MORE BANDS FOR AMATEURS IN THE FUTURE ? See page 5

CQ

November 1971
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p. 16

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The Ten-Tec Argonaut !

The Radio Amateur's Journal
08240

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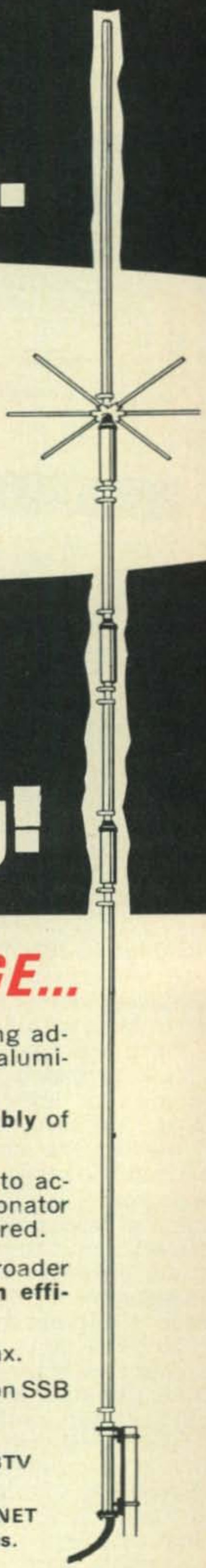

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NOVEMBER, 1971 VOL. 27, NO. 11

The Radio Amateur's Journal

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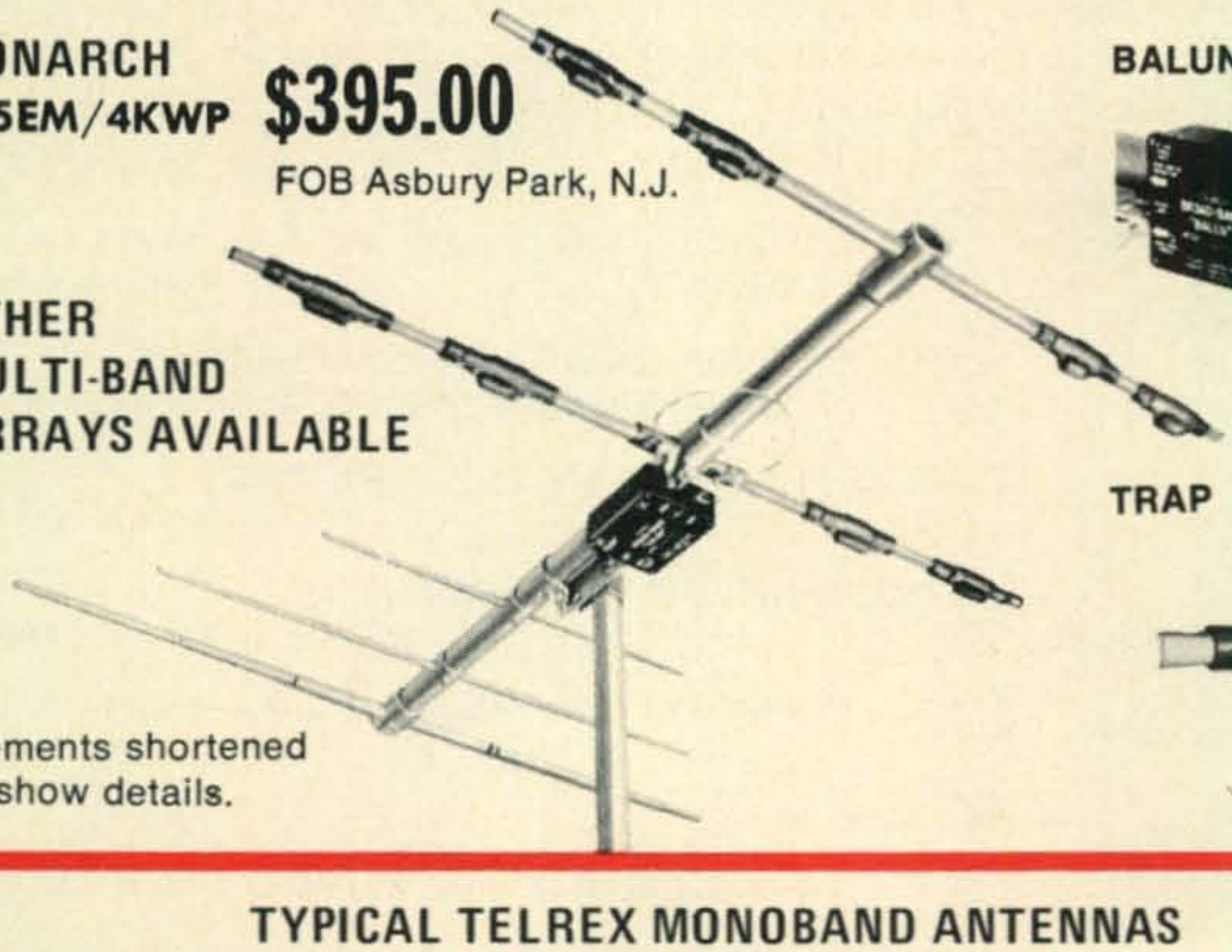

