of this work was done with his leg in a cast from the knee down. This injury, itself, was sustained in the pursuit of gear for the trip.

The most serious question of transportation passed through an exciting phase of helicopters to the old standby, a boat. The initial cost of the boat, quoted at $600.00 a day, sends jolts through a checkbook. A number were available, but in the final decision only two fit our needs in respect to cost and availability. The selection, the logic of which will long be questioned, was based on a few hours availability. While it came to us at no dollar cost, the performance, as I will disclose, justified a bargain rate. The *Yankee* had been raised from a resting place on the bottom of a South Vietnam Harbor and rebuilt by her owners. The project was accelerated to meet our departure date of 6 February. The major items were completed with the Spratly trip to be the shake down cruise at zero cost. In fact our hard-working skipper, Captain Vic Clyronomidies, donated his time to the project as well.

Expedition Spratly Island 1973 launched on its first attempt circa 1700 Saigon time on 6 February. The Motor Vessel *Yankee*, a 65 foot twin diesel "Q" boat, was loaded with food and provisions for 80 man days, a Boston Whaler outboard landing craft, radio gear to include 5 complete single sideband stations plus v.h.f ship-to-shore links, life support gear for use on the island and an excess margin of fuel and gasoline. The trip commenced at the river port of Saigon City. The initial phase of the trip requires 4 hours of river travel to Vietnam's seaport of Vung Tau. The Saigon River snakes through the Vietnam lowlands thus doubling the line distance of 30 miles. This leg of our journey was slowed due to darkness and one minor navigation error to dock us at Vung Tau just before midnight. The best set schedules often run afoul of unknown factors with our departure no exception. Sailing time was firmly set at first light on 7 Feb. The topping off of fuel and water was not completed until noon. It became apparent during the morning's delay that winds would be a critical factor if, in fact, we would leave the port at all. Inbound boats were reporting unusual winds and extremely rough seas. Other than our able skipper and engineer our collective nautical knowledge was close to zero. Our crew on this maiden voyage were: Phil Wight, VS6DR; Scott Gantt, WB4VBY, Pete Pederson, W5ZSX; John Lunsford, W4EVG; myself; plus the skipper and engineer.

We cast off circa 1300 local and long before we rounded the point into the high seas we sensed our first failure. Still in the protection of the mountains of Cape St. Jaques we were taking



A few small gaps in the hull of the Yankee required repair if the Spratly crew was ever to reach their island.

water over the wheel house and through the windows of the radio room. As we began to hit the winds full force some of the crew attempted to cover the forward cabin with plastic sheeting, but it was all they could do to stay on the deck from a steady barrage of water and wind coming over the bow. At full force we estimated the seas at 10 to 12 feet and winds at 25 knots. We soon realized that the trip would now take 3 to 4 days. With the existing conditions any engine failure would also spell disaster, thus the decision was to turn back. On 8 Feb. a second run was attempted. The weather appeared even more severe: seas to 15 feet and winds to 30 knots. Again failure. At first light 9 Feb. weather conditions were unimproved. Weather bureaus throughout Asia were predicting a minimum of 72 hours of no change. Reluctantly we returned to Saigon and our respective jobs. We kept constant contact with the U.S.A.F. Weather Bureau in Saigon throughout the week 9 to 16 Feb. 13 February's report showed winds below 10 kts. and seas below 6 feet with continued improvement forecast. We set a target of 16 Feb. dependent on further improvement. At noon on 15 Feb. seas were 2 to 4 feet with winds near zero. 16 Feb. locked in as run number three.

At this point Phil Wight, who had to return to Hong Kong on business matters, was replaced by Mr. Frank Ostrich, WB4UZP, who had just arrived in Saigon for a short visit. Again a late Saigon departure caused an overnight stop at Vung Tau. With a large variety of cultural entertainment centers in Vung Tau operating at full swing, an overnight stay is not a total loss. This is lessened considerably, however, when you are batting two to zero on a successful voyage. Nevertheless we were well cared for and for the first time got away at a reasonable hour. The seas were not nearly as calm as our weather man forcast though a considerable improvement over two previous runs. The course was set at 105 degrees. Somewhere near two hours off Vietnam the deck load began to shift. We turned with the wind, re-tied the load and re-set our course. Luck ran out some four hours off shore when our engineer came to the deck in a frenzy. "Forward bilges are filling with water! I took the wheel while our skipper went below to assess the damage. The report was not good. A golf course had been discovered below decks. There were some 18 holes through the hull, many of which presented a good view of daylight shining in the sea water outside. These soon became affectionately known as the front nine and the back nine, but to add to this fortune the bilge pumps were partially plugged, thus requiring some hasty action on the part of the skipper and engineer. Naturally the skipper ordered a return to port. It is interesting to note that the 4 hours out was less than 2 hours back since we now rode with the wind and seas.

Once in port the damage assessment was not so grim. Two or three planks were missing from the outer hull. The water leakage was caused by nail holes in the inner hull. The holes were immediately plugged with water expanding cedar plugs and a decision made to beach the craft at high tide. Low tide would provide access and possible repair to the damaged area. Serious concern diminished when it was determined the damage was probably not caused by heavy seas. The area in question was aft some 20 feet of the bow, underside, with loose planking torn both fore and aft. Planking would not normally tear forward from turbulent waters.

The vessel was repaired at low tide and floated at the next high. On 18 Feb. just 24 hours following the return from failure number three, we were topped off with fuel and water. For the first time Lady Luck was in our court. Winds and seas were near dead calm. We sailed through the night with only one minor incident. Just before first light we saw the outline of what looked to be a ship running without lights. As we passsed by, with twilight just breaking ahead, it took the shape of an island. Searching the charts we found the Catwick Islands to be the most likely possibility. An hour later we saw a second island. There is no mistaking this one. Poulo Sapate, the southeastern most Catwick, is described as a "shoe appearance" looking from the west. This told us our allowance for northeast monsoon was not necessary. A course correction to 115 degrees was made at Sapate. The remainder of our second day at sea went without incident. As we crossed the Hong Kong/Singapore shipping routes circa mid-day and some 130 miles off Vietnam we saw the first signs of life since leaving Port Vung Tau behind. Several large vessels were sighted traveling perpendicular to our path in both directions, ours being west to east.

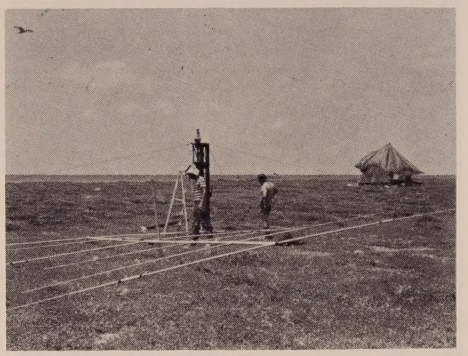
Late in the evening of 19 Feb. with some of the crew asleep and others preparing for the same we took note of a change in pitch from the engine room. By 0100 on 20 Feb. this condition was alarming enough to bring the entire crew on deck followed shortly by a failure of the starboard engine. Efforts to restart this engine allowed only brief running time paralleled with

deterioration in the performance of the port engine. By 0200 this engine ceased to operate and the generator was running eratically. By the time our main power source completely failed the skipper had assessed the situation. The forward tanks, in running low on fuel, had caused tank sediment and water to be drawn into the fuel filters. As the filters became saturated the contamination was drawn into the engines causing the failure. Under normal circumstances this would not have been as serious as it turned out. The maximum application of Murphy's Law prevailed.

Just prior to the power failure an attempt was made to move fuel from the drums stored in the rear of the boat to the forward running tanks by use of an electric pump. We discovered the pumping rate was less than that consumed by the engines under power. At the same time it was suspected that the stop-cocks for the aft running tanks were turned off since no fuel would flow from them. This was further complicated by 13 drums of fuel and gasoline stored on top of the access panels for the aft tanks. A davit, constructed for this voyage, folded over at the strain of moving one of these drums. As the main generator failed, a gasoline generator, intended for use on the island, was fired up. It ran only a few minutes and stopped. After re-starting it ran only a few seconds. A second generator was started. It performed exactly as the first. An examination of the gasoline revealed that it, too, was contaminated. Now, while we had additional fuel, the two generator gas pumps and carburetors had to first be removed, dismantled, cleaned and re-assembled. This all at 0200, adrift at sea, rocking in 4 foot sea swells, no power, the deck slippery and volatile from spilled fuels, and a cold night ocean wind. While this went on, a small gasoline pump was brought on deck to pump fuel at a high rate. It also failed. The skipper repaired the frozen impeller but could not locate the necessary hoses.

Circa 0530 things started on a better track. A gas generator was running, the hoses were located, a light was burning but all was not yet well. The fuel pump had to be primed each time a new barrel was opened. This caused one accident that made the boat a floating fire trap when Pete lost control of the prime plug and some 5 gallons of fuel sprayed into his face at extremely high pressure. Pete was immediately dumped into the sea as fuel oil can cause extreme skin irritation. The remainder of the early morning hours were spent filling the running tanks as our technique improved with experience, and washing down the decks, while our engineer cleaned engine injectors and filters below deck. By 0730 the engines were running but not at peak performance.

A sighting was taken and we mysteriously were northeast of our previous course rather than southwest with the drifting seas. In any event we



Scott and Pete erect the second antenna.

once again set our compass on Spratly Island. The days running went well but slightly slower than our previous speed. In the mid-afternoon Scotty made a trip to the mast hoping for a view of nearby Ladd Reef to the south. A very prominent ship wreck sits atop Ladd Reef, an otherwise submerged coral bank. No sighting was made and sometime around 1600 John spotted our destination from atop the mast. Only a very slight steerage correction was necessary to take us straight to the elusive Spratly. Considering the past few day's events this was certainly an exciting moment. We all watched the island loom into full view, looking carefully for any indication of life or unusual activity on Spratly. The next misfortune came as we sailed into the Spratly parking lot and with all eyes glued on the awesome sight of a million plus birds rising in protest of our intrusion. Someone noted that the bottom was rising rapidly under the boat and we had best shut down and look for good anchorage. As Captain Vic reached for the throttles they fell free in his hand as did the shift controls and *Yankee* continued on at full steam. The engineer was located and shortly cut engine power from below while we dropped anchor over the deck to slow the vessel. We were within a few seconds of becoming permanent residents of Spratly Island. It seems our enterprising engineer had disconnected the controls from below due to the erratic operation after the previous nights events. The *Yankee* was moved out to some 40 feet of water and more permanently anchored in the leeward calm water.

The task of launching the landing craft was next in line. Since we were several hours late in arriving we had to make maximum use of what daylight was left. As soon as the landing craft was outfitted with a motor, John, Scott and myself made a survey trip to the island. Landing was simple in that the expected coral reef was in fact rock. When the landing craft ran aground we jumped out and pushed it up onto the beach. There are not words to describe the moment of first setting foot on this island after years beyond



Frank, WB4UZP, mans the Spratly Island souvenir shop.

our grasp. First visual examination from our landing point on the north west corner told us the charts were reasonably accurate. The palm trees, the flagpole, and the carin were nowhere to be seen. The island appeared as a triangular billard table being perfectly flat and grass covered, about 8 feet above sea level. The grass was in fact a sort of Chickweed with the many seagulls laying their eggs openly in the grass. This was our first concern since during the nesting season we must locate a campsite in an area where no eggs were laid. We approached the birds cautiously since we had no idea how violent their reaction would be to intruders. As we passed through the nesting area the sky suddenly became black with birds taking wing. The birds approached to within a few inches but made no physical contact. This was a relief. We confidently set out to survey a campsite. We noted the carin was in fact in the proper place but had been reduced to a pile of rubble not more than a meter high. On the leeward side and to the south we located an area free of both birds and their eggs. We also noted trails indicating that large sea turtles came onto the island from this side, events that may well have been inter-related.

It was very obvious at this point that the island was entirely free of guano deposits. From the *Yankee* it appeared that the white beach surrounding Spratly might in fact be something other than sand or coral. Putting this together with the earlier weather reports of occasional 30 foot seas at Spratly it was evident that Spratly is frequently house cleaned by Mother Nature herself. On one chart we recall a building at the north end. There was no evidence of this or any other construction. In fact the only signs of past inhabitants, other than the usual by-products of infrequent campers, *i.e.*, fire sites, soft drink cans and bottles, *etc.*, was a sign dated 18 February, only 2 days prior to our arrival. It was signed "F/B *Dona Florencia*" likely a Philippine fishing boat. The well was in place at the south end of Spratly and contained some water less salty than sea water. The well was about 15 feet deep and enlarged under the ground to have possibly served as a bunker at some point in history. There was evidence of metal fragments possibly those of an aircraft about the island and at second look the island would avail itself as a natural landing strip with its flat and hard surface.

With darkness rapidly approaching John and I set a course back to the *Yankee* leaving Scott behind to continue the survey. Another of our several errors in judgment forced a manual mode of propulsion for the Boston Whaler. The outboard, un-noticed, was a short shaft model and, of course, the whaler is a long transom. This oversight prevented the water intake from being below the waterline and thus the engine overheated on the trip to the island. It would not start, the paddles were broken out, and two fatigued sailors eventually climbed to the deck of the *Yankee*. Now, among all the useless weight we dragged along, one item was not the spare outboard motor. It was fitted into place with some difficulty but it was the proper size. From this point we started the ferrying of equipment to the island. About half of the 7 or 8 trips were made after total darkness. In spite of traveling over unknown obstacles with little or no light the landings went reasonably smooth although we gave some thought to such things as sharks feeding at night when we had to walk the boat through waist deep water at the reef. We hoped there were none at Spratly and this later proved to be true. While Pete and I ferried equipment, Scott and Frank were hard at erecting the first tower and beam antenna.

When all the gear was aboard the island, Pete joined the antenna crew and I started on an operation/camp site about 75 feet away from the antenna. The shelter was simply a silk parachute strung over a single 20 foot pole with the cords tied to various coral rocks on the surface. The antenna was a complex crank-up tower requiring guys at 6 points supporting a large Yagi-type array including electrical rotators. It is considerably more than one would normally take on a trip of this sort. By applying manpower where it was needed the campsite and the antenna project were both completed shortly after midnight. Radio gear was unpacked, tested, and set up at the operating position. A few last minute chores, such as sharpening pencils, setting up chairs, placing the ashtrays and a few handshakes as the speaker came to life, and 1S1A was ready to commence operation. This was a big moment indeed. Scott was deservingly the first in the operators chair. About half a dozen contacts were made, with Phil, VS6DR, our comrade on the intital attempts, the first to contact Spratly. At that point we discussed a generator that was left on the lower beach. Not knowing the latitude

of the tides, we selected discretion as the better part of valor and set off to move it to high ground. When we reached the beach we noted the generator was in no danger as the tide had reached a high and was receding away from the island. A cursory scan of the light to the area where the Boston Whaler had been anchored sent a shock of terror through the four of us simultaneously. It was gone. But how? It was firmly tied to a heavy steel ship's anchor with a long rope. How could this possibly have happened? Did we have unknown visitors? Did the tides cause the anchor to drag away? No time to wonder. We must have this vital link of transportation to the *Yankee*.

After several passes with the spotlight, we discovered the outboard some 50 yards off shore to the southwest not far from the rock reef. Some of us went into the water and from the depth of the tide it was evident that the boat had drifted far enough to the south of the reef to be in water deeper than we could walk in and also that the boat waas drifting faster than we could walk in waist deep water. Our consensus was that the tide had risen enough where the extremely buoyant whaler had caused the anchor to disengage from the rock bottom and was actually hanging free on the end of the rope. We assessed that there was sufficient rope to reach the bottom if we could get to the boat. Pete stated he was a sufficiently experienced swimmer to cover the distance without difficulty, and because of the urgency of the situation the possible ramifications of such a suggestion were not taken into consideration. Pete was on his way. It was obvious once Pete was some distance off shore that the whaler was drifting at a faster rate than we suspected. Nevertheless, Pete, being in good physical condition, made the trip in a short time and with a flood light from shore we saw him climb into the boat. From that point there was some concern over what was taking place aboard the whaler. The boat continued to drift in a southeasterly direction and it was evident that whatever attempts Pete was making to hold ground or return to shore were failing.

Throughout the entire evening we had continuous communication between the campsite and the *Yankee* via a v.h.f. radio link installed for exactly that purpose. We went immediately to that medium to request assistance from the *Yankee*. There was no answer though we could see the lights burning bright from her berth some 1500 yards due west. We called continuously through the next three quarters of an hour with no response. By this time Pete had disappeared from our light and the island crew was in a state of panic. Consideration was given to a swimming attempt to the *Yankee* to get her under way. We later learned that through another error in judgment the vital ship to shore radio had been turned off aboard the *Yankee*. Yet through some miracle a second radio, located in the un-manned wheel house, finally attracted the attention of



Pete, W5ZSX, at the c.w. helm of 1S1A on Spratly. The campsite is simply a parachute draped over a 20 foot pole. Antennas are Hy Gain TH6DXX's on crank-up towers.

the sound sleeping skipper. The general situation was relayed to him but with Pete having left our sight an hour earlier it was difficult to give precise bearings in the darkness. To further complicate matters the *Yankee* had to be extremely cautious in getting underway to insure it did not trike some unseen rock or reef. Even the direction of the island was unsure. The skipper excitedly roused John and the engineer to assist in the launch. Several problems were encounterd at this point. Shift/throttle linkage problems followed by an anchor stuck in coral (it finally had to be cut free and tied with a float for later consideration). Then a careful position analysis. All this ate up another critical 45 minutes with the plotting of Pete's last noted direction increasingly difficult.

The *Yankee* was finally underway and after guiding to the approximate location from the island team the skipper proceeded in a square search. This is a mariner's procedure of starting from a particular point and sailing in ever increasing squares to cover a maximum of area. After another couple of hours, with no sighting, the prospect of running low on fuel surfaced. It was then decided to set the *Yankee* adrift in hope that it would simulate the drift of the Boston Whaler. In hindsight we realized we had all failed disgustingly as professional communicators in not installing a radio and light or flare in the Boston Whaler. We thus knew that short of bumping into the Boston Whaler in the darkness Pete had little chance of signaling the *Yankee* but at least he could see her running lights and would know that she was close by. By 0500 with no sighting we discussed raising Air Sea Rescue for assistance.

While the island crew had considerable faith in our skipper finding Pete at first light we initiated attempts to raise someone on the air. At this time of day conditions are just about nil and at first light no radio contact had been estab-



The Spratly Island expedition group. From left to right: Chester, XV5AC; author Don, K7CBZ/XU1DX; Scott, WB4VBY; Frank, WB4UZP; Pete, W5ZSX.

lished. Pete was still not in sight and the alarm grew. Propagation finally dropped in on the 14 MHz band a bit after 0600. Through a station on Okinawa, and gradually others in the East Asia area, an alert was relayed to Clark Air Force Base in the Philippines. No sooner was this done than our faith in Captain Vic paid off. He had sighted the whaler. Air Sea Rescue was informed to stand by for word on Pete's condition and shortly we received word that Pete was tired, hungry, understandably shaken by his ordeal, but alive and well. This was, needless to say, a great relief to the entire crew plus the several amateurs gathered on the distress frequency on 21 February. The whaler was put under tow with the *Yankee* steaming back to her Spratly berth.

At this point most of the crew had been without rest for nearly 48 hours, our previous night having been spent solving the engine failure at sea, the latter with Pete adrift through the night. With Pete now safely aboard the *Yankee* we concentrated on food and rest. After tieing off to the old anchor rope, John brought in food supplies and generator gasoline. The remainder of the day was rest and sleep for those who could in the extreme tropical heat. Some minor antenna alterations were made and the operation resumed late in the afternoon with Pete at the c.w. position. Additional operation positions were set up and put on the air.

The remainder of our stay went quite well. A second antenna was erected the following day and one additional position was put on the air. Unfortunately because the initial events and the time lost we were never able to set up a workable shift schedule to man the radios around the clock. It seemed that we were all awake or asleep at the same time. The extreme heat of the day and welcome cool nights contributed to this as well. Time away from the radio was spent exploring the small island, beach combing, or splashing in the surf. The skipper came to the island on our last day to assist in the photos and to join us in a tasty steak dinner, char broiled. We made good use of the well as an impromptu shower by lowering a bucket into the fresh water and pouring it over our heads. The only wild life, other than birds, were the many hermit crabs attracted by our discarded trash. Several small bugs covered the ground at night and eventually worked their way inside radios, suitcases and camera bags. During daylight they would seek cover in shoes, clothing, etc. They occasionally took shelter inside the cast Scott still wore on his foot, causing him to take a few early morning practice Cha Cha steps before settling into the radio position. Radio propagation was largely poor and unpredictable. Conditions to the west coast of the U.S. and Japan were, on the other hand, excellent. Because of the poor conditions to the east coast we elected to stay one additional day. At first light on 24 Feb. we totaled up some 4,000-plus contacts. We proceeded to break camp with the sad chore of packing up all the gear and removing the antennas.

By noon the expedition was reduced to a few piles on the beach, some of the gear already having been shuttled back to the *Yankee*. In a brief departure ceremony a sign was fabricated out of wood and painted to mark our intrusion upon this peaceful island. The last load moved away with the remaining crew and gear shortly after noon on 24 Feb. Every last ounce of fading energy was required by all hands to raise the Boston Whaler back to the deck of the *Yankee*. It was done, the anchor lifted and Spratly faded off the stern. We detoured only slightly to have a closer look at the shipwreck on Ladd Reef, then set course for Port Vung Tau. Even with an additional failure, a broken prop shaft, the single engine carried us over the following seas without further incident. We docked in Saigon early on 26 Feb. and headed for our respective showers and beds to quell the fatigue and jangled nerves. Spratly Island and her buried secrets were returned uninjured to the inhabitant fowl, the *Yankee* to a nearby shipyard for some needed repair.

Envoi

A special note of commemoration should go to amateur radio stations VS6DR, KA6RN, DU1WBT, KA6JT and Earl at XV5AC who gave of their time to maintain a 24 hour security watch on 14.342 and 7085 throughout the expedition and without whose assistance the trip could not successfully have been completed.

Special appreciation is also directed to Captain Victor B. Clyronomides who donated his time to take us to Spratly Island. Despite the setbacks and crew of land lubbers, Captain Vic kept astonishing high spirits througout the adventure. ■

Transistor Final Techniques

BY GENE BRIZENDINE,* W4ATE

FINE examples of solid state transmitter design have appeared in the literature, but all too seldom do we hear these on the air. Being fairly active on the high-frequency bands, I can count the handbuilt ones I've worked on one finger (Bob, K4OCE)!

Reasons for this alarming situation are many, the one most frequently heard is that the cost of the r.f. power devices is too high. So, let us eliminate that bottleneck quickly. My 80-watt carrier comes from two Motorola transistors, each characterized at 12.5 volts, 40 watts output at 175 MHz. These are modern devices, tolerant to unfavorable v.s.w.r. and related abuses. They were purchased new on the market for $8 each.[1]

This article is intended to encourage the construction and enjoyment of higher power transistor amplifiers. With the dollar hurdle behind us, let's examine some reasons why a solid-state r.f. power amplifier may not have purred for us. The low impedances and efficient transfer of power through the chain of stages and to the antenna are extremely important, (but not frightening). You may quickly prove this importance with any power device which has two emitter leads. Simply observe the r.f. output climb, as you connect the second emitter lead.