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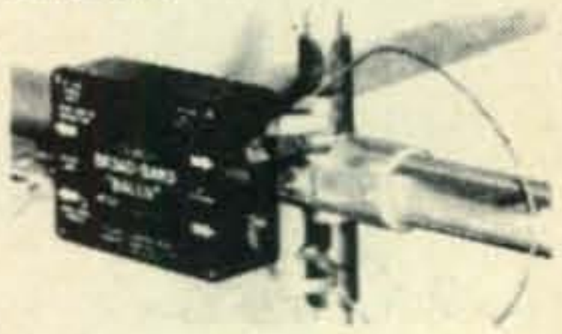

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ZERO BIAS

Guest Editorial

by John A. Attaway, K4IIF
DX Editor, CQ

A Letter from the Chief—

A New Goal and Challenge

WE recently received a letter from A. Prose Walker, W4BW, Chief of the Amateur and Citizen's Division of the Federal Communications Commission. It was a very informative letter, and of considerable significance to those concerned with the future of amateur radio. The pertinent passages are as follows:

"Many people who drop by the office express concern not only about the average age of the amateur, but the seeming lack of overall significant growth in our numbers. I'm more concerned about the former than the latter. Our h.f. bands are only so-wide and can decently accommodate only a certain number of signals at a time. If we had 500,000 hams in the U.S. today, what would the QRM picture be? Rather grim I imagine. Now it's rather rough at times even with 200 Hz passband filters.

"I think we need *more bands,* say one at 10, 18, and 24 MHz. Look at the table of allocations and you will see what I mean. Cables and Satellites are now carrying a lot of Fixed Public correspondence. I hear there will be a proposal for a new World Administrative Radio Conference in 1977. Those areas of the spectrum *could* get reallocated. Will the amateur service be ready, worldwide, with a well prepared position to justify more space? You answer the question. 1977 will be here before we know it! A little dreaming will bring to mind what a great thing it would do for DX (especially) to have bands every 3.5 MHz throughout the spectrum. From that point you can go wild! I don't think it's impossible, but a lot of work must be done if there is to be much chance."

The first paragraph quoted from Mr. Walker's letter is interesting as we find that he shares our concern over the lack of young faces among today's amateurs. However, the second paragraph downright excites us. For many years a sort of despair has infected amateur ranks. It has been widely recognized that our hobby lacked the necessary space in the radio spectrum to justify a needed burst of growth in new amateurs, and to make matters worse, emphasis has centered on a supposedly losing fight to keep what bands we have. Until now, no responsible spokesman has dared suggest that we might have a real chance to expand our bands.

Now the Chief tells us there is a tiny light at the far end of the tunnel. Technology moves on, and the advent of Cables and Satellites has resulted in a decrease in pressure on the High Frequency spectrum. The idea of more bands, possibly at 10, 18, and 24 mc is now more than a dream. It's fantastic! It's beautiful!