Quickly accept the fact that bipolar transistors are current-type devices, requiring r.f. *current* through the base-emitter path. Forget the high voltage, low current excitation requirements of the voltage-type tube device. With the low impedances presented by the device junctions, we must logically expect heavier conductors, larger capacitors and higher supply and signal current flows. (The 2N6084 40-watt collector current may reach 6 amperes).

Notice also that this high amperage may flow through the collector tank coil, which must also carry the developed high r.f. current. The coil wire size must be adequate; if shunt feed is utilized, be positive that the wire in the r.f. choke carries the peak current with very little voltage drop. This may be measured at the collector, through an appropriate r.f. choke temporarily connected to the v.t.v.m. probe. Power supply cabling must also be adequate, to avoid voltage drop and stage interaction.

Some peculiarities of transistors are baffling, until they are viewed calmly, with an unflinching eye. One such phenomena called "mode jumping" may occur in a linear amplifier. The output fluctuates for no apparent reason. This is explained by the fact that a tuned tank has a different resonant frequency for a strong drive signal than for a weak one. Since the drive to a linear varies widely, in accordance with voice intensity, mode jumps may result. Precautions to cure this include a carefully chosen bias, correct grounding and using only transistors with low values of parasitic capacitance and inductance. Most recently-released devices meet this requirement.

Another departure an r.f. amplifier may exhibit is to oscillate at a frequency much lower than the carrier. The high-Q r.f. chokes feeding bias to the base may trigger this condition, plus the transistor's greater ability to amplify at the lower frequency. A cure is shown in fig. 1.

Sufficient drives to each stage is easy to overlook. "Families" of devices, specifically designed for power buildup are the best choice. A typical example, with dissipation ratings is the RCA 2N40290 (7w.), 2N40291 (11.6w.), and 2N40292 (23.2w.) family. If a family cannot be obtained, at least a study of their ratings will afford a guide to proper drive.

Triple bypassing, for audio, high-frequency and v.h.f. is necessary. The electrolytic audio bypass is preferrably the tantalum variety. These are easily identified as being much heavier in weight than less expensive units. The h.f. capacitor may be ceramic feed-thru or disc, in that order of preference. The v.h.f. bypass may be the silvered mica button type with the shortest lead path possible. More expensive capacitors are available, but have not yet been found necessary.

The blown-up fig. 1 is presented to bring together personal findings and ideas from many sources, to render the power r.f. stage both stable and efficient. The points of interest are labeled for easy reference without shifting between text and figure.

The biasing circuit illustrated deserves comment because in s.s.b. linear service it is vital both to the proper operation and health of the device. A stud type silicon power diode is bolted to the heat sink as near as possible to the r.f. power

*600 Hummingbird Drive, S.E., Huntsville, Ala. 35803.

[1]Semiconductors Unlimited, 1095 East Indian School Road, Suite 400, Phoenix, Arizona 85014.

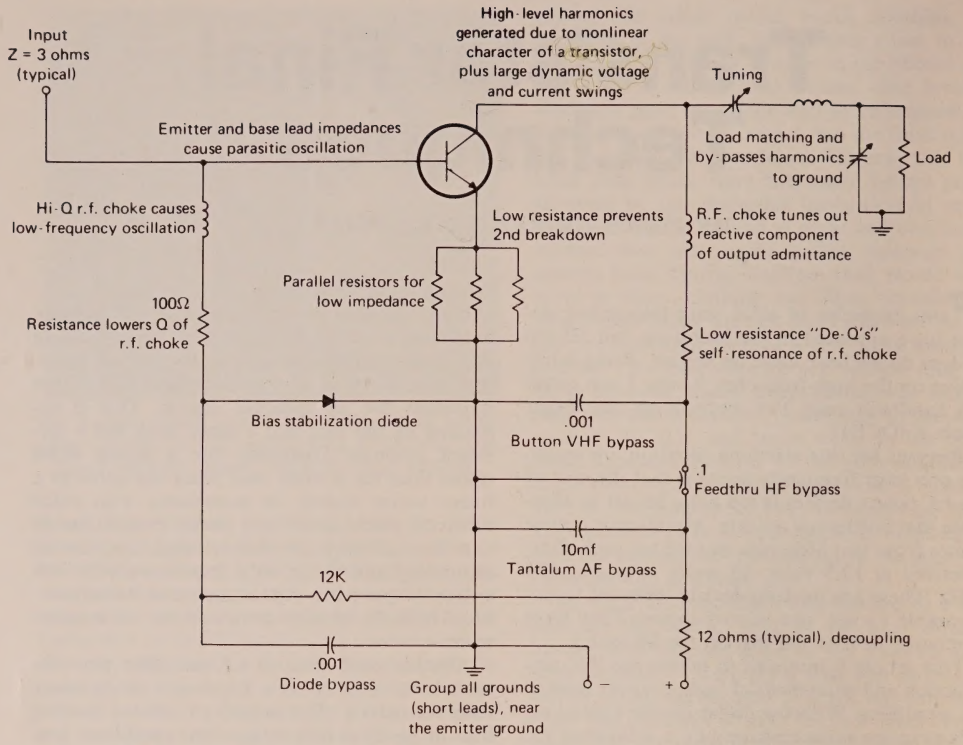


Fig. 1—Transistor r.f. final amplifier showing the function of individual components.

transistor (between a pair is ideal). Any increased heat lowers the diode resistance, lowering the positive base bias, thus maintaining a safe dissipation level in the device. A sensitive diode type may be easily selected, using only an ohmmeter and soldering iron. Measure the diodes drop in forward resistance after touching the hot iron to the stud for a given number of seconds (verbal counting is good). A diode type with fast thermal response is preferred.

Low impedance connections to the device must be made. The MT-72 stud package with four wide, flat flexible leads is ideal. PC board is efficient for the ground plane, allowing emitter leads to be solder-grounded close to the device. Soldering may be done safely while holding the emitter leads firmly against the ground plane with a small screwdriver. This uses the ground plane as a sink, carrying heat away from the device. A clean, hot 100-watt iron is best for a quick safe job.

For paralleling transistors, wide PC board strips provide ideal low impedance connections to the base and collector leads. Since the device leads are in metallic contact with the junctions, the wide PC strips provide a direct route for heat exit to the air. These details are shown in fig. 2.

Happily, a high-power TR amplifier may be tuned to resonance before applying collector power, as I have suggested elsewhere. With the driver operating, enough signal is coupled through the base-collector junction to actuate an r.f. indicator.

First, insure that the indicator will cover the desired frequency. The r.f. indicator may be a dip meter in the detector mode, or a simple "sniffer" as described by K1CLL.[2] Tune the indicator to the driver signal. Next, couple the indicator to the amplifier tank, and without the collector energized, tune the tank for maximum indicator reading. Thus, the amplifier may be quickly tuned without high v.s.w.r. and out-of-resonance abuses to the devices.

Tuneup Precautions

1. To prevent applying damaging voltages, simply insure that these are *simply not available* at the test area. Always start first with low voltage and drive, bringing both up together.

2. You may wish to temporarily tack-solder in inexpensive low-power TO-5 transistors (2N697, etc.), instead of the large devices, until you get the feel of tuneup.

3. Emitter resistors offer some protection during preliminaries. Several, paralleled present a lower impedance, the one-watt size having lower

[2]Bill Hoisington, K1CLL, "Tunable Reception for Two Meter FM," *73*, July, 1973, page 26.

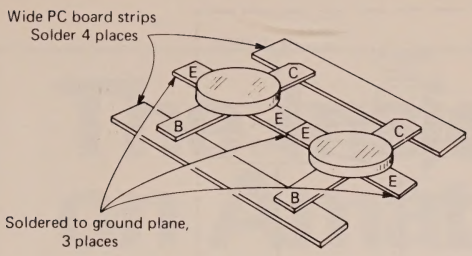


Fig. 2—Low impedance emitter grounding and paralleling strips.

Z than the half-watt unit.

4. Use ample heat sinking. During tuneup, keep a constant check on device temperature, either by finger or thermometer. The thermometer bulb may be temporarily attached to the device, using ordinary putty. Remove collector voltage the instant an unusual temperature rise occurs.

5. Never operate without normal antenna or dummy loading. It is frequently fatal to the transistor.

6. A collector ammeter should be monitored constantly. Climbing current is the earliest warning of junction overheating. But, remember that maximum r.f. output does *not* occur at the collector current dip.

A tunable r.f. indicator is a necessity, because it is easy to tune up at an incorrect frequency, due to the unfamiliar LC ratios involved. It is invaluable for taming spurious or harmonic emissions. Since the collector ammeter cannot indicate when maximum r.f. output is being radiated, an r.f. indicator or field intensity meter is most desirable.

Readings with the tunable r.f. indicator, of the various harmonic components, as a ratio to the fundamental level will give a very rough indication of their levels. Harmonic output may be reduced by use of higher C in tanks, tapping coils closer to r.f. ground, and careful attention to biasing. This care will insure that power is not being wasted by devices generating and amplifying frequencies other than those desired.

More harmonic output than from a comparable tube power amplifier is normal. Pi interstage and antenna matching systems are helpful, because some harmonic power is bypassed to ground through the tuning capacitors. However, a low-pass filter between a TR amplifier and the antenna is necessary at present state of the art.

Reviewing the scene, we may still be awed by the seeming array of hazards and pitfalls. But if we honestly enumerate all the dodges and footwork we have accumulated to live with tubes and their shortcomings, we can agree that it is time to move forward, and enjoy the advantages of transistor r.f. power. We need only to learn to play the semiconductors game, using their rules. ■

COP's COLUMN

BY COPTHORNE MACDONALD,* WØRX

W6MXV's Scan-Converter

Since Mike Tallent unveiled his first camera-end scan-converter at the 1973 Dayton Hamvention he has been refining the design, and has come up with a "finished" version which he calls the MXV-200. This converter takes the regular video output of a standard, unmodified, fast-scan vidicon camera (or other video source) and converts it to a 128 line 8.5 second slow-scan signal.

The block diagram of the converter appears in fig. 1. Operation is roughly as follows. The input fast-scan video signal is amplified and fed to an analog-to-digital converter. At the same time, the sync is stripped from the video and used for certain timing operations. The A-to-D converter generates a 4-bit digital code that represents, at any instant, the grey level of the incoming video. (A 4-bit code permits 16 discrete grey levels to be preserved.) The digitized fast-scan video is then clocked into the type 2502 quad 256-bit shift register memory, one fast-scan line at a time, under direction of the timing and control circuitry. Once a line of fast scan video is stored in the memory, it is clocked out at a much slower rate. The central portion of that fast-scan video line is, in effect stretched in time to 1/15 of a second—the duration of a slow-scan line. The 4-bit code is converted back to an analog signal in the D-to-A converter. From there it goes to the subcarrier f.m. generator where it frequency shifts the audio subcarrier which is the transmitted SSTV signal.

Mike's scan converter has a number of interesting and worthwhile operating features. In common with the sampling-type SSTV cameras on the market today, the unit permits the video polarity to be inverted (black becomes white and vice versa). Half and quarter frames can be transmitted, as well as full length frames. In common with WØLMD's scan-converter, the bottom 8 lines of each frame are an electrically generated

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

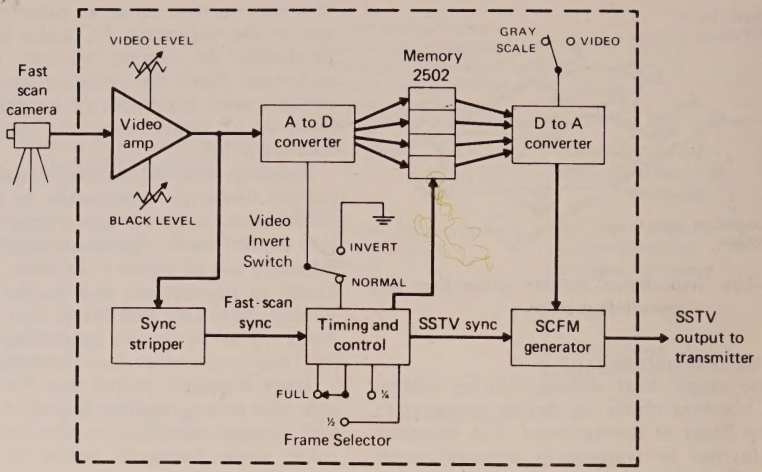


Fig. 1 - Black diagram of the MXV-200 fast scan to slow-scan video scan-converter.

grey scale. A pattern of this sort can be a tremendous help in optimizing the black-to-white video swing for any given picture. The receiving operator can also use this signal to make sure that his monitor brightness control is set so that black is "just black." A switch permits the grey scale pattern to cover the entire screen if desired. The unit will operate on either 110 or 220 volt, 50 or 60 Hz power.

A number of special effects are possible by tying other station equipment into the converter. To quote from Mike's letter, "A flying-spot scanner or keyboard can be locked to the H and V sync from the MXV-200, and with TTL logic levels can insert black level, white level, or invert the video, independent of the fast scan camera driving the MXV-200." To put it another way, with a keyboard or FSS it is possible to insert letters or drawings into a grey-scale picture just as they do on network TV.

The scan-converter's pictures speak for themselves. They were reproduced on one of my home-brew P7 monitors from a second-generation tape cassette sent to me by Mike. He obviously used a good fast-scan camera to feed the converter. The resulting slow-scan pictures are just about as crisp and sharp as the basic limitations of the slow-scan standards permit. Grey scale rendition is excellent, and I couldn't detect any objectionable "contouring" of grey levels due to the 4-bit encoding process.

The unit uses 41 integrated circuits and 26 transistors, operating at frequencies extending from d.c. to the low megahertz range. This would make it a pretty scary project for any but the most experienced, except that Mike is making a PC board available. To quote from his letter again, "The complete circuit has been put on one PC board, 8″ × 9″, and 3½″ high. Thus chassis wiring has been reduced to a few connections to the controls and connectors. The board is double-sided with plated-through holes, solder plated with a gold plated connector strip. Price for [bare] board and instructions is $35.00. A kit with all parts less cabinet, power cord, and knobs is. $175.00. Board wired and tested is $235.00." Mike Tallent's address is 6941 Lenwood Way, San Jose, CA 95120.

Some Straight Talk

It's getting tougher and tougher to build your own ham gear. That's no news to any of us. Equipment is getting more and more complex. Fewer and fewer distributors are willing to sell parts in small quantities to individuals. Parts shortages, while easing somewhat, are still common. Delivery times for some components stretch out to months. Component prices are going up. Yet on the bright side, there are individual hams doing something to help the situation. If a good design is recorded, not only on paper, but also in the epoxy-glass and copper of a good quality PC board, other hams can build that piece of gear who could not do so otherwise. If the designer is also willing to do some or all of the parts scrounging, still more people will be able to build that piece of gear. Finally, if the designer is willing to insert and solder the parts into the board, and to test it, the circle of users is extended still further.

I'm very excited about this sort of thing. With a proven board design you don't have to be an engineer with a lab full of equipment to build a sophisticated piece of gear and have a reasonable assurance that it will work. Information brokers such as *CQ* and myself are happy to help make all this happen. It is one of the activities which will help the do-it-yourself side of ham radio stay alive. There are potential pitfalls, however, which can bring nasty letters to all the well meaning people involved, and create a

The Inside Story on Amateur *Slow Scan* TV

PART 1



SEND FOR OUR 7 PC. 10,000 WORD SSTV STORY. Everything from SSTV frequency allocations to reprints of ham magazine SSTV articles that you may have missed.

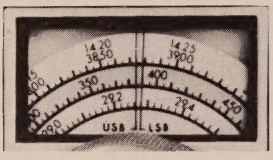
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WE'LL SEND YOU OUR DIRECTORY OF SSTV OPERATORS!

Talk with them yourself and see how much they enjoy SSTV. You might find that old friend you used to work on 6 meters has gone to SSTV.

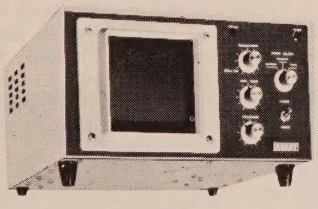
PART 3



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lot of hard feelings. The problem is that once our very helpful designer accepts a check from the ham buddy he's trying to share his design with, he's also in the middle of a hard, cold, no-nonsense business deal. The purchaser expects his hardware delivered, as described, when promised. The would-be supplier all of a sudden realizes that he is in business. Sometimes it is a more complex, more time consuming, more difficult business than he bargained for. Certain parts become unavailable. A change in his personal life causes his free time to evaporate. He fails to take into account incidental costs like shipping, telephone calls to balky vendors, etc. Trouble is close by in circumstances like these.

There are a few basic groundrules I'd like to suggest to the part-time ham supplier and to the ham purchaser who deals with him. First, for the supplier: think the whole thing through beforehand. Be realistic. Restrict your offer of help to a level that you can manage. If you provide only a bare board you need only to get and supply one part—the board itself from the board manufacturer. If you supply all the parts that go into the board, you will have to purchase a great many different parts from many vendors. Do you have the money to buy the parts in advance? Are your customers willing to wait if you don't? If you stuff, solder, and test the boards you must add in more of your own time. How will you handle bad parts? Boards that don't work? Second, make *realistic* delivery promises. Leave room for contingencies. People can wait a long time if they've bargained for it; but run out of patience in a hurry if they haven't. Third, be scrupulously honest at all times. If unexpected difficulties arise, let the purchaser know. Most people respond well to an honest revelation of your troubles. Lettings things drag on, and then avoiding letters and phone calls is bad news. Finally, recognize that accepting an order binds you with a legal and moral commitment to deliver what you promised.

To prospective purchasers I would first suggest that you get the full picture. Will the board come with holes, or will you have to drill them yourself? Will the supplier offer any checkout help if you can't get the unit working? What

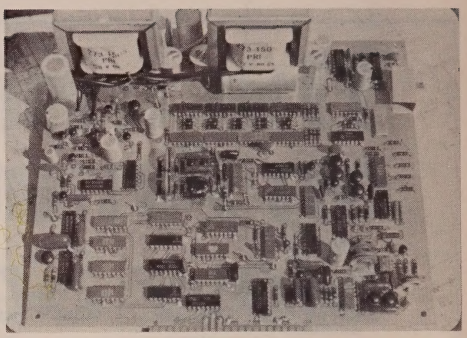


Fig. 2—This one board plus a few external switches and pots comprises the entire scan-converter.

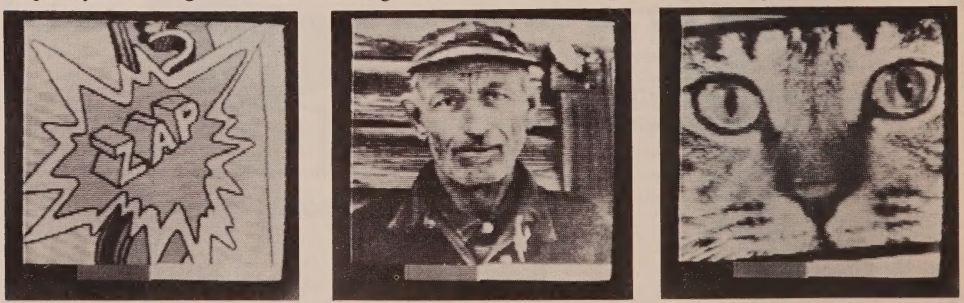
delivery can you realistically expect? A phone call to the producer/ham can be a very worthwhile investment here. Second, adopt a patient, flexible attitude; particularly with respect to the wait for delivery. Let it be known that you *want* the truth if problems arise. Presumably the supplier is a fellow ham trying to help you build a piece of gear. Let him know that you are a reasonable person, dealing in good faith, and as long as his attitude is the same, you should be able to work out any problems.

Reducing Cassette Recorder Wow & Flutter

In a recent column we reviewed some of the causes of line-to-line jitter in slow-scan systems, and pointed to cassette recorders as major offenders. The basic problem is that the speed stabilizing effect of the capstan flywheel is not as great as we would like in cassette recorders. This is because the basic tape speed is only 1⅞ inches per second, and the small size of most recorders dictates a small flywheel. Mike Ludkiewicz, W1DGJ, has a very slick solution which he has been using in his station for some time now, and wants to pass it along. I'll quote directly from his letter.

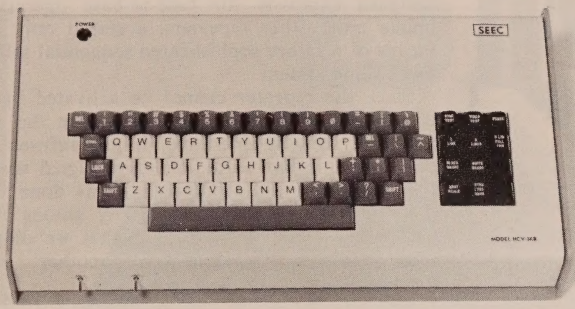
"I'm using a Norelco cassette recorder that I bought for $15 at a discount store sale. It nor-

[*Continued on page 70*]



Examples of picture quality attainable with the scan-converter. (One frame time exposure of a P7 monitor screen during playback of cassette recorded pictures.)

Announcing

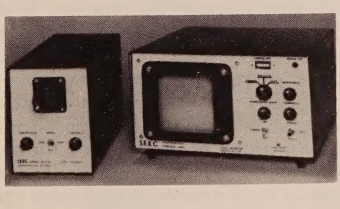


THE SEEC HCV-3KB SLOW SCAN TV KEYBOARD

Announcing another first from the company and the designer of the world famous HCV-1B SSTV Camera and the HCV-2A SSTV Monitor, now the HCV-3KB Slow Scan TV Keyboard. This is the first commercially made SSTV Keyboard and it is built with the same quality as all SEEC/THOMAS equipment. We will not attempt to list all the features of the HCV-3KB here and we suggest that you write for full specifications. For those that are not familiar with SSTV Keyboards, the HCV-3KB eliminates the need for a menu board or other number/letter set-up arrangements which is very time consuming to set-up a meaningful text by arranging letters one at a time, by hand on a board or other surface. It also "frees up" the SSTV camera for other uses, such as live shots of the operator or other subject matter. Simply type out the message you wish to send. U.S. Patent no. DD-033469.

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Sony TC110A Cassette Recorder $134.95.
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'JUP on FM

BY NORM STERNBERG,* W2JUP

ONCE in a while some of us get the chance to combine different phases of our hobbies into a new and highly satisfying activity. For years I have been a radioteletype freak. For years I have been an f.m. cuckoo. This month, I would like to expose for your consideration the happy marriage that I have found for the two techniques. I mean operating RTTY on two meter f.m., both simplex and via a repeater.

To the uninitiated and unwashed, RTTY may appear to be a monstrous struggle with outmoded, obsolete and frequently cranky mechanical gadgets, full of bars and cams and levers and clutches and strange sounding tones and shifting things. To the same type of uninitiated unwashed and unadventurous soul, f.m. may mean nothing more than plugging his Mastercharge card into the local radio store and coming up, like Little Tom Thumb, with a plum in the form of instant amateur radio. Commercial radios, synthesizers, ready-made antennas, preformed cables with the connectors attached. . . . For many guys today, this is where amateur radio is at. God bless them each and every one. If that is what amateur radio means to them I say a hearty "carry on!". To each his own, bearing in mind that this is still a hobby, and what you can get out of it many times is a function of what you put into it.

For some of us, RTTY has been a challenging way of keeping amateur radio fresh and vital, capable of introducing new problems and the satisfaction that comes with mastering new techniques and solving the problems. Operating through an f.m. repeater offers still further challenges and produces some great advantages and a lot of fun with the other RTTY operators in the area. In some cases, the RTTY men have decided to operate surplus commercial gear because of the relatively heavy duty cycle requirements of RTTY. Others have chosen to make minor modifications to the rice-box variety of radios. In all cases, there is fun to be had!

An example of some of the things that can be done with the combined techniques of RTTY and f.m. is best illustrated by mentioning my own repeater here on Long Island. WR2AFC is a strange creature . . . a teletype-only machine, designed expressly for base-to-base operation unlike most other repeaters, accessed only by means of a rather sophisticated sequential selective calling system.

Since the repeater cannot be activated by a carrier (there is no COR), and since the repeater is fully regenerative, it just refuses to pass anything but a Radioteletype signal using five level code or Baudot. This was done for the obvious reasons of exclusivity among the authorized users. (The truth is that we didn't think Long Island could hack another "yak machine!")

Our repeater group has the usual assortment of humanity . . . one radio engineer, couple of TV broadcast engineers, one accountant, one printer, one designer, and so forth. No geniuses involved. But we do accomplish some stunts that can be very impressive to the newcomer. For example . . . when two of our guys are working different shifts at their respective "salt mines", they still communicate with each other. They are both set up for autostart. It works like this. The teletype gear sits quietly, minding its own business, doing nothing, until the repeater comes on the air. Then, the teletype starts itself, and as any teletype signals come through the repeater, the teletype prints it out on the page. When the traffic is over, the repeater goes off, and about thirty seconds later, the teletype turns itself off and goes back to dozing. When I get home, I scan the page and can readily find whatever traffic may have been left for me by any of the guys in the group. I can also read whatever contacts have taken place between any of the other users of the repeater. In effect, we have remote control over each other's teleprinters and can leave messages for one another with the greatest of ease. Now while there is nothing new or radical about the autostart concept, and there's plenty of it on 20 meters, we do have a couple of things going for us. . . . low power transmitters (I run 8 watts out), fixed frequency receivers and transmitters (no critical tuning or stability problems for autostart), high gain antennas are easy, and we all sit with our antennas pointed at the repeater. Have you ever had a RTTY roundtable among five or six stations on v.h.f., each station in a different direction from you? You can go out of your mind trying to track the guys with beams when you need the gain. With the repeater, of course, aint no sweat. Matter of fact, the idea must be a fairly good one . . . I see that the MARS has a RTTY repeater outside New York City for the purpose of distributing traffic from the h.f. nets into the local area.

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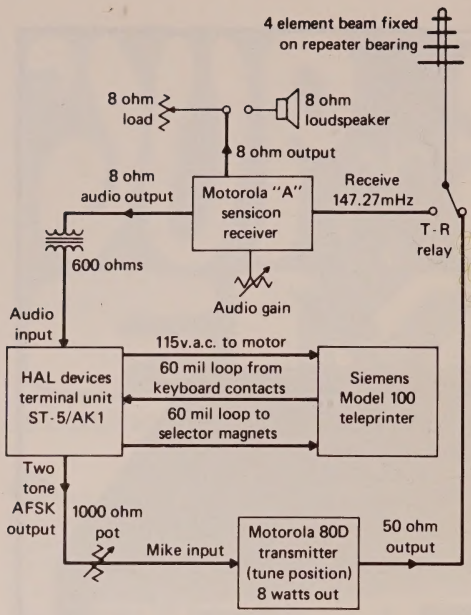


Fig. 1—Basic RTTY station setup at W2JUP.

Take a look at some of the techniques involved. For reasons of facility and stability, we use AFSK, rather than FSK. Instead of shifting the carrier frequency itself at the Baudot code rate (which would be true F1 emission), we generate a pair of tones at an audio rate. Then we use these two tones in the Baudot code to frequency modulate our f.m. rigs in lieu of a voice signal (F3 emission). On the receiving end, instead of using a b.f.o. to beat with the incoming shifting carrier and produce the varying tones at the audio output of the receiver, we take a normally demodulated signal from the regular audio output and apply the varying tones to our RTTY terminal units. This way, we gain the advantage of f.m. quieting and stable tones and shift. As for the terminal units used to generate the shifting tones and convert the tones into the necessary d.c. pulses for the teleprinters, that is a subject amply covered in other places and many designs are available for homebrewing and many kits are available for home construction. The amount of sophistication you achieve is strictly a function of your imagination and your pocketbook. Some of our group are using surplus military terminal unit equipment with excellent results. The teleprinters in use by our people range from the complex and expensive 28ASR units to the military surplus Kleinschmidt printers found in many magazine ads. Again, the teleprinter you use is a function of what friends you have and how much you can scrounge as well as the size of your budget.

For the sake of standardization and compatibility with some of the existing terminal equipment, we have chosen to adhere to the older shift standard of 850 Hz, in spite of the march now evident on the h.f. bands to use the narrower 170 Hz shift. On v.h.f. f.m., we don't have the problems of selective fading, phase shift, sideband distortion usually associated with the h.f. medium. Either we have a quieting signal at the repeater, or we don't. The repeater has a conventional Motorola Sensicon receiver, unmodified. The output of the receiver feeds a homebrew terminal unit and a "selcal" device, a commercial surplus unit from one of the press wire services. The terminal unit decodes or demodulates the incoming tones, and applies these tones to a regenerator, which in turn, reconstitutes the teletype code characters, correcting for various types of distortions and signal defects, generates new code characters and applies the cleaned up code to the transmitter input. But the transmitter (an unmodified G.E. Prog Line unit) does not go on the air until the "selcal" enables it to do so. The "selcal" (sequential selective calling unit) is programmed internally to recognize a specific pattern of code characters, and when that sequence of characters is received in the proper tone relationships and the correct sequence and timing, the "selcal" turns on the transmitter and the repeater is on the air. An example of how the "selcal" is coded would be like this . . . These characters would have to be sent in exact sequence to turn it on.

Letter H
Figure shift
Numeral 4

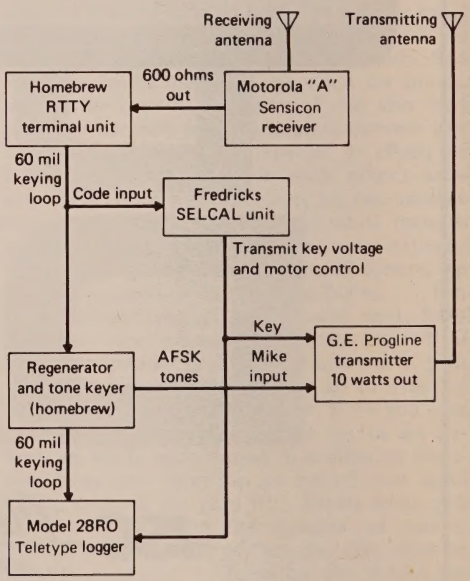
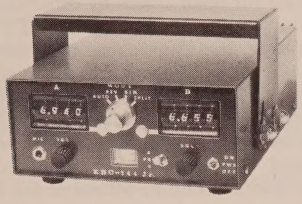


Fig. 2—Block diagram of the WR2AFC teletype repeater as presently operated.

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Letter shift
Letter A
Letter B
Letter C.

In other words, on your teletype machine at home you would send "H4ABC", and the repeater would go on the air as long as your signal into the repeater exceeded 1.5 microvolts and your tones are the right frequency and your code characters are properly formed with less than five percent character distortion.

Our input receiver at WR2AFC has a special i.f. filter, extremely narrow, as f.m. filters go, and overdeviated signals, that is, signals with deviation on the tones over three kHz, simply will not get thru the equipment. Interestingly enough, by making the receiving criteria of the repeater rather strict and needing close adherence by the user, we have managed to clean up an awfully large number of what formerly were rather crummy RTTY signals. And the results are obvious when our guys go over to the h.f. bands to operate. They get improved results because they were pushed into alignment, so to speak.

The repeater is turned off by sending the standard teletype turnoff code, "NNNN". It remains off until another signal on the input presents the "selcal" information once again. Generally the repeater is turned off after each transmission but in the case of a round table with several stations involved, the repeater will be left on for open access by other stations. One of the really nice features of the RTTY repeater is that everyone knows that they will not time out the repeater, since it has no such time out provision. Teletype transmissions through the repeater can and sometimes do run as long as twenty or twenty five minutes. The sending station need only observe the legal requirements for his identification in Morse at the mandatory ten minute intervals.

Since most of the users of the repeater are rather good friends, there is a close-knit camaraderie not generally found on the other repeaters. In some cases, one guy will come up with a special problem, detail it on the page via the repeater when he has a few minutes to spare and then wait and see which of his colleagues may be able to help out with answers. Sometimes the answers come back two days later. RTTY requires a certain patience not often found on conventional repeaters. Some of the guys hand type all their traffic, and others use tape perforators and terminal distributors to run the pre-cut paper tape into the repeater. So much for the philosophy. Better we should present some typical block diagrams of how we can lash up the stuff to make it play the right music.

Fig. 1 shows a simple but effective setup used at this station for some time. By the way, mention of a particular type of teleprinter or terminal unit does not constitute any recommendation or endorsement by this writer of any particular product or device. Products, where mentioned, are for information and example only.

Fig. 2 is the basic block diagram of the WR2AFC teletype repeater as presently operated. The diagram is simplified and excludes the various FCC-required control and peripheral gear.

Since the repeater is co-located at one of the local broadcast stations, emergency power is available and the repeater can very well serve as a high speed traffic link for emergency services. Tests have been conducted with the successful passage of traffic at 60 words per minute between the Philadelphia area and central Connecticut using the repeater for a single hop circuit.

Next month we will present some of the problems found by our gang in interfacing various types of commercial and imported two meter gear for AFSK RTTY and discuss the solutions arrived at to satisfy our operating requirements. By the way, if you have any hot questions on the subject, you can call me at (516) 796-4133.

73, Norm, W2JUP

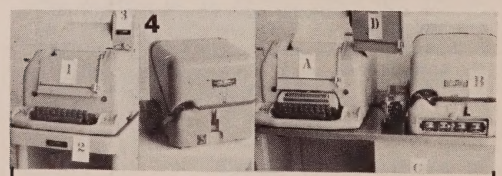
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antennas

BY WILLIAM I. ORR,* W6SAI

"Mailman!" cried Pendergast, kicking open the door of the shack and dumping a pile of mail atop the operating desk.

"QSL cards from rare DX stations?" I asked with a smile.

"No, sir," replied Pendergast. "Letters from your admirers, commenting upon the remarks you made about vertical antennas in your November *CQ* column. You really rang the bell with that one."

I reached for the stack of mail which my friend had brought in from the mail box. "Here's a great letter from Art, W1AM. He says, 'Your article in November *CQ* was interesting and constructive and prompts some comments, drawn on experience with vertical antennas, which I might offer as extension to your thoughts.

'As the sunspot count dropped, I caught the 5-band DXCC illness, and decided to put up antennas for 80 meters. Cost and practicability were real considerations. I built two antennas: a 125′ horizontal about 40 to 50 feet high, end-fed by a tuner. The second antenna was derived from the W2FMI design in *QST*, a 24′ mast with a small top-hat and 100 radials, 70 foot long each. The mast was base-loaded with a high-Q coil.

'In comparing these antennas, I saw little of the conclusions drawn by VE3AAZ and mirrored by yourself (. . . there seems to be very little to be said for vertical polarization except for the non-directional feature . . . *QST*, June, 1965). I attribute this conclusion of mine to the fact that this practical horizontal antenna, like so many on 80 meters, is only about 0.15 wavelength high. The radiation pattern is one that favors very high angle radiation, and is distinctly at a disadvantage at low angles, compared to the not-so-outstanding vertical antenna with its ground losses!

'Since almost everyone else uses low horizontal antennas on 80 meters, the user of a good vertical antenna on the low bands has a major advantage in the rejection of high angle radiation and the substantial increase in received DX signals in relation to background QRM when working long path stations. This point was ignored in your article.

'For example: On 75 meters I worked VP8MS in the Antarctic, receiving a 5 X 8 report when the bulk of the east coast stations were getting 5 X 6. A friendly F8 station in France gave a 2½ S-unit advantage to the vertical over the horizontal. Russian teletype signals on 80 meters are usually one to two S units louder on the vertical than on the horizontal. Also, I've seen in DX pile-ups on 80 meters signal-to-QRM ratios as much as 4 S-units better with the vertical than the horizontal. The vertical is really a potent DX-weapon on 80 meters! No doubt, the vertical is superior to the low horizontal at low angles of propagation and it has brought me 90 countries on 75 and 80 meters in the past year.' "

"That certainly speaks well for the vertical antenna," said Pendergast.

"Very interesting," I replied. "My remarks about vertical antennas, of course, were concerned with the higher frequency bands; 20, 15 and 10 meters."

"It's a different story on the low bands," said Pendergast. "There's less competition from big beam antennas on the low bands."

My friend took another letter from the stack. "Here's an interesting note from Graham, VK5ZAD portable W2. He says, 'At low radiation angles I have seen many times where a good vertical antenna has outperformed (often quite markedly) a low horizontal antenna. A particular case I can quote is a low, horizontal dipole, about 25 to 30 feet high for 160 meters (*i.e.*, less than .05 wavelength) which is consistently a poorer performer than a full-size ¼-wave vertical efficiently fed with a very good radial system. The actual efficiency of the horizontal appears to be about 8 dB less than the vertical, probably due to ground losses. On over-water paths of 1000 to 2000 miles, or more, the vertical hears and works signals inaudible on the horizontal—except during daylight hours when lower angles are absorbed. Over land, the situation becomes more complex, as a higher angle of radiation seems to be required for a given path. The crossover point between the two antennas varies, depending on conditions of the ionosphere.

'On the average, the two antennas are equal at about 700 to 900 miles on 160 meters, with the horizontal giving better performance in close, and the vertical further away. Because of lower noise susceptibility, the low horizontal gives better signal-to-noise ratio out to 1500 to 2000 miles, depending on conditions.

'The above has been found from careful examination of received signals on an accurately calibrated receiver S-meter. A good example of the day/night phenomena is that as darkness falls, the German c.w. station, DHJ, in the 160 meter band, drops in strength on the horizontal as dusk falls. At some point, the signal becomes audible on the vertical, increasing in strength as

*48 Campbell Lane, Menlo Park, CA 94025.

the signal on the horizontal drops until the cross-over point occurs. Eventually, the DHJ signal on the horizontal disappears. In ionospherically disturbed conditions, however, absorption of the lower angles can make the horizontal the more effective antenna.

'I believe that factors such as soil conductivity and topography can make many locations particularly bad for vertical antennas and this, even combined with the 8 dB inherent disadvantage shown by a low horizontal dipole, can "kill" a vertical. The vertical's only advantage is at very low angles (*e.g.*, distances over 1500 miles and ideal ionospheric conditions) and if poor soil conductivity reduces efficiency at low angles—and it can to the order of 10 dB or more—the low angle advantage of the ground plane can be removed.

'Again, when in Australia, and listening to US stations on 40 meters, we notice that some of the better signals are emanating from vertical antennas, whose owners have tried (without as good results) horizontal dipoles. And yet, others have good success with dipoles and they cannot get success with verticals. One big problem, which gives erroneous results, is that the vertical receives vertically polarized noise, and unless the user has his wits about him, can get the impression the vertical provides poor performance due to the poor signal-to-noise ratio. Many a DX operator has thrown out verticals for this reason.

'If the horizontal antenna can be put at a height which gives the main lobe at a desired, low angle for the band in use, the DX'er will unquestionably do better than with a vertical of equivalent efficiency. But, if he cannot do this, the vertical may do well for him'."

"There's a P.S. on the letter," I pointed out.

Pendergast read, "I question the statement made by many that size of wire used for radials is unimportant. I made checks on the 160 meter vertical and found that an increase in the number of radials by 40% (using #18 wire) had less effect than a 20% increase in number of radials using #6 wire."

"That'll give the 160 meter DX'ers a lot to think about," I said.

"Here's a great letter from Frank, K9KIC, concerning his DX operation from KA9FD in Japan during 1970. Frank says, 'I first put up a Hy-Gain 14AVQ on a 100 foot metal tower, hoping the tower would act as sort of a counterpoise and that I might get away without any radials. Well, it acted as a nifty 20 meter dummy load. Performance was generally poor. I added four 16 foot radials for 20 meters under the vertical (bamboo poles with wires taped on) and the antenna really came to life. QRM also came up, too. Leaving the 14AVQ at the 100 foot elevation, I put up a tri-band beam at 40 feet. The comparison between the 100 foot high ground plane and the 40 foot high beam on 20 meters was very interesting! The high vertical brought in stateside signals about 30 minutes earlier and kept them in about 45 minutes longer than the beam. Normally, the beam gave from 7 dB to 8 dB gain over the vertical, but at the beginning and end of a DX opening, the vertical pulled in signals that could not even be heard on the beam.

'At KA9MF (about 40 miles away) we had a similar situation. KA9MF had a beam atop a 185 foot tower and a second beam at the 50 foot level. The higher beam consistently opened and closed the band an hour earlier and later than the lower beam. But when the band was open, you could switch between the two antennas and have a hard time telling any difference between them.

'While not very scientific, the results were consistent over a path between Japan and the northwest United States. My generalizations are: First, Even high vertical antennas need some ground plane. The metal tower won't serve as a ground, or as a ground plane substitute. Second, a high antenna (any type) "opens and closes the band" as compared to a lower antenna. Third, during the time the band is open, height is not as important as gain.'

"Well, said Pendergast, "those tests with really high antennas are certainly interesting. Not many hams have 185 foot towers in their backyard."

"Listen to this letter from A1, W4BTZ. He says, 'The subject of working DX with vertical antennas is one in which I take a great deal of interest. I have utilized both the Hy-Gain 14AVQ and 18AVT/WB. Both antennas have been used at ground level and on my roof, which is about 30 feet high at the apex, where the antennas are mounted.

'I have tried radial systems ranging from no radials, up through four for each band, 60 radials for one band, 60 radials for one band plus 20 radials for a second band, 100 radials for one band, and 120 random-length radials covering the whole roof.

"On-the-air tests have been made against two dipoles, the first mounted at 30 feet elevation and the second sloping from 60 feet to 20 feet. And, in addition, tests with 2 other nearby amateurs, both using roof-mounted verticals. Also, comparisons have been made against a nearby ham using a tri-band beam.

'To summarize, if you are still with me, I have found the following to be true, in my experience, as unscientific as it may have been:

1—Mounting either the vertical antenna on the roof is a great performance improver, as compared to a ground mount.

2—The length and number of the radials does not seem too critical although the larger the number of radials—resonant or not—the better the performance seems to be.

3—I find very little performance difference between the roof-mounted verticals and the two dipoles. When one out-performs the other, the vertical comes out on top most of the time.

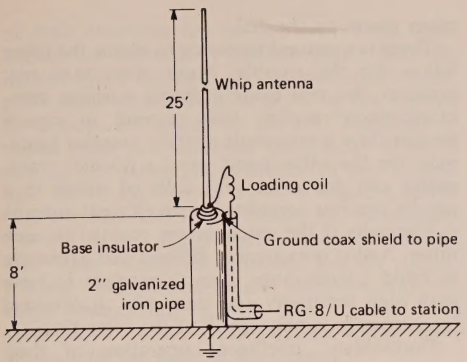


Fig. 1—The W6ZWK vertical antenna for 40 meters. The antenna is an adaptation of the "sleeve vertical antenna" described in *Antennas—Theory and Practice*, by Schelkunoff and Friis, Wiley & Sons., 1952 (page 338). The 8 foot pipe section is grounded at the bottom end and presents a value of impedance at the feed point which is close to 50 ohms, when used in combination with a resonant vertical antenna. In this case, the vertical whip is only 25 feet long so it is resonated with a loading coil of 1½ turns of copper tubing, 4 inches in diameter. The coaxial feed line runs up the side of the 8 foot sleeve and the outer braid of the line is grounded to the top of the sleeve. The base insulator of the whip sits atop the sleeve.

4—My vertical, even with a kilowatt behind it, is often outclassed by beams, especially on 20 meters. However, excellent results and good reports are quite common.

'I now have a 3 element tri-band beam and a 2 element, 40 meter mono-bander. I will, however, continue to use my verticals which have produced over 120 confirmed in less than 13 months —over half of them on 80 and 40 meters with 100 watts input."

"Hurrah for the vertical antenna," shouted Pendergast. "What do you have to say to that, old Buddy?"

"Let's hear a word from my friend Sam, W6ZWK, in San Diego," I replied. Sam says, 'I am sure you are aware that a vertical antenna does not require an elaborate ground system if it is operated close to sea water and is signing an exotic call, such as KP6KR. Most DX antenna installations do not satisfy these criteria, of course, and few operators indeed can provide the large, uncluttered yard necessary for installation of exotic ground radial systems.

'Where space is severely limited, I suggest consideration of the extended "sleeve" monopole. At present I use a 25-foot whip with its base insulator supported on a galvanized pipe, 8 feet above the ground. Using 1½ turns of copper tubing, 4" in diameter, connected in series with the whip at the feed point, the v.s.w.r. is very close to unity on 50-ohm cable at 7.2 MHz. The ground "system" consists of a length of heavy cable which connects the base of the pipe sleeve to the copper water system of the house. The elevated feed-point raises the input resistance of the antenna to about 50 ohms and, at the same time, reduces the dependency on an artificial ground plane (see fig. 1).'

"Very good," I said. "If you want to ground mount the antenna, Mickey, WA4KDC, has the solution. He says, 'I use a ground-mounted multiband vertical with good results. I very often work QRP (having both an HW-7 and an Argonaut) and can just about work anybody I can hear'.

"Hell, I can't do that with a kilowatt and a 4 element beam," interrupted Pendergast.

"To continue," I replied. "I have the antenna ground-mounted with a single ground rod at the base—no radials. Oh, yes. The ground rod is 6 inches in diameter and 85 feet long—straight down. A well casing!"

"Bah," said Pendergast. "I bet he owns an oil well!"

"Envy is a terrible thing," I replied. "One last letter before we pull the switch. This one is from Mike, VO1KE. He likes verticals for 160 and 80 and perhaps for 40 meters, but he prefers a 780 foot long wire on any band for general, DX work.

"In closing, Mike says,' Here's the design for a 20 meter beam that costs $10, or less, even at Newfoundland prices (fig. 2).

'It is a wire Yagi beam, with a director element. The antenna is slung between two supports and is bidirectional, in that it can be flipped over by hand to point in either of two opposite directions. How to do this would depend on details of a given QTH, so anybody building it will have to figure out the mechanics by themselves. It gives

[*Continued on page 77*]

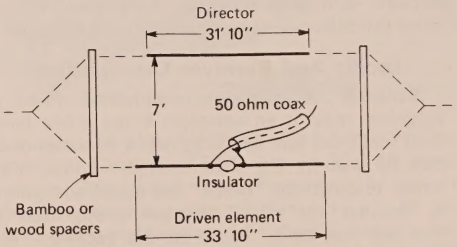


Fig. 2—Top view of the VO1KE two element 20 meter beam. The elements are made of #12 wire held in position by polypropylene rope. The only insulator is at the center of the driven element. A 50 ohm line (RG-58/U or RG-59/U) is used. The beam is held in a horizontal position, with the elements parallel with the ground. By means of ropes attached to the spreaders, the beam may be flipped over to point in either of two opposite directions. Mike estimates the gain at about 6 dB.