What a Goal for amateur radio worldwide! Now is the time to close ranks and pull together like we have never done before. The Chief says that a lot of work will have to be done. He's giving us a *challenge*. Let's get started! If amateurs worldwide will back their responsible amateur organizations and work with their respective regulatory bodies in preparation for the proposed 1977 conference, we can and will succeed. The result will be new growth and new vigor for one of the world's most educational and constructive hobbies. The opportunity is here! Let's don't muff it. It's everyone's responsibility. ■

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OUR READERS SAY

Last Word on Code Speed

Editor, *CQ:*

I was relicensed last May after a 22-year hiatus from amateur radio. In order to get back up to speed on what's going on nowadays, I turned to magazines such as yours. The excellent article you published in July on the SW-3 by William I Orr, W6SAI, provoked many memories and prompted this letter with the enclosed check for my subscription.

A couple of comments from an OT while I'm on-mike.

If I understand things correctly, you're against allocating away a piece of the 2-meter band to the CB'ers. Well, baby, I'm with you! As a matter of fact, if I were not so much the realist that I like to think I am, I'd advocate wiping out the present set-up entirely and trying again—with proper policing and less bending to lobbyists.

I appreciate the position taken by Donald Chester, K4KYV, who argues that lowering the code speed will dilute the general stature of organized ham radio. The problem is bad enough as it is. On Field Day last June, locating c.w. operators was a real barrel-bottom-scraping operation. K4KYV's closing statement wraps it up all too well: "To create a ham population explosion by reducing the present entrance requirements would contribute to the destruction of amateur radio as we know it."

I couldn't agree more. The code-speed requirement should be raised—not lowered—to 15 w.p.m. The "10-word hump" is a poor rationale. Having taken that step, there would surely arise a "5-word hump."

The amateur license should be awarded only to those who demonstrate a fixed level of competence, requiring a special kind of talent and motivation. I'm getting damned sick and tired of people who lament the fact that they can't join a group of specialists simply because they want "in" and can write a check to cover the fee.

For those who can't make it with the rest of us, there's another way to go: CB.

Please start my subscription with the August issue.

Edwin Kennedy, W3GPI
College Park, MD

Editor, *CQ:*

It's not often that I do write. I usually sit back with the so-called "silent majority" keeping myself relatively moderate in the background. However, I have thought on and off and have decided to express a few of my own views after sitting patiently off in the sidelines.

First of all, hats off to you and the FCC for the very wise choice and decision of expansion of the phone bands. I read with great enthusiasm of all the "new allocations" to phone ops like most of us, and a few shifts and additions to c.w. for the Novices. The greatest surprise to me was permission to go "down below" on 40 meters for advanced and extra classes. To me, that's *real* incentive! I think that all would agree that this step ahead will provide many hours more of enjoyable operating in our hobby, with the satisfaction of keeping a QSO going minus the QRM which plagues so many of us now.

Touching the subject of c.w., I see no purpose in arguing over the matter. It is the most basic mode and most reliable. All should have a knowledge of the code, and with ability to copy at a reasonable speed (10 to 15 w.p.m.), but to base our hobby entirely on it is to say that all means of transportation are irrelevant; we should all go back to walking because it's nice. Time marches on, there are better and more convenient ways to communicate with others. There are also more than two modes of emission permitted on the low bands. Let's not get bogged down and caught in between by others who would like to have our spectrum space (*i.e.*, non-amateurs).

My final comment is on the new CB band—Class E. I learned of the new service from the July-August issue of Elementary Electronics. It seems that we have just started sharing our 220 mc band, half for us (3 mc) and half for them (2 mc). This "new radio service" will provide users with "80 more channels when the FCC adopts new rules proposed by the Electronics Industries Association."

That quote was taken from page 31 of the magazine. It was eminent. The Class D service is unspeakable, and the only places to look for more room would be—you guessed it—us. To those few CBers who know *how* to use the service properly, I say congratulations! Your dream has come true. To those who bootleg and persist to work skip and disrupt communications, I just hope the Friendly Candy Company meets up with you someday. This doesn't seem to be a terrible loss, though, just an application of what commercial services and 2 meters has been doing. We have proven it, now the public can benefit from our technology. Reading further in the article, the method of two-way seems a bit more complex than need be, and it was emphatically stressed that the old 11 meter transceivers are of no value for class E, but then, I guess parts and converters and even transverters don't count. I agree that it might be more trouble than it's worth to modify a class D set for class E, but to me the only obvious means to get on 220 E is to *buy* a set. Well, I look at some of the prices on new two meter f.m. gear and think, who can blame them? After all, somebody's gotta make a living.