Not bad for a beam costing less than $10.

MATH'S NOTES

BY HERBERT S. BRIER,* W9EGQ

We learned in recent months that alternating currents in capacitors and inductors in a circuit are 180 degrees out of phase with each other. Also that capacitive reactance decreases with frequency and inductive reactance increases with frequency. Because of these properties, when a capacitor and an inductor are connected in series between a signal source and a load, at one (*resonant*) frequency, their reactances cancel and maximum signal current is delivered to the load. At frequencies progressively further from the resonant frequency, however, the reactances do not cancel completely and less signal reaches the load. In contrast, when the capacitor and the inductor are connected in parallel with the load, a signal fed into the circuit causes signal currents to surge back and forth between the capacitor and the inductor and develop a voltage across the circuit and load. The signal voltage is maximum at the resonant frequency and drops on either side of resonance.

By making either the capacitor or inductor variable, the resonant frequencies of such tuned circuits can be changed at will, as we prove every time we tune our transmitters and receivers to a new frequency by turning a dial. Incidentally, the many varieties of capacitive-inductive tuned circuits, such as **pi** networks, have been evolved from the basic series and parallel tuned circuits.

Locals And Receiver Overloading

Recently, an amateur complained about a neighbor (who is an amateur) living a few hundred feet from him breaking into a 40-meter contact he was having with another station. The writer resented the "break" but could not ignore it, because the signal was so strong that it blocked the entire band on his receiver. We pointed out that his signal was probably doing the same thing to his neighbor's receiver, and he realized that only by working together they could operate the same band at the same time. It is not unusual for nearby amateurs to overload each other's receivers, indicated by such things as horrendous key clicks, received signals dropping abruptly in strength or being replaced by others every time the other operator closes his key. Also, the other signal may appear on many places on the dial.

There is a natural tendency to blame the other fellow for the trouble. More often than not, however, the real cause is that a sensitive communications receiver will respond to signals weaker than a microvolt at their antenna terminals. On the other hand, even a 50-watt transmitter can deliver several volts of signal to a nearby receiver connected to an efficient antenna —especially if the antennas are parallel to each other. And it is extremely difficult and expensive to build a wide-range, tunable receiver to have both high sensitivity and immunity to overload by extremely strong signals at the same time.

Fortunately, intelligent operation of their equipment and cooperation between the operators involved can minimize the mutual interference. First, it is educational to swap operating positions long enough for operator A to observe what his signal does to operator B's receiver and operator B to observe what his signal does to operator A's receiver. Obviously, the greater frequency separation between the receiver and transmitter, the less severe the problems are likely to be. Unfortunately, a Novice band doesn't afford much room for maneuvering; nevertheless, operating on opposite ends of the band may help when receiver blocking is not too severe. Advance the receiver/transceiver audio gain control almost to maximum and vary receiver sensitivity manually with the r.f. gain control. This mode of operation renders the receiver automatic gain control (a.g.c.) circuits and the "S" meter more or less inoperative. It also often makes it possible to copy a weak signal adjacent to an extremely-strong signal.

Substitute a short receiving antenna for the transmitting antenna on the receiver when the interference is a problem. The short antenna may prevent hearing some of the weaker signals, but you would not hear them anyway with the receiver desensitized by the local signal. Better, use a vertical antenna if your neighbor uses a horizontal antenna, or vice versa. Cross polarization usually reduces the strength of local signals by three or four "S" units. Finally, judicious use of the band switches on amateur equipment has also been known to reduce local interference.

Novice Contest

"CQ NR" will ring out in the Novice bands during the annual Novice Roundup contest between 0001 GMT February 1 and 2369 GMT, February 9. Operating up to 30 hours during the contest period on any or all Novice bands. Novices will try to work as many amateurs of all classes as possible by calling "CQ NR" or answering such calls. Non-Novices should only *answer* "CQ NR." Participants exchange serial numbers starting with number 1, signal reports and the names of their ARRL sections for one point. (Page six of any *QST* magazine lists the ARRL sections. DX stations substitute the names

*385 Johnson St., Gary, Indiana 46402.

of their countries for the section.) Total score equals the number of contact points plus the highest speed recorded on the contestant's code-proficiency certificate multiplied by the number of sections and countries worked. These abbreviated rules are sufficient for casual work or picking new states and provinces in the "Round-up." But if you want to try for a winner's certificate write to ARRL, 225 Main St., Newington, CN 06111, for official scoring sheets, WAS map, and other useful information. Include an addressed, business-size return envelope with 10-cents postage affixed with your request. Mail your score to the same address within three weeks after the close of the contest.

News And Views

After finishing another successful Novice license course, the Indianapolis Red Cross Amateur Radio Club, 441 East 10th, Indianapolis, IN 46200, has now scheduled a new weekly General class course beginning at 8:00 P.M. EST, January 20, 1975. From previous experience, the course will start with a full complement of students, the great majority of whom will own General tickets when the course concludes . . . **Ethan Nussbaum, WN9JYJ,** presently at Hesston College, Hesston, KS 67062, confirms his radio contacts by check! He puts his call letters in the upper left corner and records the date of the contact on the normal date line. He fills in the lines starting, "Pay to the order of" with the call letters of the station worked One-and 00/100 QSL cards. Time, frequency, and report/mode are entered above the signature, and the words "Not Negotiable" are entered to the left of the signature. The sender's address can be placed at the top of the check or on the back. Also, be sure to indicate some place on the card unmistakably that the check/QSL confirms a two-way radio contact . . . **Steve. WN8PBN,** is probably a WB8 now, because he was scheduled to take his General/Advanced examinations a week after he wrote. He is an electrical engineer and has built up his code speed to over 20 w.p.m. in 18 months as a Novice. Steve discovered that his Heathkit HW-16 transceiver and HyGain 12-AVQ vertical antenna would have scored near the top in Ohio in the 1974 Novice Roundup, if he had submitted a score.

Ralph A. Zimmerman, WA4EDQ, Box 010572, Main Office, Miami, FL 33101, worked 47 states and 21 countries in a year as a Novice. But he wrote to warn, not to boast. Living in the southeast, where lightning storms are severe, Frank grounded the coaxial shield of his antenna feedlines and installed "blitz-bug" lightning arrestors in them. In addition, he disconnected the lines from his equipment when he left the "shack." Nevertheless, after a recent storm, he discovered his TV set playing when he left the "shack." Nevertheless, after a recent storm, he discovered his TV set playing with the power switch off. Lightning had entered the shack via the power line, disintegrating the control unit for his antenna rotor and doing extensive damage to his receiver. Frank now pulls the power plugs when he leaves the radio shack. This is a wise precaution, especially in the country and with solid-state devices, which do not have much tolerance to voltage surges; and lightning strikes power lines more often than the average amateur realizes. Thanks for the warning, Frank . . . **Mark Austin, WN2UYL,** Corliss Park, Building 10, Apt. 3, Troy, NY 12182, uses a Heathkit HW-16, a DX-20 transmitter, a Hallicrafters SX-140 receiver and a "secret" antenna—at least he didn't tell us what kind it is. Mark works his share of DX on 15 meters and he reports that many Novices miss a lot of DX by paying attention to only the weakest signals, and many DX signals are surprisingly strong.

We will be waiting for your "News And Views" and pictures next month. All pictures will be considered for our monthly photo contest. It is unfortunately true, however, that many pictures that otherwise would have an excellent chance of winning the contest or being published are out of focus or too dark to reproduce. Address all mail to the Novice Shack at the address on the first page of the column.

73, Herb, W9EGQ



Douglas J. Probst, WNØKUT, 1224 South 7th St., Beatrice, Nebraska 68310, has worked 48 states with a Globe Scout transmitter driven by a Ten-Tec variable Frequency oscillator (v.f.o.). He receives on a Hallicrafters SX-100. His antennas are a Mosley TA-31, 10, 15, 20 meter rotary dipole, 25 feet high and 40 and 80 meter dipoles, 40 feet high. We are sending WNØKUT a 1-year subscription for CQ for this winning entry in our monthly photo contest. If you wish to enter, send us a clear photograph (preferably black and white) of you and your station and some details about your amateur career. Even if you do not win, suitable pictures will be published as space permits. Address your entry to: Novice Shack Photo Contest, c/o Herbers S. Brier, W9EGQ, 385 Johnson St., Gary, Ind. 46402.

QRP

LOW-LOW POWER OPERATING

BY ADRIAN WEISS,* K8EEG

Optimum Antenna Performance

Now fellas, I know that January isn't the best time to talk about antennas, what with nature venting her annual freezing spleen upon us. But spring is just around the corner, and it is time to start planning for those beautiful crisp days when every ham's thoughts turn skyward. A while back, WA2KTW wrote me a note complaining of his miserable luck with antennas. Let me quote from it: "After my folded dipole came down, I built a trap dipole right out of the handbook. Top notch materials, exact measurements, and a thirty foot elevation yielded only a landing strip for sparrows. What ever I'm doing wrong, I've been doing for fifteen years! What we duffers need is a little of the nitty-gritty. Go hang your bloody theory on a coat rack and give it to us down and dirty. The trouble with facts that everyone already knows is that most people don't!" OK Bob, I'll have a go at it.

The HCL Theory

The old-timers had a relatively simple theory on the subject of antenna performance, the venerable HCL axiom. Spelled out, this translates to: get the antenna as *H*igh as possible, in the *C*lear, and as *L*ong as possible. In the old days, the only antennas in use were end-fed wire, the longer it is, the better. But today, dipoles and beams have taken over, and the *L*ong of the HCL formula means "full-sized" for the frequency of operation. A lot of trick antennas have appeared over the years in the literature which claim great performance with very small size. The implication is that a significantly shortened dipole will do the job that a full-sized dipole will. Or that a minibeam will compare with a full-sized yagi. The nitty-gritty fact can be expressed in one word—NOWAY! Once a dipole is shortened beyond a 0.1 wavelength reduction, its effectiveness begins to decrease. Of course, you can work a lot of stations on 75 meter s.s.b. with a 60 ft. shortened dipole—if you are pumping 600 watts into it, that is!

In The Clear

While knowledgeable types have long known that the presence of obstacles such as trees, walls, power lines, hills, and other such phenomena, will affect antenna performance, I am unaware of any studies which deal with the subject in concrete terms of antenna losses. I1RBA reports that a Bell study of several years ago came up with the following results: 1.) at 30 MHz, a dry brick wall will cause a loss of about 2db to a signal passing through it; 2.) add 3db if the wall is wet; 3.) a leaveless bank of trees will result in a 2-3db loss at 30 MHz for a vertically polarized signal, and no noticeable loss to a horizontally polarized signal. However, add leaves with their mineral salt content to the branches, and loss will appear.

The implications of these findings are obvious. An indoor antenna mounted on the second floor, let us say, of a brick apartment building will get about half the power into the ionosphere that it would if it were out in the clear. Put it into an attic with shingles, wood, nails, and perhaps foil-covered insulation, and no telling how much power will get out.

Looking at the subject from another angle, any antenna that is in proximity to large surrounding objects such as trees, buildings, power lines, hills, etc. will be affected by those surroundings. Reflection and absorption of the radiated signal will occur, and in either case, the signal won't be going where it is supposed to. Objects also have a direct effect upon the radiation resistance of the antenna and can affect the resonant frequency of the antenna.

As High As Possible

Height is not as simple a problem as getting the antenna in the clear because many more variables are relevant. Perhaps the most important thing for the typical operator is the distance that he can work. The height of an antenna has a direct bearing of the angle at which the signal is radiated. The lower the angle of radiation, the farther the signal will travel on each "skip" or reflection from the ionospheric reflecting planes. In the May, 1974 QRPP COLUMN Table I provided calcu-

Table I

Height (ft.)	Height (wavelength)	Relative Field Strength	Relative db
5	0.019	0.12	−15
10	0.038	0.24	−9
15	0.057	0.35	−6
20	0.076	0.48	−2
25	0.095	0.57	−1
30	0.11	0.66	0
35	0.13	0.75	+1
40	0.15	0.82	+1.6
45	0.17	0.88	+2.3
50	0.19	0.93	+2.9

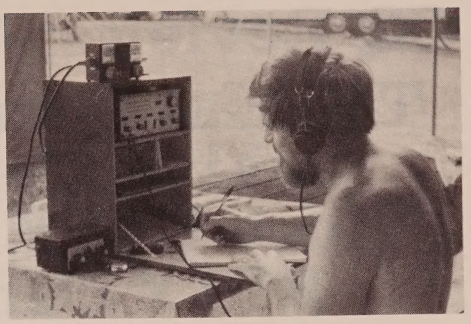
*213 Forest Ave., Vermillion, SD 57069.

lated one-hop skip distances for various antenna heights on 40 meters for day and night conditions. A glance at the table will show the relationship between the height of the antenna and the calculated distance for a single hop. Since each reflection from the ionosphere and earth causes signal losses (on the average, about 10 db per reflection), it is important to reach the desired point with as few hops as possible. For example, assume that the desired distance is 1200 miles under night time conditions. If the antenna on 40 meters is at a half-wavelength height of 66 ft., the single hop distance will be about 600 miles, and hence, two hops will be necessary. However, if the antenna is a full wavelength or 133 ft., a single hop will suffice. Now, when the antenna is moved above a half-wavelength, secondary lobes of maximum radiation appear. These can be very important in achieving a wide range of coverage. For example, when all the energy is concentrated in a single lobe at 40 degrees, let us say, the touch-down point will be about 450 miles—for about 400 miles or so of the path, then, no signal will be apparent to a receiving antenna. In contrast, if the antenna is at .75 wavelength, or 98 ft., three lobes appear at 20, 40, and 90 degrees, with three touchdown points for single hops at 900, 450, and 225 miles. Strong signals will be received at each of the three points. The odds will be bettered by 3:1 over the antenna at .4 wavelength, or 53 ft., simply because a strong signal will be present at three points along the path. The implications should be clear: taking a one-wavelength height as "high as possible" for each band, the closer you get the antenna to that height, the better your chances are for making more contacts.

With respect to 20, 15, and 10 meters, achieving a one-wavelength height is relatively simple. The real difficulty crops up on the lower bands. 266 ft. for an 80 meter dipole is simply out of the question; likewise 133 ft. for 40 meters. The practical question becomes: if 80 meter operation is desired, what amount of increase in height will produce a worthwhile increase in signal strength at a given distance? The answer must be entirely relative, since changing the height of the antenna changes the angle of radiation and, hence, the reception point. But, if we arbitrarily assume that the majority of QRPp QSO's on 80 meters is at the 300-500 mile range, then we can come up with some numerical predictions.

In a paper dealing with subject, [1]W9SCH came up with some interesting results. Assuming a given path distance which remained constant, he calculated signal strengths at the receiving point from a dipole at varying heights compared to a dipole at 30 ft. on 80 meters. See Table I for his results. Note that the antenna height in wavelengths varies from 0.019 to 0.19, or all cases under a quarter wavelength. At these levels, maximum radiation will be straight up, or 90 degrees, and W9SCH actually has calculated the amount of signal that will leave the antenna at 30 degrees, the angle necessary for the desired distance. Now, some points should be summarized. 1.) If the antenna is very low (5-15 ft.), the received signal will be a couple of S-units below the dipole at 30 ft. Once you pass the 30 ft. level and go to the 50 ft. level, an apparent improvement of 2.9 db will be achieved. In other words, raising an 80 meter dipole from 20 to 50 ft. will yield a worthwhile difference. However, raising it from 20 to 30 ft. just isn't worth the effort. Now, if W9SCH had extended his calculations beyond the quarter-wave point, where the angle begins to decrease from 90 degrees, the signal would continue building until the antenna reached 133 ft., at which point the maximum lobe would be at 30 degrees, which would be optimum for the given path.

If you substitute the proper number of feet that correspond to the wavelength column for the 40 and 20 meter cases, it becomes clear that some real improvement in signal over the same path can be achieved within realistic terms. A half-wavelength at 40 meters is 66 ft., and that is a height which is not too difficult to attain, if the proper mechancial approach is applied. We'll turn the discussion to that aspect next month.



This is a shot of WB9LKC's solution to carting his rig around on camping trips. The PM-2 plus batteries, key and all the necessary components fit securely in the box when the front panel, which also serves as a desk top, is latched closed. Frequent camping trips pointed up the need for the box. WB9LKC used the rig for 68 contacts on Field Day.

[*Continued on page 77*]

[1]W9SCH, "How Much Is Another Foot Worth?, *The Milliwatt,* ii:4(August, 1971), page 2.

CQ Reviews:

The Hal Communications Dual Mode Keyboard, Video RTTY Display and RTTY Demodulator

BY HARRY B. ROBINSON,* W2SR

For one whose communications experience dates from the brass telegraph key and sounder, today's technology in this field is almost overwhelming. Consider the fact—some of today's communication circuits operate at a 9600 baud rate—ten channels of 1000 w.p.m each simultaneously over one voice-grade telephone line. That's a far cry from the single copper wire, battery-to-ground type of circuitry used in the Morse days...

One of the spinoffs of such advanced techniques is the wealth of new, sophisticated accessories now available for the advanced amateur radio station. Foremost among these, for the RTTY and c.w. enthusiast, is the product line from Hal Communications Corp. First, let's take a look at the Hal Communications model DKB-2010 dual-mode keyboard, dual-mode because it generates both c.w. and RTTY signals. Housed in an attractive grey case, the keyboard layout is similar to a computer terminal keyboard. There are 52 keys arranged in four rows. In addition to the usual alpha/numeric keys there are, in the c.w. mode, eleven punctuation marks and five double character combination keys—AR, SK, AS, KN, and BT. Also included is an error key, which generates a string of dots to indicate a mispunch. There are three special function keys which are programmed by separate diode matrices. Although usually programmed at the factory for "De-call letters," "CQ" and "DX" the matrices can be changed if one so desires. A space bar is included and actually generates a word space. A three-character buffer register is standard and allows smooth typing without regard to the length of the c.w. characters—as opposed to the non-rhythmic typing necessary in some keyboards without the buffer feature. A "buffer full" lamp lights up when your typing speed exceeds the output by more than three characters.

Output speed is controllable from 8 to more than 60 w.p.m. by a panel mounted pot. Keying weight is adjustable to fit your particular transmitter circuitry and provision is made for either grid-block or cathode keying via jacks on the rear panel. A sidetone oscillator and built-in speaker allow you to monitor your signals. Tone and volume are adjustable.

In the RTTY mode, the DKB2010 is a most versatile instrument. Four crystal-controlled keying speeds are provided—60, 66, 75 and 100 w.p.m. An "end-of-line" lamp will light up when you have reached the 65th character of a line.

There are 17 punctuation marks, three carriage control keys, two shift keys, a break key and the three special keys for "CQ," "DX," and "DE." Also included is a "QBF" key which, with one stroke, transmits the test line "The quick brown fox jumps . . . etc. . . ." The shift keys are used for punctuation. There is no need to shift for numerals as the keyboard generates a figures shift automatically when a numbered key is struck. A separate output jack on the rear panel is provided for RTTY keying of the usual 130v 60 ma loop supply.

An available option is a 64 or 128 character buffer-memory board. The addition of either of these plug-in options immensely increases the flexibility of the machine. In this mode, the shift key, in addition to shifting for punctuation also provides control for the buffer-memory. The shift keys act similarly to the CONTROL key on computer terminals. Holding the shift key down while depressing the "DE" key clears the buffer-memory and when struck in combination with the "DX" key inhibits the output from the buffer-memory and allows one to type into memory without keying the transmitter. You can enter the beginning of your reply to a station while he is still transmitting to you. When you get a go-ahead from the other station simply depress the shift key with the "CQ" key and the machine will start outputting from the memory section. For break-in operation while in the c.w. mode just inhibit the buffer-memory output as stated above and use the "BRK" key as a hand key for a fast comeback and then resume automatic operation by depressing the "shift/CQ" keys without losing anything already in the buffer.

*2906 Essex Rd., Wantagh, NY 11793.

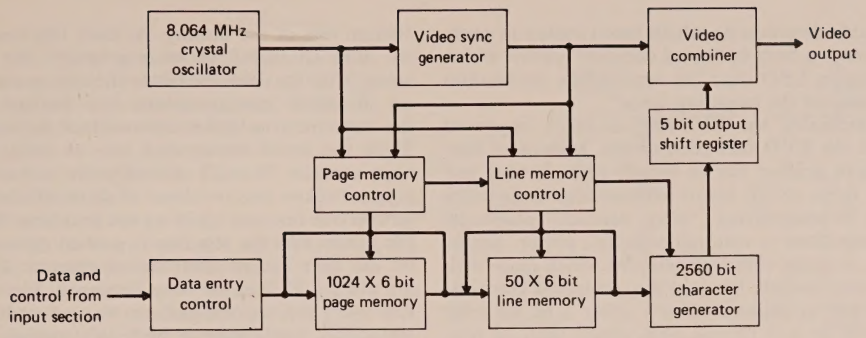


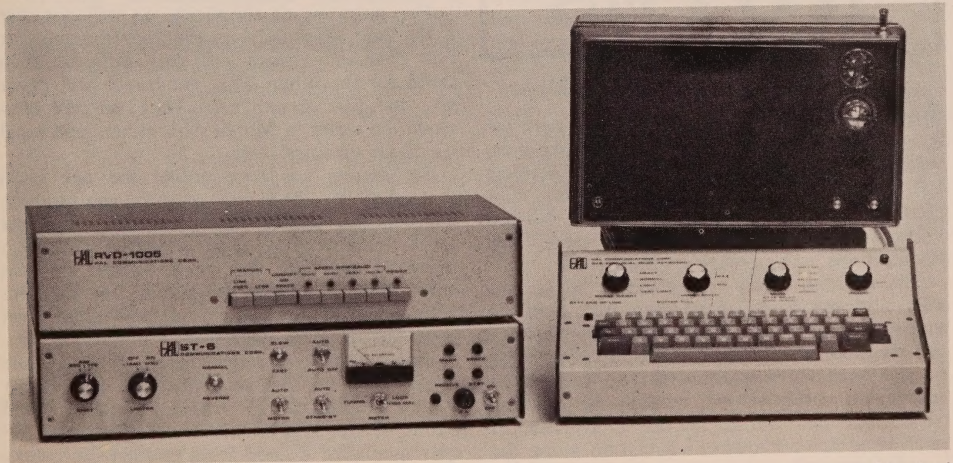
Fig. 1—Memory and display section block diagram RVD-1005 display generator.

Any RTTY enthusiast, even the hunt-and-peck beginner, will have no trouble getting used to the operation of the keyboard. With just a little practice you can become a real expert. The key touch is soft but positive and much less fatiguing than pounding a printer keyboard or even a perforator. The c.w. types may find it a bit confusing listening to both the keyboard monitor and the regular station monitor at the same time, as the keyboard lags behind the transmitter output by the number of characters you have managed to pile up in the buffer-memory. Just turn off the keyboard monitor and have confidence in your typing accuracy. Or if you're a little "Chicken" listen only to the keyboard monitor so you can correct your typos when noted. The expert typist, using the extended memory option, will be especially pleased with this machine. The input speed to the memory is limited only by your ability to type. Go as fast as you like and the output in either c.w. or RTTY mode will flow smoothly with perfect characters and spacing at whatever speed you have set the controls.