John F. Croft, Jr. WA2GIE
Fair Haven, NJ

OUR READERS SAY welcomes letters about nearly anything of interest to amateurs, whether about *CQ* itself, the state of the hobby, or whatever else you have on your mind. The most interesting letters will be selected for publication each month; just keep them legible.

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Announcements

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The Chautauqua County F.M. Reapeater Association will hold a public auction on Saturday, Oct. 16 at 1 P.M. featuring equipment and parts at Shore Acres Boat Yard, Old Route 17, on the lake, Bemus Point, New York.

Brownfield, Texas

The 17th Annual Brownfield Free Swapfest, sponsored by W5HPI, Terry County Amateur Radio Club, will be held in the National Guard Armory, Brownfield, Texas, on October 24, 1971. Army MARS and West Texas VHF Clubs meetings. Doors open 7:00 A.M. local time. Catered Dutch buffet lunch. Eyeball QSO's refreshments and entertainment evening of October 23rd for early arrivals. Door prizes. Public is welcome.

Kingston, Oklahoma

The Annual Texoma Hamarama will be held again this year at Lake Texoma Lodge, Kingston, Oklahoma on October 29, 30 and 31st. Programs for both men and women are planned. There will be technical talks, demonstrations and special interest meetings. Bingo and special entertainment is planned for the ladies. The Annual Area Meeting of the QCWA has in the past brought Old Timers from surrounding States. Reservation for accommodations should be sent directly to the Lake Texoma Lodge, Kingston, Oklahoma 73439. All Pre-registrations are $2.00 and should be sent to Texoma Hamarama, P.O. Box 246, Kingston, Oklahoma 73439 before October 25th.

Queensland, Australia

On November 6th and 7th, the Sunshine Coast International Rodeo will be held at Nambour, Queensland. The Sunshine Coast ARC has decided to take advantage of this and for the duration of the Rodeo will be operating the club station, VK4SZ, from the grounds. Frequencies will be 14275 and 14175 kc. and times of operation will be from 1800 to 0700 Z. each day, but these could be altered to suit prevailing conditions. They are having special cards printed and QSL will be 100%. It is hoped this Rodeo will become an annual event and to further the International aspect they would greatly appreciate any support they can get from overseas contacts.