Mating this keyboard with the new Hal RVD1005 Video Display generator and a TV monitor produces a total system which most amateurs would have considered impossible only a few years ago. None of the usual printer problems with this system—no noise, no oil, no fussy adjustments, no messy tape or paper all over the floor and a minimum of space is necessary. All solid-state—with attendant low power consumption for the energy conscious amateur—this integrated system provides features not found in most electromechanical printer setups.

Simply stated, the RVD1005 take the output from any terminal unit and converts the baudot signal to one that is compatible with any TV set. Hal's instruction manual gives the complete "how to" information for such interfacing. A nine-inch video monitor complete with r.f. front end for regular TV reception is also available from Hal.

The front panel contains a number of push-button switches—one for power off, four speed selection switches, 60, 66, 75 and 100 w.p.m., an unshift-on-space switch and a manual line-feed and letters switch. Operators will have no



The Hal Communications RTTY demodulator (lower left), video display generator (upper left), dual mode keyboard, and Motorola TV set/diplay.

trouble determining which speed switch to push. There is a built-in "speed decision" circuit which lights an LED over the appropriate pushbutton to indicate the incoming speed.

Internally, the RVD1005 is much improved over the RVD1002 predecessor. Instead of four plug-in printed circuit boards there is now just one large circuit board without edge connectors and accompanying "dirty contact" problems. Connections to external switches, power, lamps, etc., is made with DIP plug-ins which mate with IC-type sockets for positive, protected contacts.

Input to the unit is from either a 60 ma loop supply or a ±15 volt FSK signal such as produced by the Hal ST6 terminal unit. This can be modified internally for either EIA or RS232-type keying.

The output is completely compatible with US television standards. The video signal bandwidth is a little less than 4 MHz. The Line rate is 15,750 kHz, the field rate is 60 Hz. and the frame rate is 30 Hz. There are 262.5 lines per field and two fields per frame with interlaced lines. The characters are displayed as white letters on a black background and are made up as a 5×7 dot matrix. There are 40 characters per line, and 25 lines to a page, displaying the same 1000 characters per screen as the previous unit but with somewhat larger sized letters. A cursor appears on the screen indicating where the next character will be formed. The characters appear continuously on the screen and are changed only by the reception of new information which is written letter by letter as it is received on the bottom line of the display. As each line reaches the 40th character, or more properly, the first space after the 35th character the unit generates an automatic carriage-return and linefeed and the cursor returns to the bottom left of the screen. Since the usual transmitted line of teleprinter copy contains 70 to 75 characters the screen display is broken into two lines of about 40 characters on one line and 30-35 on the next line. When the screen fills the top line is pushed off screen by the next line of information entered. There are always 25 lines of copy displayed. For contest operation there's just no way an ordinary teleprinter can compete with this system. It's fast, very readable and perfectly adapted for the usual short contest exchange. And in addition, the lack of noise and ease of operation leaves the operator much less fatigued after long hours of operating.

The ST6 terminal unit from Hal has been presented many times in various publications over the past few years and needs no review here. Suffice to say that it is one of the most versatile terminal units available today, with all the features one needs for today's modern RTTY amateur.

Combining the DKB2010 keyboard, the RVD-1005 and the ST6 into one integrated RTTY/c.w. station makes a neat, compact, attractive layout for today's advanced amateur and is a totally new, exciting experience for even the most blase ham. The DKB-2010 keyboard is priced at $425; 64 key buffer at $100; 128 key buffer at $150.

[*Continued on page 77*]

MATH'S NOTES

BY IRWIN MATH,* WA2NDM

In September and October of last year we discussed FET's and some of their many uses. At that time we also briefly touched on their r.f. applications and, judging by the mail consequently received, did not give enough useful information and circuitry to satisfy our "home brew" v.h.f. receiver enthusiasts.

We will try to rectify the situation this month and next month by presenting our thoughts and a collection of typical front end circuitry for the two bands of most interest (according to our mail) six meters and two meters. In months to come we will actually be building and evaluating "state of the art" converters for each band for our own v.h.f. station along the lines of this discussion and will be glad to present these results to our readers.

We would also be most anxious to see some of the circuitry designed by our readers and will publish schematics as well as pictures of true high performance units.

For purposes of simplicity we will consider each band separately as the requirements for one frequency range are very different than those for the other. This month we will cover six, and next month two. Then we will conclude the series in March with mixers and local oscillator schemes.

Six meters has been called the one band that exhibits all forms of propagation and, in fact, everything from reliable, consistent local communication over a 50-100 mile path to world-wide DX has been worked on that band when conditions permitted. One problem with the band however, is the high noise level —caused to some degree by atmospheric conditions and to a greater degree by man-made interference such as very close (in frequency) 50 kw channel 2 TV transmitters, low band public service transmissions, etc. The basic requirements for a good front end for six meters then is good rejection of strong adjacent frequency signals, a noise figure that will allow

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

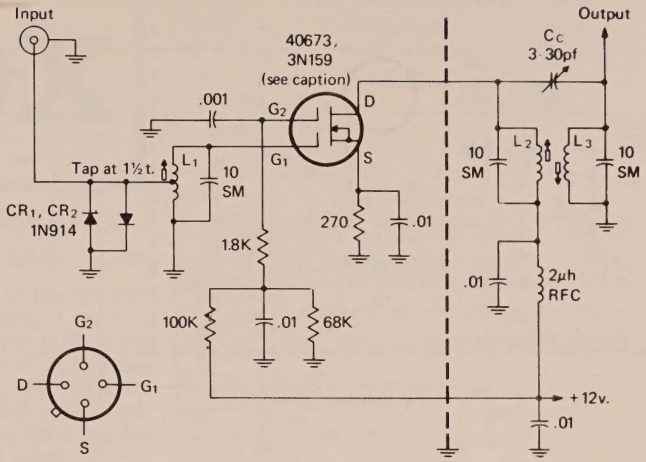


Fig. 1—A dual gate MOSFET 50 MHz amplifier. The 3N159 offers a lower noise factor but is not protected by internal diodes so that extreme care must be taken when using this device. The two input diodes short circuit excessive, damaging input energy while allowing inputs as high as ½ volt to pass unattenuated. Note that a shield is inserted over the output tuned circuit to eliminate any possibility of feedback. L_1, L_2 and L_3 are wound on J. W. Miller 4500-4, ¼" dia. ceramic coil forms and each consists of 10 turns, close wound, of #24 enameled wire. Note also that all coils are tuned with silver mica capacitors.

the limiting factor to be external noise, and enough gain to provide an adequate signal through the mixer and into the following i.f. stages or receiver in the case of a converter.

Fig. 1 shows a typical 50 MHz r.f. amplifier stage using a MOSFET and fig. 2 shows another 50 MHz stage with a junction FET. Both circuits are capable of providing 15-20 dB of gain and, if a narrow range of frequencies (500 kHz or so) is to be covered either one will be adequate to drive a subsequent mixer.

The noise figure at 50 MHz is usually not considered when using transistors such as these since the external noise on this band is usually quite high. In the interest of those who feel that they live in an extremely quiet location, or who are not satisfied with the general comment, the trade-off between the two circuits is as follows:

a) The MOSFET circuit will exhibit a noise figure of about 3 dB or so while the JFET circuit noise figure can approach 1.5 to 2 dB with the hot transistor.

b) The cross modulation figure with the MOSFET will usually be better than that of the JFET.

Note that if you consider that the typical 6 meter antenna produced noise is indeed the limiting factor, then the MOSFET is the device to use and, many of the newest commercial gear does use MOSFETS.

Since I am one of those die-hard noise figure believers I would still use a high performance JFET such as the siliconix U310 or standard 2N4416, 2N5484, etc., in my converter. I am really quite certain however that one could only tell the difference, at these frequencies, with test equipment—certainly not through a speaker or pair of earphones!

But, if you have to—adjust the antenna tap for lowest noise figure with a diode noise generator in the conventional manner and stagger tune the tuned circuits and C_c slightly, with the aid of a sweep generator if you have one.

When one is building a pre-amp or converter to cover 2, 3 or 4 MHz (the entire band), complete coverage is desired without compromises at either end. For this application, the circuitry becomes a bit more complex. Many magazine articles, commercial pre-amps, handbook circuits etc., all still use one stage and one can do so by stagger tuning the various tuned circuits and adjusting the bandpass coupling capacitor C_c. However, as the bandwidth desired increases, the gain available decreases and the sensitivity begins to suffer.

The solution, to me anyway, is to simply use two r.f. stages and stagger tune them with the aid of a sweep generator to achieve the desired response. Beware of excess gain and

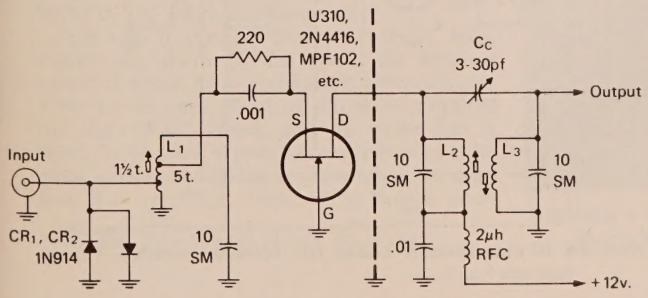


Fig. 2—A junction FET 50 MHz amplifier. The common gate circuit is used to eliminate the need for neutralization. The source is tapped down on the input coil for impedance matching and all other considerations and tuned circuits are the same as those in fig. 1, with the exception of the extra tap on L_1. One note of caution—be sure to keep the gate lead as short as humanly possible.

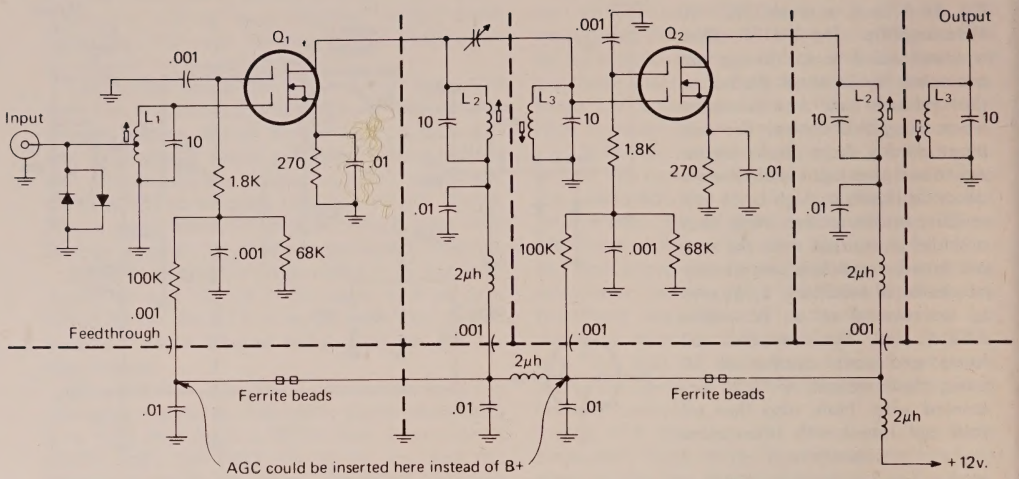


Fig. 3—A two stage stagger tuned pre-amp as discussed in the text. See fig. 1, for missing details. The use of a sweep generator is most advisable for proper alignment.

oscillation problems however, with the gain of the transistors at this "low frequency" for them at least, a poor layout can create unbelievable problems.

One advantage of the MOSFET in a two-stage amplifier is the ease in which an a.g.c. voltage can be applied to gate two. Such an arrangement could be used manually or even automatically to prevent overloading on strong signals. Figures 3 and 4 show potential (but untested) circuitry that might be used in a wide-band amplifier. Placement of various shields are also shown and these must be used.

A few pertinent references that most experimenters can understand follows and it would be wise to look at them as well as other typical r.f. amplifier circuitry before building any of the pre-amps mentioned. Layout and bypassing has an awful lot to do with a real high performance converter and, unfortunately, the best is often not easy to come by. See you next month and to all of my readers, a very happy New Year.

73, Irv, WA2NDM

Reference Data

1. *RCA Solid State Databook,* SSD-202B, RCA, Box 3200, Somerville, NJ 08876
2. *Radio Amateurs Handbook,* 1974
3. *Radio Amateurs VHF Manual,* ARRL, Newington, Conn. 06111
4. *Application Note AN73-7, Introduction to FETS,* Siliconix Corporation, 2201 Laurlelwood Road, Santa Clara, California 95054
5. *Data Sheet, U310,* Siliconix (see above)
6. "A 2 meter preamplifier for repeaters," *QST,* July 1972, Doug DeMaw
7. Data sheets for 2N4416, MPF102, Motorola

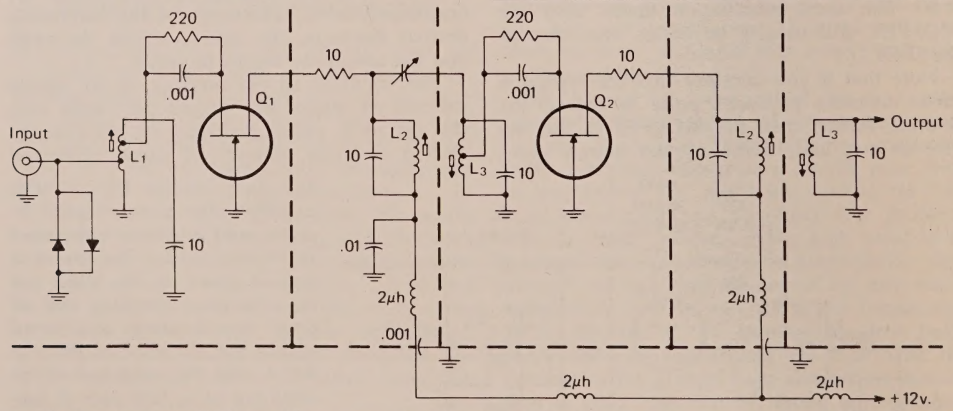


Fig. 4—A two stage JFET amplifier. Note the 10 ohm resistors added for increased stability. For details see fig. 2.



DX

BY JOHN A. ATTAWAY,* K4IIF

WHEN the *CQ* DX Awards Advisory Committee was formed 8 years ago, one of the first items on the agenda was a DX award for Novices. As a result of the Committee's action the WPNX award was established. WPNX, for Novices only, is awarded to those who work and confirm 100 prefixes under their novice call. The first WPNX award was issued in 1967 to Mary Ann Crider, WA3HUP of Camp Hill, Pennsylvania, then operating as WN3HUP, and the second by Craig Boyer, then WN5RWU, of Oklahoma City.

The rules for WPNX are the same as WPX except for the lower number of prefixes required and the lack of any special endorsement stickers. For award purposes a prefix is defined as the combination of 2 or 3 letters and numerals, such as WN4 or 4U3, which make up the first part of any amateur call. Any variation in the numbering, lettering or order constitutes a different prefix so that each of the following count separately: W2, WA2, WB2, WF2, WN2, K2, KN2, KD2, etc. However, to keep the total number of prefixes within manageable bounds, prefixes with 2 or 3 digit numerals are not counted. Examples are UB25 and HA1ØØ which count aas UB2 and HA1 respectively.

Suffixes designating portable operation outside the normal call area or country are accepted so long as they are the normal prefix for the area or country. For example, K4IIF/KP4 is acceptable to confirm the KP4 prefix, but KP4ZZY/7 would not be acceptable as KP7.

All calls without numbers are assigned an arbitrary Ø plus the first two letters of the call. For example, RAEM counts as RAØ, AIR counts as AIØ and UPOL counts as UPØ. Similarly, portable suffixes without a numeral are also assigned Ø. An example of the latter is W4BPD/LX which counts as LXØ.

And now a question for you Novices. How would you like a Novice award for working zones? It would be a significant achievement for a Novice to work 30 of the 40 zones required for *CQ*'s WAZ award, and we might call it WNZ. WAZ itself is possible under Novice rules when sunspot conditions are favorable, but even then it is very rare. However, a Novice interested in DX should be able to work Zones 1-16, Zone 20, Zone 25, Zones 30, 31, 32, 33, 35, 36 and 40, particularly if he or she operates during the c.w. DX contests when large numbers of DX stations are actively working toward thousands of contacts. Somewhere along the line he should be able to pick up 4 more to go with the above 26. What do you think Noxices? Should this idea be forwarded to the *CQ* DX Committee? If so, drop a line to K4IIF, P.O. Box 205, Winter Haven, FL 33880.

*P.O. Box 205, Winter Haven, FL 33880

The WPX Program

Mixed

459.....W3MDO

C.W.

1361.....I1TLA
1362.....JH3JEX
1363.....G4BGE
1364.....IØBAM
1365.....K2SHZ

VPX

80.....A-843-

S.S.B.

819.....CT1ZW

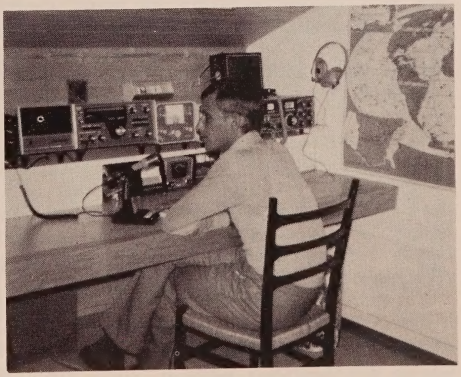
Endorsements

Mixed: W2NUT-1150, YU1BCD-950, K2AAC-900, W6NJU-850, W5LPO, W4HHN-700, IS0AEW, W3MDO-500, K9UQN-450
C.W.: YU1BCD-800, K2SHZ-750, W6NJU-600, LA3UF, VO1KE-550, W4ZYQ, W1DMD, K4KQB-500, I1TLA, I0BAM-350
S.S.B.: XE1J, YU1BCD-700, W6NJU-650, K2AAC-500, CT1ZW-400
VPX: WDX5FEB, W4-10646-550, SM4-3958-500, A-8431-400
20 Meters: YU1AG
15 Meters: YU1AG
10 Meters: YU1AG
Africa: YU1AG
Asia: W6KYA, SM4-3958
Europe: K9UQN
Oceania: W4-10646

Complete rules for WPX may be found on page 67 of the February, 1967 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.

De Extra

Antenna and Time to Listen are two major factors in DX excellence. Whenever two or more are gathered together (DXers that is), the conversation almost always begins and ends with colorful tales of individual experiences



This shack is neat as only the Swiss can make them. Recent WAZer, Gerd Burkhard, HB9ASK.

WPX HONOR ROLL

The WPX Honor Roll is based on confirmed current prefixes which are submitted by separate application in strict conformance with the CQ Master Prefix List. Scores are based on the current prefix total, regardless of an operators all-time prefix count.

Mixed

W4LRN 1375	W4BQY 1002	W4WSF 877	W6NJU 811	WA5LOB 749
VE3GCO 1142	WB2FMK 980	DL1CF 872	W9WHM 811	PY4AP 735
F9RM 1140	ON4QX 975	K2AAC 863	IØJX 803	KØBLT 733
WA6MWG 1120	W4IC 950	K6SDR 862	WA5VDH 801	K7NHG 719
W2NUT 1093	PAØSNG 943	W4BYU 859	W3YHR 777	WA6EPQ 713
W3PVZ 1083	YU1AG 943	WØAUB 856	JA1AG 765	PAØVB 706
W8LY 1082	DL1MD 940	YU2DX 855	WA6JVD 763	W9ZTD 700
W4CRW 1076	W9FD 938	WA2EAH 850	WB4SIJ 755	WAØCPX 693
W8ROC 1072	K1SHN 934	G3DO 849	K2ZRO 751	WA6TAX 655
W6TCQ 1056	YU1BCD 930	W6ISQ 847	K6ZDL 750	
W3GJY 1052	WB4KZG 930	WAØKDI 824	K8UDJ 750	
DJ7CX 1004	I6SF 893	SM7TV 822	CT1LN 749	

C.W.

W8LY 1067	WA6MWG 845	K7ABV 767	W6TCQ 707	K1LWI 629
W8KPL 1003	W2AIW 813	YU1AG 751	I6SF 702	VE4OX 600
DL1QT 900	VK3AHQ 809	K1SHN 746	W4IC 700	OK2QX 600
W2HO 885	G2GM 785	VO1AW 742	W6ISQ 685	
WB2FMK 870	DJ7CX 782	WA6JVD 741	K6ZDL 656	
W9FD 870	YU1BCD 782	W3ARK 739	SM5BNX 652	
ON4QX 851	W4BYU 768	K2AAC 726	K2ZRO 635	

2XSSB

W4NJF 1100	ZL3NS 874	W3DJZ 818	PY3BXW 734	WB4KZG 680
F9RM 1089	I8KDB 873	I4ZSQ 801	OE2EGL 730	WA6TAX 665
IØAMU 957	WØYDB 869	W4IC 800	W6YMV 720	W2EHB 659
DL9OH 932	W6TCQ 860	I8YRK 766	YU1AG 719	WB4SIJ 652
W9DWQ 917	DL1MD 858	G3DO 765	OK1MP 715	WA5VDH 618
HP1JC 903	F2MO 835	WB2NYM 762	WB6DXU 708	CR7IK 613
IØZV 886	IT9JT 833	K1SHN 753	YU1BCD 703	I4LCK 608
K2POA 883	PAØSNG 824	W3YHR 750	CX2CN 702	
WA6MWG 887	W6RKP 822	WA5LOB 747	WA2EAH 700	

incurred chasing the latest rare station or DX-pedition. Equipment and operating technique are elements lauded in success and declaimed in failure, and they are important. Every DXer dreams of trading in his or her 3-element tribander at 50 feet for stacked, 6-element yagis or quads on 100 foot towers, and if he has the money to buy and the space to build such a magnificent antenna his signal will gain by many decibels and his contacts will be early in the pileups.

Unfortunately, in these days of crowded living, apartment buildings, small lots, zoning restrictions, *et al.*, even the 3-element tribander may soon become a luxury for many, except at very low elevations. The fortunate few with the acreage and resources will dominate the pileups, propagation conditions being equal, but they don't necessarily have to dominate the country and prefix totals. Joe Average can still work the rare ones if he has the time and patience to survive the chase. However, time, like space and resources, is also a precious commodity. The DXer must listen, listen, listen if he is to work the rare ones, and with jobs and family responsibilities coming first old Joe Average is again hard put to stay in the race.

Yet there is another key to DX survival, and it lies in the phrase above, *propagation conditions being equal*, because propagation conditions are inherently unequal. When precious time is wasted calling a station who is skipping into another call area with much stronger signals, the only harvest is frustration and discouragement. A DXer without a wealth of time and equipment must make what he has count by going into action at the moment the rare station is peaking in his area. There is an hour, or fraction thereof, when the tribander at 50 feet will be heard in DX-land a bit stronger than the super antenna a few hundred miles away, if that time can be found.

Precisely pinpointing the time when signals will rise and fall, or even when propagation will be good or bad, is like forecasting the weather, but predictions are made and they can be very helpful. For many years *CQ* readers have benefitted from the propagation forecasts of George Jacobs, W3ASK, who has an enviable track record in this difficult art-science. In order to make his forecasts even more useful, George has instituted a direct mail service to get propagation information to the DXer at more frequent intervals.

George's new service is called MAIL-A-PROP, and it includes forecasts based primarily on detailed analyses of solar, geomagnetic and ionspheric data. Predictions cover band by band, continent by continent and major time periods throughout the day for 10-160 meters. News items concerning solar activity, the sunspot cycle, v.h.f. ionospheric possibilities, meteor showers, etc. are also included. MAIL-A-PROP is published at least once every 2 weeks, minimum 32 issues per year, and is sent first class mail to reach subscribers before the forecast

The WAZ Program

Single Band WAZ 20 Meter C.W.

3.....JA1ATF

S.S.B. WAZ

1229.....ZL2APM
1230.....W8TWA
1231.....G3ZBA
1232.....YU1AG

C.W.—Phone WAZ

3770.....I3LSA
3771.....OK1ATZ
3772.....OK3TCA
3773.....K4KQB
3774.....WB4YUP
3775.....KA2PJ
3776.....YU1OBA
3777.....VE3OI
3778.....JA3DWT

Complete rules for the Single Band WAZ Program are shown on pgs. 57-58 of the December, 1972 issue of *CQ*. Complete rules for regular WAZ may be found on pgs. 64-66 of the June, 1970 issue. Application blanks and reprints of the rules for all WAZ awards may be obtained by sending a self-addressed, stamped envelope to the Assistant DX Editor, P.O. Box 205, Winter Haven, FL 33880.

period begins. Its prognostications have been up to 90% correct. If arranging your operating sked scientifically sounds like your bag, rates and other info on MAIL-A-PROP may be obtained by contacting George directly at the following address: Mr. George Jacobs, W3ASK, 11307 Clara Street, Silver Spring, Md. 20902. Good DX!

The Hard Zones for WAZ

Many a deserving DXer has bogged down in his quest for WAZ over four very tough zones, Zone 18, Zone 19, Zone 23 and Zone 34. Some of the difficulty with the Siberian Zones lies in the inability of most Zone listeners to differentiate stations they hear in Zone 18 from those in the somewhat easier Zone 17, and to positively classify Zone 19 stations among the many UAØ stations they hear. While you know that a 5A, SU or ST station is in Zone 34 and a JT is in Zone 23, its not so easy with the UA9-UAØ group. Many new Zone chasers are also not aware that part of Zone 23 is UAØ country, so that you can confirm that Zone without working a Mongolian station. In fact, this writer's own personal WAZ was completed with a UAØYT card from Tana Tuva in Zone 23.

The wavy north-south lines separating Zone 17 from 18 and Zone 18 from 19 on the WAZ map don't follow clear boundaries as do many zones which are differentiated by national borders, oceans or prominent rivers. If you hear a PY station you know he is in Zone 11, but with a UA9 or UAØ its a guess or by-golly. Even when you get his QTH you have to be an expert on Siberian geography. Therefore it is lucky that there are keys which make it easier for you, and the ridges and grooves of those keys are the letters immediately following the numeral of the UA, UK, UV or UW9 or Ø call. The first letter after the numeral is a function of geographic location in the Russian system.

With this knowledge you can zero in on the zones you need as follows, with all calls shown as UA although the keys also apply to UK, UV, UW, etc.:

Area/Zone	Prefix and Following Letter
Chelyabinsk/17	UA9A, UA9B
Sverdlovsk/17	UA9C, UA9D
Perm & Tagil/17	UA9E
Tomsk/18	UA9H, UA9I
Tyumen & Hanti/17	UA9J
Omsk/17	UA9M, UA9N
Novosibirsk/18	UA9O, UA9P
Kurgan/17	UA9Q, UA9R
Orenburg/16	UA9S, UA9T
Kemerov/18	UA9U, UA9V
Bashkir/16	UA9W
Komi & Vorkutu/17	UA9X
Altai & Barnaul/18	UA9Y
Krasnoyarsk & Nobilsk/18	UAØA, UAØB
Cape Chelyuskin/18	UAØKAE
Dickson Island/18	UAØKAR, UAØAZ, UAØBC, UAØBD, UAØBF
Khabarovsk & Sakhalin Is./19	UAØC, UAØE, UAØG
Cape Schmidt, Bering, Magdan, Pevek and Wrangel Is./19	UAØI
Blagoveshchensk (Amur)/19	UAØJ
Vladivostok/19	UAØL
Ussuriisk/19	UAØM
Buryat-Mongolia, Ulan-Ude and Yakutsk/18	UAØO, UAØP
Olenek/19	UAØQ, UAØR
Irkutsk/18	UAØS, UAØT
Chita/18	UAØU, UAØV
Tanna-Tuva/23	UAØY
Kamchatka & Petropavlovsk/19	UAØZ

Examples of some Siberian stations heard recently, with frequency and time in GMT, and the identification of their Zones using the above



VP8NP, Ian Bateman, is stirring 160 Meter DXers to a fever pitch since he put this rare country on 160 for the first time. He operates on 1804 & 1827 kHz using balloon and dipole antennas, and will be in the area for 2 years on a scientific expedition. QSL to G4BNH. *(Photo via W1BB).*

The CQ DX Award Program

C.W.	2XSSB
163.....W7NJ	373.....OE3EVA
164.....W3IN	
165.....W1EWD	

Endorsements

C.W.: K4KQB, DL3VI-200 Countries, K1EWD, W3IN-150 Countries.

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.

table are as follows: UA9USA, 14224 kHz at 1300—Zone 18 (Kererov); UAØAJ, 14227 at 1200—Zone 18 (Krasnoyarsk & Nobilsk); UAØYAE, 14049 at 0030—Zone 23· (Tanna-Tuva); UK9CAE, 14210 at 1250—Zone 17 (Sverdlovsk); UAØYT, 14220 at 1500—Zone 23; UK9MBA, 14020 at 1425—Zone 17 (Omsk); and UKØLAB, 21030 at 0245—Zone 10 (Vladivostak).

Activity from Zone 34 has been largely restricted to a few stations in Egypt and the Sudan in recent years, 5A operation from Libya being taboo. Two stations reported active are SU1MA on 14207 at 1930 GMT and ST2AY on 14240 at 1400, 0050 and 0144 GMT. The latter has also been worked by European stations on 3795 at 2150 GMT.

Late Rare Zone Information

Zone	Station	Frequency (kHz)	Time (GMT)	Mode
18	UAØAAC	14050	0110	c.w.
18	UAØAAF	14008	1125	c.w.
18	UKØAG	14028	0030	c.w.
18	UKØBAE	14030	0140	c.w.
18	UA9IF	14210	1135	s.s.b.
18	UKØKAC	14019	1325	c.w.
18	UKØKAR	14028	0145 & 1210	c.w.
18	UA9OAK	7006	1455 (west coast)	c.w.
18	UA9OBK	14210	0240	c.w.
18	UK9OBM	14040	1215	c.w.
18	UA9OCG	14030	0150	c.w.
18	UAØSAV	14011	1220	c.w.
18	UAØSBC	14028	0045	c.w.
18	UKØSK	14050	0240	c.w.
18	UAØSP	14025	0000	c.w.
18	UWØTG	14219	0125	s.s.b.
18	UAØSY	14025	0110	c.w.
18	UA9USA	14205	1230 & 1315	s.s.b.
18	UA9VB	14222	0130	s.s.b.
18	UW9VH	14025	0145	c.w.
19	UAØFBS	3510	1325 (west coast)	c.w.
19	UAØFGM	14205	0115	s.s.b.
19	UAØFGM	3600	1300 (on tuesdays)	c.w.
19	UAØMS	14025	0325	c.w.
19	RAØLAN	28608	0120	s.s.b.
19	RAØLAU	28562	0125	s.s.b.
19	UWØLE	28503	0140	s.s.b.
19	UAØLU	14028	0310	c.w.
19	UKØZAB	14022	0125	c.w.
23	JTØAE	14038	0220	c.w.
23	JTØAE	14210	0125	s.s.b.
23	JT1AO	14005	1325	c.w.
23	JT1AQ	14040	1300	c.w.
23	JT1AS	14007	1245	c.w.
23	JT1AS	14042	1130	c.w.
23	UAØYAB	14027	0045	c.w.
23	UAØYAD	14028	0245	c.w.
23	UAØYT	14225	1250	s.s.b.

Prefix News

A number of interesting prefixes were heard or worked during the past few weeks. Among them are the following:

CV4—CV4C was operating with a special Uruguayan prefix. QSL to the CX Bureau.

IC8—IC8HBR was heard on 14275 at 2120 GMT.

IFØ—IFØXRR was on 14220 at 2100 GMT.

IZ2—IZ2ZGP came through on 15 meters, 21286 at 1705 GMT.

IZ8—IZ8RBV was in the DX portion of 20 meters, 14140 s.s.b. at 1730 GMT.

KD3—Special station KD3AFF operated on 14 MHz s.s.b.

RA6—RA6HFA and many other Soviet v.h.f. stations operate on 10 meters. The frequencies from 28500-28600 are a good place to look for them.

VX1—A special prefix used in late 1974 to commemorate the 25th anniversary of union between Canada and Newfoundland. QSL VX1-CV to the VO1 Bureau.

WL4—WL4GBC was heard on both 20 meter c.w. and s.s.b.

WS6—WS6JHA was a special Boy Scout Jamboree call activated in October, 1974.

7SL2—7SL2AN was heard and worked by WA6GLD on 14212 at 2325 GMT.

7X—Algeria is now divided into regions as follows: 7X2—La Saoura, 7X3—Oasis, 7X4—Alger, 7X5—Oran and 7X6—Constantine.

QSL Information

A35AP—via JA1SWL
CM8OT—to Box 500, Santiago, Cuba
CR6SN—c/o W0GX
CR8AC—via P.O. Box 59, Dili, Portuguese Timor
CT2BM—to WA5BDJ
EA8JJ—c/o W3HNK
EL4D—via WA5ZWC
FM7WE—to K4CFB
FM7WN—c/o K2KGB
FP8AA—via K2OJD
FY7AE—to WA4WTG
FY7AM—c/o WB4VUP
HI8LC—via W2KF
HI8XPK—to W0GX
HK0BKX—c/o WA6AHF
I G4DS—via WB8LUI
O A4AIW—to K9YXA
PY9RT—c/o WA3IAQ
TI2BEV—via K4VW
VK2BKE—to W9RKP
VK9XX—c/o W2GHK
VP1FF—to WØELT
VR0DM—via WA4NRE
VP2DM—c/o WA1ABV
VP2E—via W4GSM
VP2EY—to W3HNK
VP2GM—c/o W5MYA
VP2KJ—via WB2TSL
VP2MSU—to WB5IZN
VP2SQ—c/o W2MIG
VP5WW—via WB4EYX
VK1KE—to WA1QBH
WC1CMC—c/o WA2UWA
WG4TWN—via WB4SIJ
WJ4EEA—to K4VJB
WL4GBC—c/o WB4KZG
XU1DX—via W1YRC
ZF1ST—to W1CER
ZF1WM—c/o W8JUY
ZP5AY—via K3TUP
4X4UR—to VE3MR
5T5CJ—c/o WABAA
5T5GS—via W6KTE
5U7AG—to W3HNK
5Z4PP—to W3HNK
5V7WT—c/o F9GL
5W1AL—via W5UBW
8R1CB—c/o W2MIG

73, John, K4IIF



Propagation

BY GEORGE JACOBS,* W3ASK

SUNSPOT activity behaved somewhat strangely during 1974. Instead of declining at a steady rate, the cycle actually took a small, temporary turn upwards! Although the data for the entire year is not yet available, it looks like 1974 began with a smoothed sunspot number of 34, increased to 36 during February and remained at this level through March and April. The cycle began to decline again during May, and dropped to an estimated level of 30 by the year's end.

Solar activity during the new year will probably range from a high of around 29 during January to a low of about 15 by the end of 1975. This will truly be a period of low solar activity, but the minimum of the present cycle is now unlikely to occur much before mid-1976.

During January, the best DX bands during the hours of *daylight* should be *15* and *20* meters. During the hours of *darkness,* best bets are *40* and *80* meters. The following are propagation tips for use throughout the day.

Midnight to Sunrise:—Best band should be *40* meters. Look for openings towards Europe, the Middle East and parts of Africa until 3 A.M. in EST time zone and 2 A.M. in CST. In PST zone look for long-path openings between 6 and 8 A.M. Expect good openings from all time zones towards South America, with signals strongest to the Caribbean, Central America and the northern countries of South America until 6 A.M. in EST and CST zones, and to 4 A.M. in MST and PST zones. Check for fairly good openings from western half of country towards the South Pacific from Midnight to sunrise, and in the eastern half from about 3 A.M. to sunrise. An occasional opening may also be possible from the West Coast to the Far East, and to Antarctica, with the best time being just before local sunrise. *Eighty* should open from the eastern states to Europe and parts of Africa and the Middle East until 3 A.M. The band looks fairly good towards the South Pacific from the western states from Midnight to sunrise, and openings may extend eastwards between 4 A.M. and sunrise local time in EST and CST zones. Check for good openings to the Caribbean, Central America and the northern countries of South America between Midnight and 5 A.M., and to 3 A.M. for deeper openings into South America. There's a slight possibility that *80* might open from the west coast to the Far East between 1 and 3 A.M. Openings on *160* meters should be possible from the eastern states to Europe until 2 A.M. In the western states check for openings towards the South Pacific between 3A.M. and sunrise. Openings towards the Caribbean, Central America and the northern countries of South America should be possible from all time zones from about 3 A.M. to sunrise. For *short-skip* openings up to 750 miles the best band should be *160* meters. Between 750 and 1500 miles try *80* meters and for openings beyond 1500 miles try either *80* or *40* meters.

Sunrise to Sunset:—Check *10* meters for an occasional opening to Europe from the eastern states between 8 and 10 A.M. Band should open a bit more often towards Africa between 9 A.M. and Noon in all time zones, and may extend an hour or two longer in EST and CST zones. Good openings into South America should be possible on *10* from all time zones between 9 A.M. and 3 P.M., with peak conditions between Noon and 2 P.M. Check for openings towards the South Pacific between Noon and 5 P.M. in western states and between 2 and 4 P.M. in the east. Band may open occasionally from western states to the Far East between 3 and 5 P.M. DX conditions on *15* meters should hold up well during the entire daylight period. Check for openings toward South America as early as 8 A.M., with the band peaking between Noon and 4 P.M. Openings towards Africa should be best between 10 A.M. and 2 P.M. in the eastern states and until Noon in the west. The band should open to Europe from the eastern states between 8 A.M. and Noon, and until 10 A.M. in the PST and MST zones. Check for openings towards the South Pacific between 2 and 6 P.M., with the band open a few hours earlier in the western states. *Fifteen* should open from the western states towards the Far East and Asia between 4 P.M. and sunset, but only occasionally in the east. *Twenty* should open to just about all areas of the world from just after sunrise,

*11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For January, 1975

	Rating & Forecast Quality			
Propagation Index .....(4)	(3)	(2)	(1)
Date *January*				
Above Normal: 1, 14-15, 19, 27-29	A	A-B	B-C	C
Normal: 2-3, 12-13, 16-18, 20-26, 30-31	A-B	B-C	C-D	D-E
Below Normal: 4-6, 8-11, 17	B-C	C-D	D-E	E
Disturbed: 7	C-D	D	E	E

Where *expected 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—No opening expected.

HOW TO USE THIS FORECAST

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

2. With the *propagation index*, use the above table to find the expected signal quality associated with the particular opening for any day of the month. For example, all openings shown in the Charts with with a *propagation index* of (3), will be good-to-excellent (A-B) on Jan. 1, fair-to-good (B-C) on the 2nd and 3rd, fair-to-poor (C-D) on the 4th to 6th, etc.

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

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 *Standard* time is used at the *path midpoint*. For example, on a circuit between Maine and Florida, the time shown would be EST; on a circuit between N.Y. and Texas, the time would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones, add 2 hours in the PST zone, 3 hours in MST zone; 4 hours in CST zone; and 5 hours in the EST zone. Add 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 P.M. in Los Angeles; 17 or 5 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *Standard* time in other areas of the USA, subtract 8 hours in PST zone, 7 hours in MST zone, 6 hours in CST zone, 5 hours in EST zone. For example, at 20 GMT it is 15 or 3 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.

and remain open to about 11 A.M. From 11 A.M. through the early afternoon signals should weaken, with the band open primarily towards Europe, Africa, the Caribbean, Central America, and the northern countries of South America. In the eastern states check for long-path openings to Australasia between 2 and 4 P.M. In the western states look for short-path openings to the same area between 4 P.M. and sundown. Signals should increase in intensity towards South America from 3 P.M. onwards. *Forty* should begin to open towards Europe and to the Caribbean, Central America and the northern countries of South America about an hour or so before sunset, but signals may be weak. For short-skip, check *80* meters for openings up to 250 miles. Try *40* for distances between 250 and 750 miles; *20* for openings between 750 and 1500 miles, and both *20* and *15* meters for openings beyond 1500 miles.

Sunset to Midnight:—Twenty meters should remain open towards South America and Antarctica until 8 P.M., and occasionally right up to Midnight. The band should also remain open towards the South Pacific, Far East and Asia until 8 P.M., with conditions favoring wsetern states. Also check for long-path openings from the west to Europe and Africa after 10 P.M. Expect some fairly good openings on *40* meters to Europe and parts of Africa and the Middle East throughout this entire time period, with conditions favoring eastern states. Band should remain open to many areas of South America as well. In western states check for *40* meter openings towards the South Pacific beginning about 10 P.M. *Eighty* should open towards Europe, Africa, the Caribbean, Central America and the northern countries of South America during most of this time period. Check for possible openings on *160* meters towards the Caribbean, Central America and the northern countries of South America between 10 P.M. and Midnight in all time zones, and towards Europe from the eastern states after 10 P.M. On *short-skip*, try *160* meters for openings up to 250 miles; *80* meters between 250 and 1300 miles, and *40* meters for openings beyond 1300 miles.

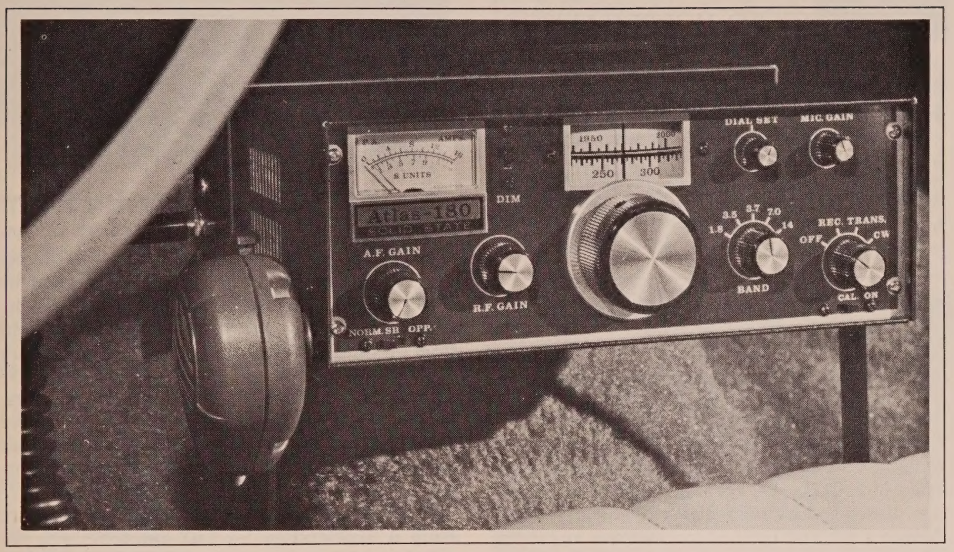
CQ Short-Skip Propagation Chart
January & February, 1975
Local Standard Time
At Path Mid-Point

Band (Meters)	*Distance Between Stations (Miles)* 50-250	250-750	750-1300	1300-2300
10	*Nil*	*Nil*	10-15 (0-1)	08-10 (0-1) 10-15 (1-2) 15-17 (0-1)
15	*Nil*	10-16 (0-1)	08-09 (0-1) 09-10 (0-2) 10-15 (1-3) 15-16 (1-2) 16-18 (0-1)	07-08 (0-1) 08-09 (1-3) 09-10 (2-3) 10-15 (3-4) 15-16 (2-3) 16-18 (1) 18-19 (0-1)
20	*Nil*	08-10 (0-1) 10-14 (0-3) 14-16 (0-2) 16-18 (0-1)	06-07 (0-1) 07-08 (0-2) 08-10 (1-4) 10-14 (3-4) 14-16 (2-4) 16-18 (1-2) 18-19 (0-2) 19-21 (0-1)	06-07 (1) 07-08 (2) 08-10 (4) 10-14 (4-3) 14-16 (4) 16-17 (2-4) 17-18 (2-3) 18-19 (2) 19-21 (1)
40	07-08 (0-1) 08-09 (1-2) 09-10 (2-4) 10-16 (3-4) 16-17 (3) 17-19 (1-2) 19-21 (0-1)	07-08 (1-2) 08-09 (2-3) 09-11 (4) 11-15 (4-3) 15-17 (3-4) 17-19 (2-3) 19-21 (1-2) 21-02 (0-2) 02-07 (0-1)	07-08 (2) 08-09 (3-1) 09-11 (4-1) 11-15 (3-1) 15-17 (4-2) 17-19 (3-4) 19-22 (2-4) 22-02 (2-3) 02-07 (1-2)	07-08 (2-1) 08-15 (1-0) 15-17 (2) 17-19 (4-3) 19-22 (4) 22-02 (3-4) 02-04 (2-3) 04-07 (2)
80	07-08 (1-2) 08-09 (3-4) 09-19 (4) 19-21 (3-4) 21-23 (2-1) 23-03 (1-2) 03-07 (1)	07-08 (2) 08-10 (4-2) 10-16 (4-1) 16-18 (4-2) 18-21 (4) 21-23 (3-4) 23-03 (2-3) 03-07 (1-3)	07-08 (2-1) 08-10 (2-0) 10-16 (1-0) 16-18 (2-1) 18-20 (4-3) 20-23 (4) 23-05 (3) 05-07 (3-2)	07-08 (0-1) 08-16 (0) 16-18 (1-0) 18-20 (3-2) 20-23 (4) 23-03 (3) 03-05 (3-2) 05-07 (2-1)

*Indicates best time for 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.

[*Continued on page 70*]

this one is "something special"



the Atlas -180

SINGLE SIDEBAND TRANSCEIVER

- COMPLETELY SOLID STATE
- "SUPER" MOBILE
- COMPACT (Only 3½"H x 9½"W x 9½"D)
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- RELIABLE
- VERSATILE



Desk top AC supply available. Features front facing speaker and space for accessory VOX

Band Coverage: 20, 40, 80 and 160 meters • 180 watts P.E.P. and CW input • Power Output: 80 watts minimum P.E.P. and CW (100 watts typical) • Highly stable VFO • Plug-in circuit boards • Operates directly from 12-14 volt D.C. source • • Built-in speaker • AR-117 and AR-230 desk top power supply available for AC operation • Broadband design includes ALC and infinite VSWR projection • Super selectivity (bandwidth at 120 db is only 9.2 kc) • Includes 4 I.C.'s, 18 transistors, 32 diodes • The Price... $499.00

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THE awards PROGRAM

BY ED HOPPER,* W2GT

USA-CA Honor Roll

3000		1500		500	
WAØCEL	142	K6SE/2	251	KA2AMN	1017
W3CDG	143	WAØCEL	252	K6SE/2	1018
				VK4VU	1019
2500		1000		WB2CST	1020
WA0CEL	178	K6SE/2	338	WA9BHH	1021
		WAØCEL	339	WAØCEL	1022
2000		WA1PQF	340	WA1PQF	1023
W3ARK	209	KØOJG	341	VE3RN	1024
WAØCEL	210	VE3RN	342		

THE January, "Story of The Month", as told by Jim is:

James M. Farris, Jr., WA4MGC

(All Counties #90, 12-22-71)

"Guess one should begin with their birthday, mine is November 15, 1916. I first became interested in radio in 1932 when I bought an American Bosch short wave receiver. I was then a full-fledged s.w.l. and listened to amateurs and many of the foreign broadcasts. Incidentally, I still have the American Bosch radio, and it is still in operating condition.