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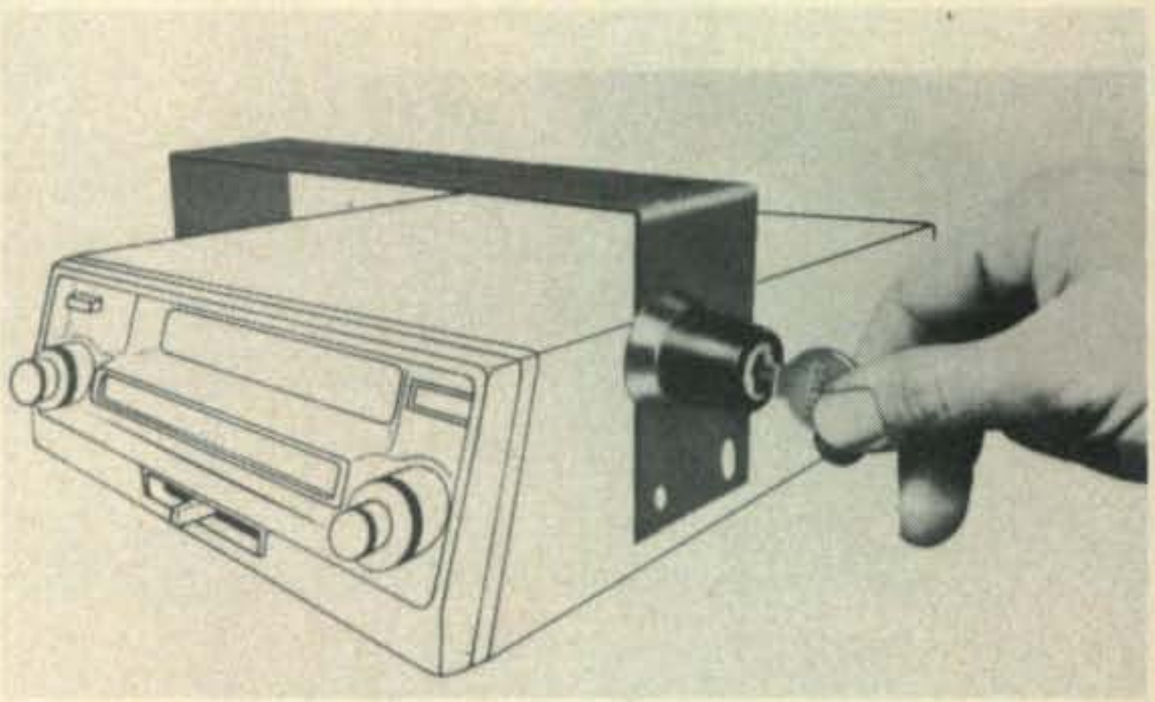
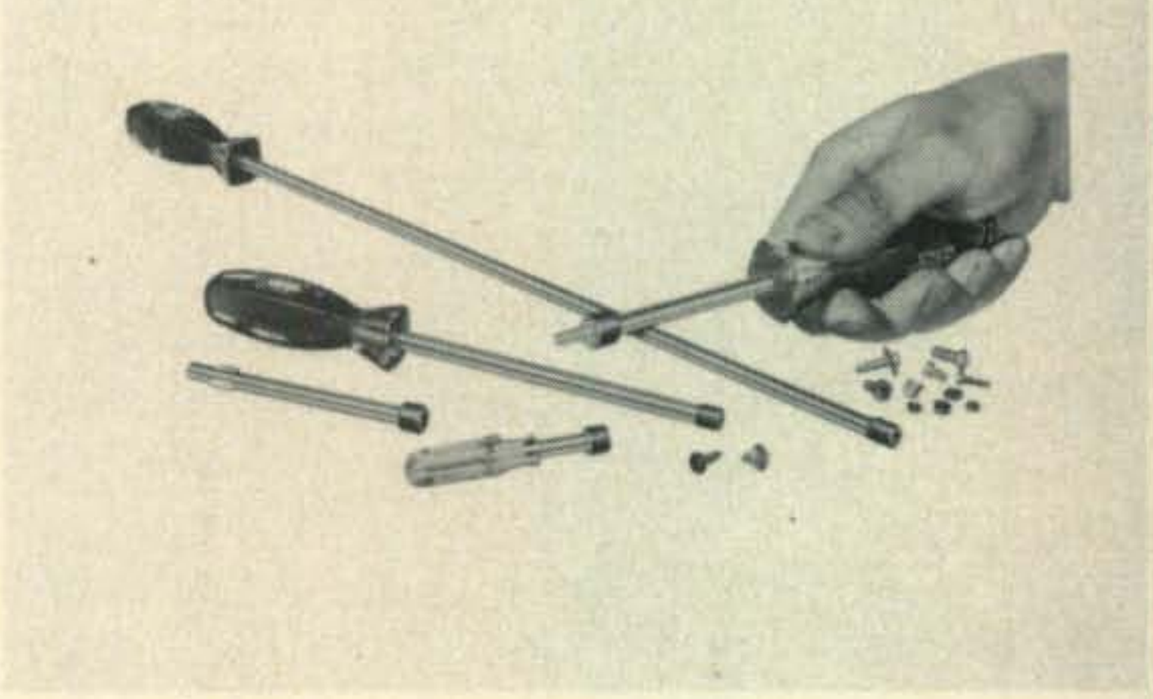


Bolen Security Lock

BOLEN Industries announce their new "21" security lock to help stop the theft of anything from a stereo tape player to that new f.m. transceiver. It installs easily to any mounting bracket with just a screwdriver in minutes. No alterations are necessary. The Bolen "21" features a 5 tumbler lock and an anti-pry wrench-resistant collar. It is supplied with 2 keys. The lock with instructions sells for $5.95. For further information write to: Bolen Industries Inc., 789 Main St., Hackensack, N.J. 07601 or circle A on the Reader Service coupon.



Xcelite Inc.