"In 1937, I really became interested in amateur radio through a classmate at Howard College. I graduated there in 1937 with a degree in Business Administration, intending to teach. Instead, a grocery store and delicatessen was bought in 1939 and all thoughts of amateur radio were put aside.

"A period of illness in 1940, and my very good nurse. Earleen, and I were married on October 21, 1940. We have a son, Larry. We operated the grocery store until 1951 when a heart attack and the doctor sent me home.

"My wife and I then started raising and selling tropical fish in the basement of our home. In 1961 I again became interested in amateur radio and began studying theory and code. Finally I got my ticket in January, 1963. In June of 1963, I was tuning around on 40 meters and ran across the old net on 7225, with K9EAB, Cliff Jr., K9UTI, Earl and many others. At that time W4UNR, Don was very active mobile. He lived here in Birmingham. A visit from Don and I was hooked on County Hunting.

"I worked about 1500 Counties on 40 meters using a Hallicrafter SR-150 barefoot. The 40 meter net began to gradually break up and I lost contact since I did not have an antenna system for 20 meters.

"In 1968 I bought a Drake TR-4, put up a tower and added a TA33 SR beam. In 1969 I took the test for Advanced Class, which I now hold, and began to work toward 3079, which I finally made in December 1972, Bledsoe, Tennessee from John, W4HA.

"I don't think one could find a nicer, more cooperative group of people anywhere, than the County Hunters. At present I'm working on second time around USA-CA and DX.

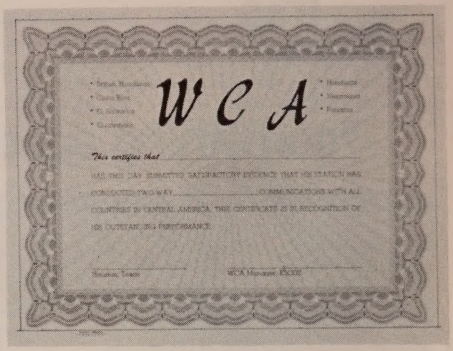
"I have had muscular dystrophy and am almost paralyzed completely. Amateur radio and County Hunting in particular, have given me many very happy moments.

"Thanks to all, and one final word, I would suggest that holders of *All Counties,* please check into the County Hunter's Net, many of us would like to work you for your number."

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



James Farris, WA4MGC.



Worked Central America Certificate, see December CQ for rules.

Awards Issued

Riley Dunn, WAØCEL nearly dunn them *all* (excuse the pun) but he did get USA-CA-500 through USA-CA-2500 endorsed All 14; All S.S.B. and USA-CA-3000, All S.S.B.

Ennis Royer, W3CDG also got USA-CA-3000.

Jack Kupp, W3ARK (nothing to do with Noah & his ARK) acquired USA-CA-2000, endorsed All A-1 (who sez c.w. is dead?)

John Irwin, K6SE/2, found time between his



Valley Forge Mini-Convention.

DX-peditions and his hiking/mountain climbing, to do the necessary paper work required for USA-CA-500 through USA-CA-1500 endorsed All 20, All Mobiles, All S.S.B.

Henry Masten, WA1PQF was issued USA-CA-500 and USA-CA-1000.

Wilbur Lewis, KØOJG added USA-CA-1000 to his collection.

Lee Foster, VE3RN won USA-CA-500 and USA-CA-1000, endorsed All S.S.B. This is #10 to VE3 and #22 to Canada.

Fred Roberts, K2AMN applied for USA-CA-500 endorsed All 40 S.S.B.

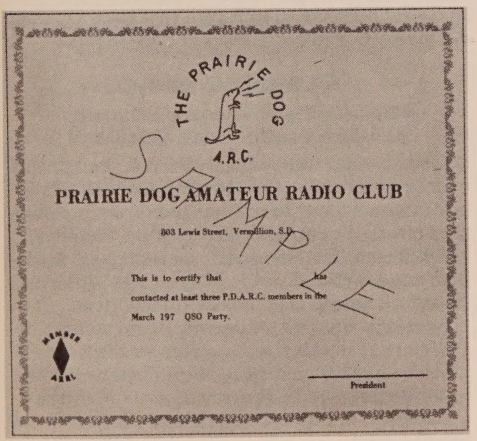
Martin Luther, VK4VU claimed USA-CA-500 endorsed All S.S.B. This is #3 to a VK4 and #8 to Australia.

Fred Belghaus, WB2CST also got USA-CA-500.

Jim Lauterbach, WA9BHH qualified for USA-CA-500, endorsed All 14; All 2 × S.S.B. and All Mobiles.

Awards

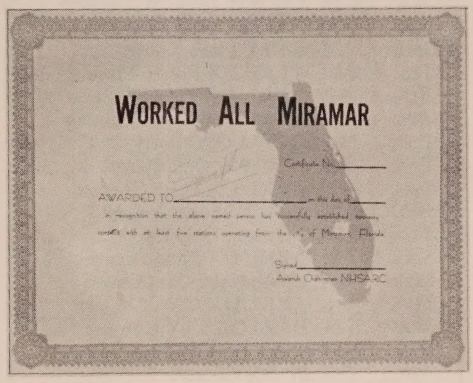
Prairie Dog A.R.C. Certificate: Sponsored by the Prairie Dog Amateur Radio Club of Vermillion, South Dakota for contacting at least 5 of the 22 club members during their QSO Party



Prairie Dog ARC Award.

0000Z 29 March to 0200Z 31 March. c.w.—3.690, 7.070, 14070, 21.70, 28.070 S.S.B. 3.955, 7.240, 14.285, 21.390, 28.550—also check 6 and 2. Novices check on 3.710, 7.110, 21.110 on the even hour. Exchange RS-RST, State and Name. Send confirmation to WBØEVQ, Box 493, Springfield, S.D. 57062 with 25¢ in stamps to cover costs.

Worked All Miramar (Florida) **Certificate:** Sponsored by the Nova High School Amateur Radio Club and is issued for successful contact with at least 5 stations operating from Miramar, Florida, with endorsements in increments of 5 up to 25 and then in increments of 3. Application must be made to Evan Derison, WA4BTQ, 7776 Alhambra Blvd., Miramar, Florida 33023, and must include a list of stations showing date,



Worked All Miramar (Florida) Award.

time, call, band and mode and s.a.s.e. QSLs are not necessary. The Award is open to all amateurs and s.w.ls worldwide. S.w.ls please send s.a.s.e. for special details. Prospective applicants are reminded to check back in their logs as there is no starting date for valid contacts. Active Miramar stations include: WA4BTQ, WA4GAJ, WA4BTR, W4OZF, WA4FYZ, WN4FOF, K4GLV,, W4PPQ, W4MYF, WN4-YSO and many others.

Notes

Through the courtesy of Paul Bugen, WA3-TUC, here is some data on the Mini-Convention at Valley Forge the week-end of last July 13. Bob Brown, WA3VLB and Bill Wentzel, W3GWA did a fine job in setting up the Mini at the Holiday Inn. A fine group was there, as you can see from the picture (taken by Paul with self-timer) and included a good number of Cliff Corner's for this size group—W2BLM, K2OO, WB2SJQ, W3LDD and W3LXN. Index To Picture:

Back Row: WA1PQF*, W3LXN, W3GWA*,

[*Continued on page 65*]



Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

Jan.	4-5	ARRL VHF Sweepstakes
*Jan.	8-9	YLRL DX C.W. Contest
*Jan.	11-12	YU 80 Meter C.W. Contest
*Jan.	11-12	DL QRP C.W. Contest
*Jan.	18	RTTY Flash Contest
***Jan.**	**24-26**	**CQ WW 160 C.W. Contest**
Jan.	25-26	French C.W. Contest
*Jan.	26	RTTY Flash Contest
*Jan.	29-30	YLRL DX Phone Contest
Feb.	1-2	ARRL DX Phone Contest
Feb.	2	Two Meter RTTY Contest
Feb.	8-9	QCWA QSO Party
Feb.	8-9	10-10 Net QSO Party
Feb.	15-16	ARRL DX C.W. Contest
Feb.	22-23	French Phone Contest
Feb.	22-24	Vermont QSO Party
Mar.	1-2	ARRL DX Phone Contest
Mar.	8-9	Commonwealth Contest
Mar.	15-16	ARRL DX C.W. Contest
Mar.	22-24	BARTG RTTY Contest
Mar.	**29-30**	**CQ WW WPX SSB Contest**
Apr.	5-6	SP DX Contest
Apr.	26-27	WAEDC RTTY Contest
May	17-19	Michigan QSO Party

*Covered in last month's Calendar

ARRL DX Contest

Phone: February 1-2 and March 1-2
C.W.: February 15-16 and March 15-16
Starts: 0001 GMT Saturday
Ends: 2359 GMT Sunday

This will be the 41st year for this contest. The DX stations will be working the W/K's and VE/VO's and the boys on this side will be digging for the DX.

The exchange for our fellows will be a signal report and their state or province. DX stations will add 3 digits to their signal report indicating their power input.

This year single operator stations can compete in one of three categories: 1, All Band, 2, High Band. (10, 15, 20) 3, Low Band. (40, 80, 160) Multi-op all band only.

Stations making over 1000 contacts will also receive an award. And there is a "One week-end DX-pedition classification."

All details were given in the December issue of *QST*. It is recommended that you use the offical ARRL log and summary forms and their check list which are available by sending a s.a. s.e. to Headquarters.

Address all requests and your logs to: ARRL Communications Dept., 225 Main Street, Newington, Conn. 06111

Two Meter RTTY Party

The Tu-Boro Radio Club is sponsoring this local party. Action will be on 145.620 MHz from 6 A.M. to midnight local time on February 2nd.

A certificate will be issued to each station working five members of the Club.

All inquiries and logs go to: The Tu-Boro Radio Club, 149-14 14th Avenue, Whitestone, N.Y., 11357. Applications will be accepted until March 1st 1975.

Ten-Ten Net QSO Party

Starts: 0000 GMT Saturday, February 8
Ends: 2400 GMT Sunday, February 9

This is the annual QSO Party of the Ten-Ten International Net of Southern California. It's open to all amateurs but non-members are ineligible for awards. However they are encouraged to submit a list of contacts and apply for membership. Activity is on Ten Meters only, but any mode.

Exchange: Name, QTH, and 10/10 number if a member of the Net.

Scoring: For members, 1 point per contact, add 1 point if its with a 10/10 member. Add an additional point if QSO is with a out-of-state, province or DX station. (That's your score, there is no multiplier)

Awards: 1st and 2nd place certificates in each U.S. call district, KH6 & KL7, and each VE province. And to 11 continental and sub-continental areas over the world.

Indicate the name of your chapter on your log and send it before March 15th to: Grace Dunlap, K5MRU, Box 445, La Feria, Texas 78559.

QCWA QSO Party

Starts: 0000 GMT Saturday, February 8
Ends: 2400 GMT Sunday, February 9

This is the 18th annual QCWA Party, this year sponsored by the Houston Chapter. Rules and format have been changed from previous year's with the emphasis this year on Chapters.

Exchange: QSO no., and your chapter. Members not associated with a chapter use "at large." Directors should also indicate their office.

Scoring: Number of members × number of Chapters × number of Directors worked. (There are 69 chapters and 10 QCWA Directors) The same station may be contacted *once only* regardless of band or mode, and only one Chapter name may be used.

Frequencies: C.W.—3550, 7050, 14050, 21050,

*14 Sherwood Road, Stamford, Conn. 06905.

28050. Phone—3900, 7240, 14270, 14340, 21390, 21435, 28600. RTTY—3595, 7095, 14095, 21070, 28070. Also 146.55 Simplex including repeaters.

No mention was made of any awards or if a new Plaque will be donated by National Headquarters now that the old one has been retired by W3IN.

Include a summary sheet showing the scoring, number of contacts, breakdown of multiplier and your chapter. Comments are invited.

Mailing deadline is March 10th to: QCWA Houston Chapter, Att: Monty Montemayor, W5YZ, P.O. Box 55254, Houston, Texas 77055.

Vermont QSO Party

Starts: 2100 GMT Saturday, February 22
Ends: 0100 GMT Monday, February 24

The Central Vermont ARC is again making this comparatively rare state available for the 28 hour contest period. The same station may be worked on each band and mode, and mobiles may be counted as a new contact for each county change.

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

Scoring: Vermont stations score 1 point per contact, multiply total by number of ARRL sections and countries worked. All others score 3 points for each Vermont station worked, multiply total by number of Vermont counties worked *on each band.* (14 per band possible)

Frequencies: 3685, 3909, 3932, 7060, 7265, 7290, 14060, 14290, 14325, 21060, 21375, 28100, 28600, 50260, 50360, 144-144.5, 145.8 (Try c.w. on odd hours, phone on even hours GMT)

Awards: Certificates to top scoring station in each ARRL section, DX country and 2nd, 3rd and 4th in Vermont. Also multi-operator and mobile stations operating in Vermont. Trophies to the Top Scorer in and outside Vermont. Party contacts may be credited for the W-VT Award for working 13 out of the 14 Vermont counties.

Mailing deadline is April 30th to: Peter Kragh, W1AYK/K2UPD, 170 Summit Ave., Ramsey, N.J. 07446. Include s.a.s.e. with your log.

CQ WW DX 160 Contest

Starts: 2200 GMT Friday, January 24
Ends: 1600 GMT Sunday, January 26

Rules are the same as previous years and fully covered in last month's CALENDAR.

For those not familiar with 160 operation, East Coast stations you will find state-side and VE activity between 1800 and 1825, and 1830 and 1850 kHz. The section between 1825 and 1830, the "DX Window," is reserved for overseas DX stations by a gentlemen's agreement. West Coast and KH6 stations will be found just below the 2000 kHz edge. (See U.S. Regulations)

The DX stations, W6 and W7's, and KH6's usually specify where they will be listening, usually 1800-1805 but never on frequency. It will be a split frequency operation.

Area	Maximum D.C. Plate Input Power in Watts															
	1800 to 1825 kc		1825 to 1850 kc		1850 to 1875 kc		1875 to 1900 kc		1900 to 1925 kc		1925 to 1950 kc		1950 to 1975 kc		1975 to 2000 kc	
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
Alabama	500	100	100	25	0	0	0	0	0	0	0	0	100	25	500	100
Alaska	1000	200	500	100	500	100	100	25	0	0	0	0	0	0	0	0
Arizona	1000	200	500	100	500	100	0	0	0	0	0	0	0	0	0	0
Arkansas	1000	200	500	100	100	25	0	0	0	0	100	25	100	25	500	100
California	1000	200	500	100	100	500	100	25	0	0	0	0	0	0	0	0
Colorado	1000	200	500	100	200	50	0	0	0	0	0	0	0	0	200	50
Connecticut	500	100	100	25	0	0	0	0	0	0	0	0	0	0	0	0
Delaware	500	100	100	25	0	0	0	0	0	0	0	0	0	0	100	25
District of Columbia	500	100	100	25	0	0	0	0	0	0	0	0	0	0	100	25
Florida	500	100	100	25	0	0	0	0	0	0	0	0	100	25	500	100
Georgia	500	100	100	25	0	0	0	0	0	0	0	0	0	0	200	50
Hawaii	0	0	0	0	0	0	0	0	200	50	100	25	100	25	500	100
Idaho	1000	200	500	100	500	100	100	25	100	25	100	25	100	25	500	100
Illinois	1000	200	500	100	100	25	0	0	0	0	0	0	0	0	200	50
Indiana	1000	200	500	100	100	25	0	0	0	0	0	0	0	0	200	50
Iowa	1000	200	500	100	200	50	0	0	0	0	100	25	100	25	500	100
Kansas	1000	200	500	100	100	25	0	0	0	0	100	25	100	25	500	100
Kentucky	1000	200	500	100	100	25	0	0	0	0	0	0	0	0	200	50
Louisiana	500	100	100	25	0	0	0	0	0	0	0	0	100	25	500	100
Maine	500	100	100	25	0	0	0	0	0	0	0	0	0	0	0	0
Maryland	500	100	100	25	0	0	0	0	0	0	0	0	0	0	100	25
Massachusetts	500	100	100	25	0	0	0	0	0	0	0	0	0	0	0	0
Michigan	1000	200	500	100	100	25	0	0	0	0	0	0	0	0	100	25
Minnesota	1000	200	500	100	500	100	100	25	100	25	100	25	100	25	500	100
Mississippi	500	100	100	25	0	0	0	0	0	0	0	0	100	25	500	100
Missouri	1000	200	500	100	100	25	0	0	0	0	100	25	100	25	500	100
Montana	1000	200	500	100	500	100	100	25	100	25	100	25	100	25	500	100
Nebraska	1000	200	500	100	200	50	0	0	0	0	100	25	100	25	500	100
Nevada	1000	200	500	100	500	100	100	25	0	0	0	0	0	0	0	0
New Hampshire	500	100	100	25	0	0	0	0	0	0	0	0	0	0	0	0
New Jersey	500	100	100	25	0	0	0	0	0	0	0	0	0	0	0	0
New Mexico	1000	200	500	100	100	25	0	0	0	0	100	25	500	100	1000	200
New York	500	100	100	25	0	0	0	0	0	0	0	0	0	0	0	0
North Carolina	500	100	100	25	0	0	0	0	0	0	0	0	0	0	100	25
North Dakota	1000	200	500	100	500	100	100	25	100	25	100	25	100	25	500	100
Ohio	1000	200	500	100	100	25	0	0	0	0	0	0	0	0	100	25
Oklahoma	1000	200	500	100	100	25	0	0	0	0	100	25	100	25	500	100
Oregon	1000	200	500	100	500	100	100	25	0	0	0	0	0	0	0	0
Pennsylvania	500	100	100	25	0	0	0	0	0	0	0	0	0	0	0	0
Rhode Island	500	100	100	25	0	0	0	0	0	0	0	0	0	0	0	0
South Carolina	500	100	100	25	0	0	0	0	0	0	0	0	0	0	200	50
South Dakota	1000	500	500	100	500	100	100	25	100	25	100	25	100	25	500	100
Tennessee	1000	200	500	100	100	25	0	0	0	0	0	0	0	0	200	50
Texas	500	100	100	25	0	0	0	0	0	0	0	0	0	0	200	50
Utah	1000	200	500	100	500	100	100	25	100	25	0	0	0	0	100	25
Vermont	500	100	100	25	0	0	0	0	0	0	0	0	0	0	0	0
Virginia	500	100	100	25	0	0	0	0	0	0	0	0	0	0	100	25
Washington	1000	200	500	100	500	100	100	25	0	0	0	0	0	0	0	0
West Virginia	1000	200	500	100	100	25	0	0	0	0	0	0	0	0	100	25
Wisconsin	1000	200	500	100	200	50	0	0	0	0	0	0	0	0	200	50
Wyoming	1000	200	500	100	500	100	100	0	100	25	0	0	0	0	200	50
Puerto Rico	500	100	100	25	0	0	0	0	0	0	0	0	0	0	200	50
Virgin Islands	500	100	100	25	0	0	0	0	0	0	0	0	0	0	200	50
Swan Island	500	100	100	25	0	0	0	0	0	0	0	0	100	25	500	100
Serrana Bank	500	100	100	25	0	0	0	0	0	0	0	0	100	25	500	100
Roncador Key	500	100	100	25	0	0	0	0	0	0	0	0	100	25	500	100
Navassa Island	500	100	100	25	0	0	0	0	0	0	0	0	0	0	200	50
Baker, Canton Enderbury, Howland	100	25	0	0	0	0	100	25	100	25	0	0	0	0	100	25
Guam, Johnston Midway	0	0	0	0	0	0	0	0	100	25	0	0	0	0	100	25
American Samoa	200	50	0	0	0	0	200	50	200	50	0	0	0	0	200	50
Wake	100	25	0	0	0	0	100	25	0	0	0	0	0	0	0	0
Palmyra, Jarvis	0	0	0	0	0	0	0	0	200	50	0	0	0	0	200	50

160 meter regulations for the US.

Last year the phone boys were very-co-operative and stayed out of the "DX Window," some even took a holiday for the contest week-end. Thanks a lot fellows, its only a once a year request.

Contest stations should also co-operate and not work too close to 1825 & 1830. Some of you have real potent signals that spill over on the DX.

Still time to obtain log forms and U.S. Regulations from CQ. A large s.a.s.e. with your request please.

Mailing deadline is February 28th to: *CQ* 160 Contest, 14 Vanderventer Ave., Port Washington, L.I. N.Y. 11050

French DX Contest

C.W.: Jan. 25-26 Phone: Feb. 22-23
Starts: 1400 GMT Saturday
Ends: 2200 GMT Sunday

Contest exchange is not confined to the French continental stations only, you can also work DUF countries and the following prefixes, HB, LX, ON, 9Q, 9U, 9X and 4U1ITU.

[*Continued on page 70*]

SURPLUS sidelights

BY GORDON ELIOT WHITE*

Two really first-class military receivers have dominated the surplus market for the last decade, the R-390 and 390-A, by Collins, and the Hammarlund SP-600. Although both are tube type circuits, and "obsolete" by that definition in this solid-state age, both still have a great deal to offer the radio amateur or experimenter. My subject this month is the SP-600. which is still found in surplus, particularly, now, in a Northern Radio terminal system which is being phased out of military and commercial use.

No one who appreciates a good general-coverage receiver should feel that he is in the poor-relation class with the SP-600, indeed a noted receiver designer once observed to me in a moment of candor that with transistors "we make 'em smaller now, but not necessarily better." If you don't plan to carry your receiver around in your pocket, both the SP-600 and the R-390 series' offer excellent basics: fiine stability, sensitivity and selectivity.

The SP-600-JX, the JAN or mil-spec version of the SP-600 commercial model receiver, covers 540 kHz to 54 MHz, an extraordinarily wide band, running from commercial a.m. broadcast to six meters. It is designed for either rack or tabletop mounting, and operates off conventional 117 v.a.c. power. No conversion is required. Weight is 87 pounds.

The set contains 20 tubes, including the power supply. Reception is a.m. or c.w., and a product detector may be added for single sideband.

The controls are straightforward, and are designed for extremely rapid tuning throughout the receiver's wide coverage. The tuning knob may be spun like a small flywheel, and the SP-600 is therefore far easier to tune than the wrist-breaking R-390. In addition to the main tuning dial, the receiver has a bandspread control for fine tuning.

The frequency range is broken up into six bands: 540 kHz-1.35 MHz; 1.35-3.45 MHz; 3.45 MHz-7.40; 7.40-14.8 MHz; 14.8-29.7 MHz; and 29 MHz-54 MHz.

Audio output at 600 ohms is 2.5 watts. Power consumption is 130 watts.

Sensitivity is rated at 2.3 microvolts or better, with a signal to noise ratio of 10:1. Image rejection is rated at better than 80 db.

Unlike the Collins design of variable slug-tuned i.f. transformers, the SP-600 adheres to the rotating-turret design of its ancestor the Hammarlund Super Pro. (SP-400)

Two stages of r.f. amplification are provided on all bands, using low-noise 6BA6 tubes. On the first four bands, below 7.4 MHz, single conversion is provided, to a 455 kHz intermediate frequency. Above 7.4 MHz double conversion is used, with a first i.f. of 3.955 kHz, followed by a second mixer and thence the 455 kHz i.f. section.

*1502 Stonewall Rd., Alexandria, Va. 22302

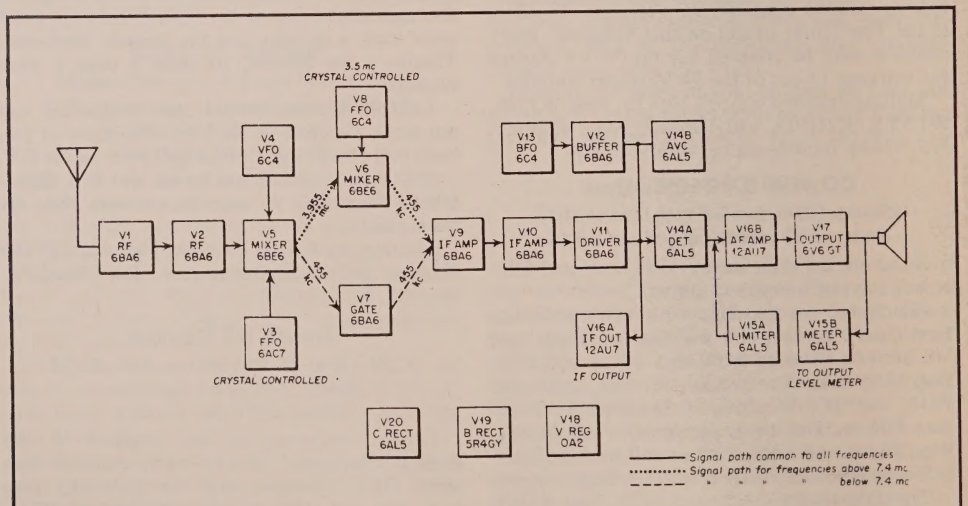
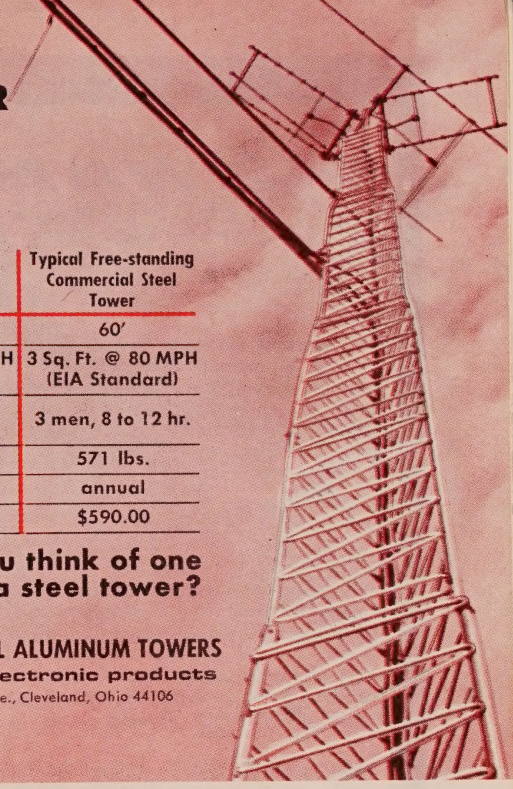


Fig. 1—Block diagram of the SP-600 receiver.

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The beat frequency oscillator is isolated by a buffer stage to eliminate "pulling" effects, and the b.f.o. is variable from zero to 3 kHz.

Selectivity control is provided in a six-position filter, using crystals in the three narrow positions. Bandwidths range from .2 kHz to 13 kHz.

Stability was rated by Hammerlund at between .001 and .01 percent of frequency, depending upon the band in use.

Fig. 1 is a block diagram of the receiver.

As you can see, it also has a noise limiter, and pretty good B+ regulation. A cathode follower circuit provides low-impedance i.f. to drive a remote unit such as an i.f.-type RTTY demodulator or sideband converter.

The SP-600 Antenna circuit is designed to work with a 100 ohm balanced transmission line, such as twinax. If using a single long-wire, of course ground one of the two terminals and run the long-wire to the other.

For net work, the SP-600 offers six crystal-controlled channels, but everyone I have known who had this receiver has used it strictly v.f.o.

Most of the SP-600's I have seen in recent years have come from the Northern Radio dual diversity receiver system, known as type 110, model 6. This is a seven foot tall rack containing two specially modified SP-600's, a master oscillator, monitoring panels, tone keyers, and demodulators. Strictly a teleprinter setup, the #110 provides extremely stable high frequency b.f.o. oscillator signals from the even-type master oscillator.

These sets were used in commercial and military fixed stations, where the same signals were sent on two channels, separated by either antenna location or frequency, and because of the diversity effect, provided added reliability in the face of adverse propagation conditions.

All of the SP-600's I have seen that came from such systems were readily converted to local-oscillator operation. They should give excellent amateur service.

Awards [*from page 61*]

W2BLM*, W2SDU, WB2FVO, W3GWA, W2QKJ*, W2QKJ, WA1LZS, WA1NIV, K2OO, K3VQO.

Middle Row: WA1PQF, W6CCM, K3VQO*, WB2TAA*, WA2GPT*, K2KQC*, W3LDD, K1LBK.

Bottom Row: W6CCM*, WA3VLB-, WA2TGN, WB2SJQ, WA3TUC, WA2GPT*, WA3VLB, W9ZHD, W9ZHD*.

Note: * indicates YL or XYL.

Hope 1975 will be a banner year for Amateur Radio in general and County Hunting in particular!! *All the best for you & yours in 1975.*

Don't forget to write and tell me, How was your month? 73, Ed., W2GT.

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HIGH-Q BEAM ANTENNAS

HEAVY DUTY 4-ELEMENT TRIBANDER

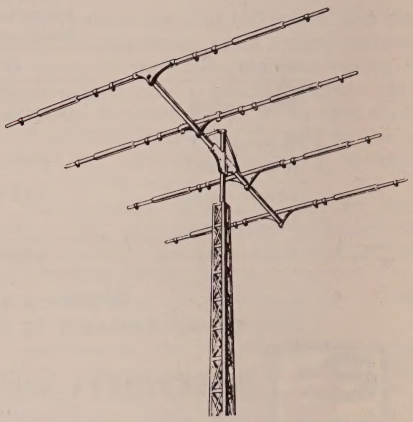
Four working elements on each band in 10, 15 and 20 meters. 24 foot boom permits optimum spacing for maximum forward gain and front-to-back ratio. All traps are precision tuned and weather-proofed. Rugged reliability assures ability to withstand winds up to 100 mph. TB-4HA. **$189.95**

HEAVY DUTY 3-ELEMENT TRIBANDER

Three working elements on each band in 10, 15 and 20 meters. 16 foot boom requires a lighter duty rotor and tower than the TB-4HA but still provides excellent performance characteristics. Precision tuned and weather-proofed traps are combined with rugged construction. TB-3HA. **$159.95**

ECONOMICAL 2-ELEMENT TRIBANDER

Two working elements on each band in 10, 15 and 20 meters. 6.5 foot aluminum boom can easily be raised on an inexpensive mast and operated with a standard TV rotator. Withstands winds up to 80 mph. TB-2A. **$119.95**



HEAVY DUTY 2-ELEMENT 40-METER BEAM.

Two working elements on 15.75 foot steel boom. Maximum forward gain and front-to-back ratio in the CW or phone portion of the 40-meter band is easily achieved for optimum performance. Large high-Q loading coils are weather-proofed. Rugged design easily takes 100 mph winds. MB-40H. **$179.95**

All Swan Beam Antennas are Rated for 2000 Watts and designed to use 52 Ohm coaxial feedlines.

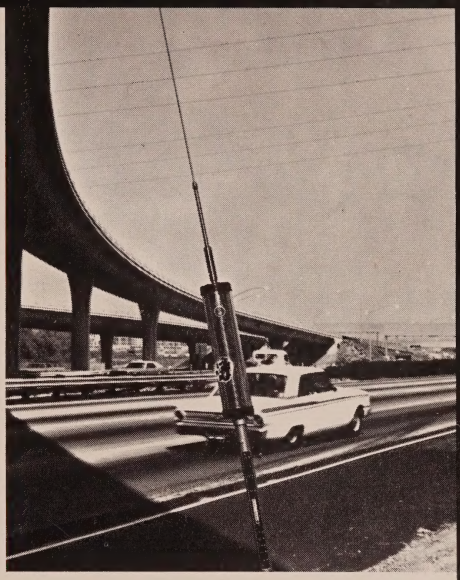
SWAN BEAM ANTENNA SPECIFICATIONS

Antenna Model Number	Average Forward Gain	Front to Back Ratio	Boom Length & Diameter	Longest Element	Turning Radius	Maximum Wind Survival	Wind Load @80 mph	Wind Surface Area	Net Weight
TB-4HA	9 dB	24-26 dB	24' x 1.5"	28'-10"	18'-6"	100 mph	148 lbs.	6 sq. ft.	54 lbs.
TB-3HA	8 dB	20-22 dB	16' x 1.5"	28'-2"	16'	100 mph	110 lbs.	4 sq.ft.	44 lbs.
TB-2A	5 dB	16-18 dB	6.5' x 1.5"	27'-8"	14'-3"	80 mph	60 lbs.	1.8 sq.ft.	18 lbs.
MB-40H	4 dB	16-18 dB	15.75' x 1.5"	30'-4"	17"-6"	100 mph	80 lbs.	2.5 sq.ft.	40 lbs.

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1040-V Trap Vertical Antenna **$99.95**
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☐ 45 Mobile Antenna @ $84.95 ☐ 1040-V @ $99.95 ☐ 75MK Add-on Kit @ $38.95

TOTAL AMOUNT OF ORDER = $ _____ AMOUNT ENCLOSED = $ _____

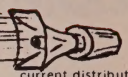
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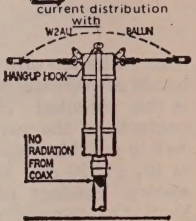
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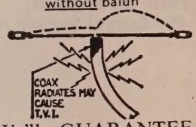
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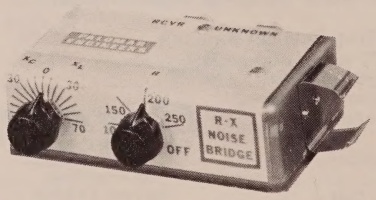


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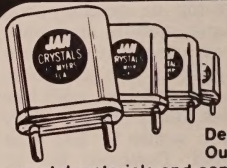
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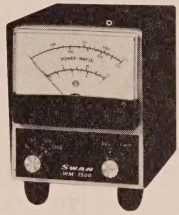


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Quality is not sacrificed. Cross-modulation and front-end overload will not plague or frustrate your communications. This Champion delivers a full 700 watts P.E.P. input on 10, 15, 20, 40 and 80 meters with selectable USB, LSB, AM, or CW with sidetone. For extra frequency coverage, plug in an optional 510-X crystal oscillator. If you want separate transmit and receive frequencies, use a 508 VFO accessory. VOX? Yes, with SWAN's plug-in VX-2 option. You can also hook up an FP-1 telephone patch to the 700CX. Even if you insist on more power, you can obtain the maximum legal limit of 2000 watts by adding a SWAN Mark II linear amplifier.

Whatever your style, the Champion 700CX is a winner. Whether you select the 700CX for your home station, its portability, for mobile use, or for its many compatible accessories—you can count on this Champion to give superior performance — everytime!



With all this talk about cost per watt, you may be interested in SWAN'S WM-1500 In-Line Wattmeter. Read forward or Reverse power on four scales from 0 to 5, 50, 500 and 1500 watts. Accuracy is better than 10% full scale on frequencies from 2 to 30 MHz.

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Propagation [*from page 58*]

160	09-17 (1-0) 17-19 (3-2) 19-05 (4) 05-07 (3) 07-09 (2-1)	17-18 (2-1) 18-19 (2) 19-21 (4-3) 21-05 (4) 05-06 (3) 06-07 (3-1) 07-09 (1-0)	17-18 (1-0) 18-19 (2-1) 19-21 (3-1) 21-03 (4-3) 03-05 (4) 05-06 (3-2) 06-07 (1)	18-19 (1-0) 19-21 (2-1) 21-03 (3) 03-05 (4-2) 05-06 (2) 06-07 (1-0)

ALASKA
January & February, 1975
Openings Given in GMT†

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

HAWAII
January & February, 1975
Openings Given in Hawaiian Standard Time†

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

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

Cop's Column [*from page 34*]

mally sold in the $30 range. The thing that I liked about it is that it had a high level input that I could connect my receiver output to, and make electrical recordings directly off the air.

"Like most cassette recorders, its wow and flutter did present a problem with SSTV. Its motor pulley is about ⅜" in diameter. I had a machinist friend (also a ham) machine a new motor pulley about ⅝" in diameter with a mounting hole large enough to slip over the original pulley. This way I can restore the recorder to its original condition without having to hunt for the 'lost' pulley. The original drive belt had enough stretch in it to slip over the new pulley without putting too much load on the system.

"Now my recorder runs at approximately 4⅜ inches per second. It's probably the only machine that runs at this speed in the world! The only drawback is that it can only play back cassettes that were recorded on this machine. But since I only use it for SSTV, and recording off the air transmissions, this presents no problems.

"Running the flywheel at a higher speed smooths out speed variations and eliminates some of the jitter/stagger problems that I had. I have not experimented with a still larger motor pulley, but speeds of 6½ IPS could be achieved without too much trouble. [The pulley sizes Mike mentioned were just his rough recollections. The ratio of new speed to old should be close to the ratio of new pulley diameter to old.]

"I use C-30 cassettes that are normally 15 minutes on a side. At the new and faster speed I get only a little over 5 minutes on a side. I record only one subject on each side of the tape. This way I can pick a tape out of my tape album (holds 12 tapes or 24 subjects) and as long as there is tape on the hub, I know what the picture will be without having to hunt for it. For example: one tape will have my handle on one side and QTH on the other. Another tape will have my rig information on one side, and my photo on the other, etc."

It sounds like Mike Ludkiewicz has come up with not only a good solution to the cassette speed variation problem, but a very handy random access picture storage scheme as well. Thanks for sharing your ideas with the rest of us, Mike. How about some pet ideas from others of you? Vy 73, Cop, WØORX

Contest Calendar [*from page 63*]

The same station can be worked on each band for QSO and multiplier credit.

Exchange: RS(T) plus a QSO number starting with 001. French stations will include 2 figures after their call to identify their department. HB and ON will indicate their Canton and Province with a 2 letter abbreviation.

Scoring: Each QSO counts 3 points. You earn a multiplier for each French department (95) each Swiss canton (22) and each Belgium province (10) and each DUF country, plus LX and 4U1ITU worked on each band.

Final Score: Total QSO points times the sum

[*Continued on page 77*]



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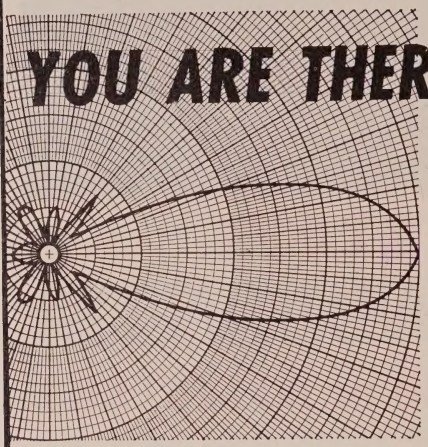
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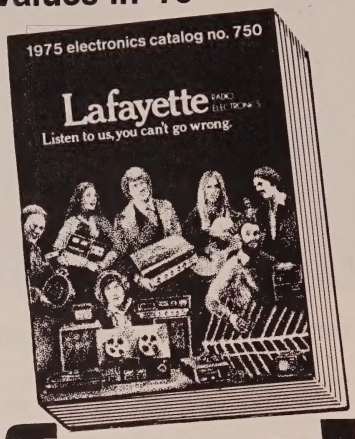
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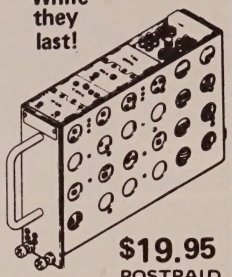
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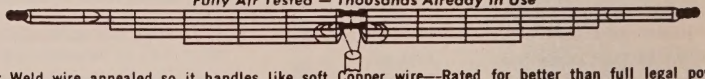
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Contest Calendar [*from page 70*]

of the multiplier from all bands.

In celebration of the 50th anniversary of the REF, contacts with the special station F8REF are worth 50 QSO points and 1 multiplier per band.

Awards: Certificates to the top scorers in each country and US call areas. Contest contacts may also be applied for the many French awards, DUF, DPF, DDFM and DTA.

Logs go to: REF Traffic Mgr., Lucien Aubry, F8TM, 53 rue Marceau, 91120 Palaiseau, France.

Editor's Notes

Mailing deadline for your c.w. logs comes up the 15th of this month, (Jan.) so be sure to get them off to us. When we eventually receive them is something else. As an example, we did not receive HS4AGN's WPX log until October, six months after it had been mailed from Thailand, long after we had gone to press with the results issue.

The all band score is 507,345 points, 1286 QSO's and a multiplier of 227 prefixes. The log will be accepted.

We had a good one for the Phone contest last October. Conditions were fair on the first day and fair to good on the second day, just as George Jacobs had predicted in his MAIL-A-PROP forecast. Activity was good from almost all areas, especially the Caribbean which was loaded with Contest Expeditions. Now if we could only get some of the natives interested in contest operation.

At this writing it's impossible to give a forecast for the 160 Contest at the end of this month, but with a lower sunspot count than at the same time last year when we had a good week-end, we should at least do equally well this year. Providing we don't run into a high static level week-end. In any event fellows, keep out of the "DX Window," let that DX sneak through.

Good luck, 73 for now, Frank, W1WY

Antennas [*from page 43*]

about 6 dB gain over a dipole, but the front-to-back ratio is approximately 6 dB, too.

'The theoretical radiation resistance is about 17 ohms, but I found out that using two parallel lengths of 50 ohm coax line (to give me a 25 ohm line) made no difference in operation at all compared to just a single length of line. The s.w.r. is quite high on the line, but it loads OK and works plenty of DX.

'I think it is important to use polypropylene rope since hemp rope seems to conduct when wet and messes up things electrically. I use no insulators at the ends of the elements, tying the wires to the wood spacers with the plastic fiber rope. No doubt a 4 element rotary on a 100 foot tower could do better, but for guys without several spare kilobucks, this is a dandy and simple way to squirt a few extra dB's to Europe, Japan, or wherever."

"A fine little beam," sighed Pendergast. "Didn't you use one something like this, years ago, at 3A2AF in Monaco?"

"That's correct," I replied. "It was written up in *CQ* in 1959, if my memory is correct. And it really worked well."

"Well, the definitive word on the vertical antenna has not yet been said," observed Pendergast.

"Perhaps so," I replied. "However, my friend Paul Lee, K6TS, has just completed a new handbook entitled *The Vertical Antenna Handbook*, published by *CQ*. Ole Paul has played around with verticals for years and he is considered an authority on the subject. I'm sure his new book has a lot of good information in it."

"Is he more of an authority than you are?," asked Pendergast slyly.

"No comment," I replied. "Pass me the cooking sherry."

CQ Reviews: HAL [*from page 50*]

The RVD-1005 video display unit is $575, with the Motorola TV set/monitor $140 from Hal. The ST-6 terminal unit is $390 complete. All are manufactured and/or sold by Hal Communications Corp., Box 365, Urbana, Illinois 61801. —*W2SR*

QRPp [*from page 47*]

New QRPp Net

Quite a few of you have inquired about the existence or possibility of a QRPp Net. Since none exists, let's go ahead and start one! After monitoring various bands, 80 meters appears to be the best bet. I've worked both coasts with about 3 watts to a dipole at 30 ft. on this band. We should be able to make a go of it with some degree of success. One weekly session will be held on Tuesday at 2200 EST (Wednesday, 0300 GMT). The frequency will be 3540 KHz ±3 KHz. First session will occur on January 15, 1975, and every week thereafter. I will function as an informal NCS. We'll take check-ins for the first ten minutes, with stations calling each other in order for the next fifteen minutes, and then ten more minutes of calling for check-ins.

It's end of the year time again, and time for publishing the annual QRPp DXCC and QRPp WAS standings. Drop me a card soon with your standings, and indicate power. We'll see how QRPp'rs have fared during the past year. I'm proud to note that I passed the 100 country mark in late October of 1974 and I'm heading for 200 now! Getting the QSL's is the next problem. Until next time, then, 73, and don't forget the AGCW-DL QRPp DX Contest January 11-12, 1975. 73, Ade, K8EEG/Ø

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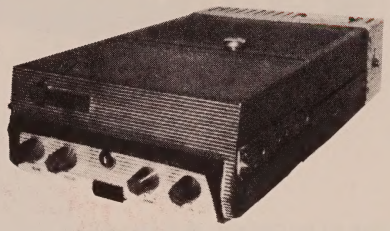
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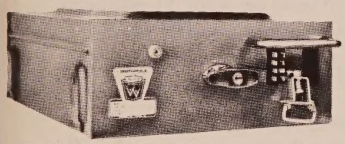


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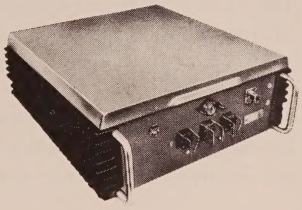
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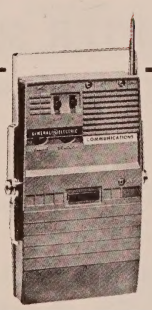


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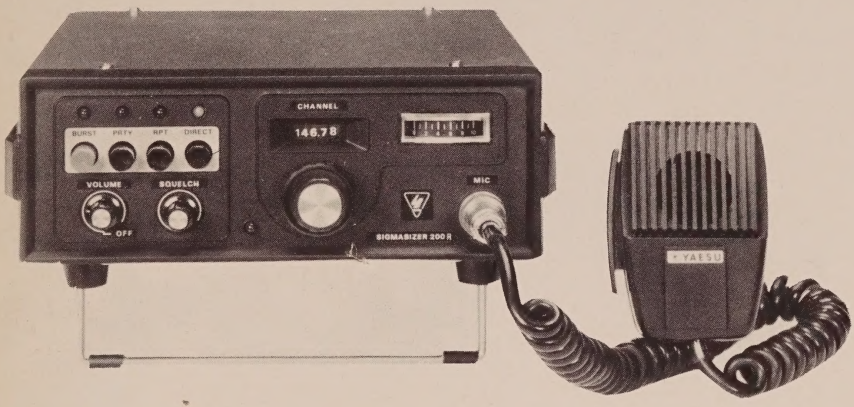
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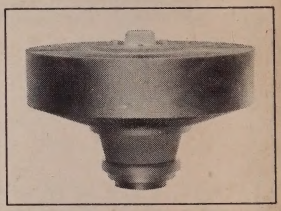
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