XCELITE Inc. has added ¼" and 5/16" hex socket magnetic nut-drivers to its line of hand tools. The magnetic feature is being offered on midget pocket clip, regular, extra long, and super long fixed handle drivers and also on interchangeable shanks for use with all Xcelite Series "99" handles, both regular and ratchet types. The magnetic nutdrivers are priced from $1.50 to $6.80 depending on size of shank (from 3½" to 20¾"). For complete details write to: Xcelite Inc., Orchard Park, N.Y. 14127, Attn: Mr. Frederick L. Davis or circle B on the Reader Service coupon.

NEW! Improved rugged 8122W's, 8121W's, 8072W's, and 8828W's, from EIMAC

EIMAC's new 8122W family of premium, second generation tubes are directly interchangeable with earlier equivalents in most FM, linear or modulated equipments.

These rugged, long life power tetrodes combine high screen dissipation and excellent thermal stability in a heavy duty structure which gives you improved performance in demanding communication circuits.

EIMAC's new design features rigid precision-wound gold plated molybdenum wire grids. The result is a direct-replacement tube with higher screen overload capability and greater resistance to shock and vibration. The EIMAC 8122W family is ideal for applications where you have experienced problems under environmental or electrical stress.

EIMAC's unique 8122W electron-gun structure is available in four anode configurations: Axial air flow cooling (8122W), Transverse air flow cooling (8121W), coolerless (8072W) and conduction cooled (8828W). Special heat sink coolers are also available upon request.

EIMAC's Application Engineering Section stands ready to assist you in designing these exceptional tubes in new equipments. Contact EIMAC Division of Varian, 301 Industrial Way, San Carlos, California 94070, or your nearest Varian/EIMAC Electron Tube and Device Group Sales Office.

Eimac®
division
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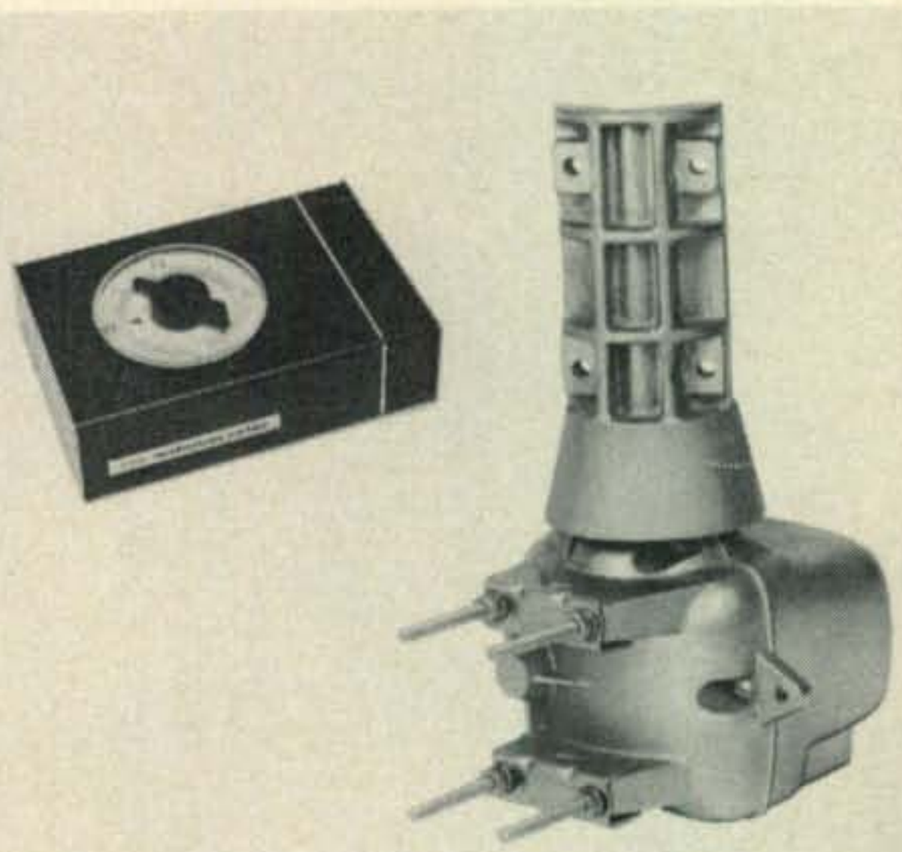
Injectorall Electronics

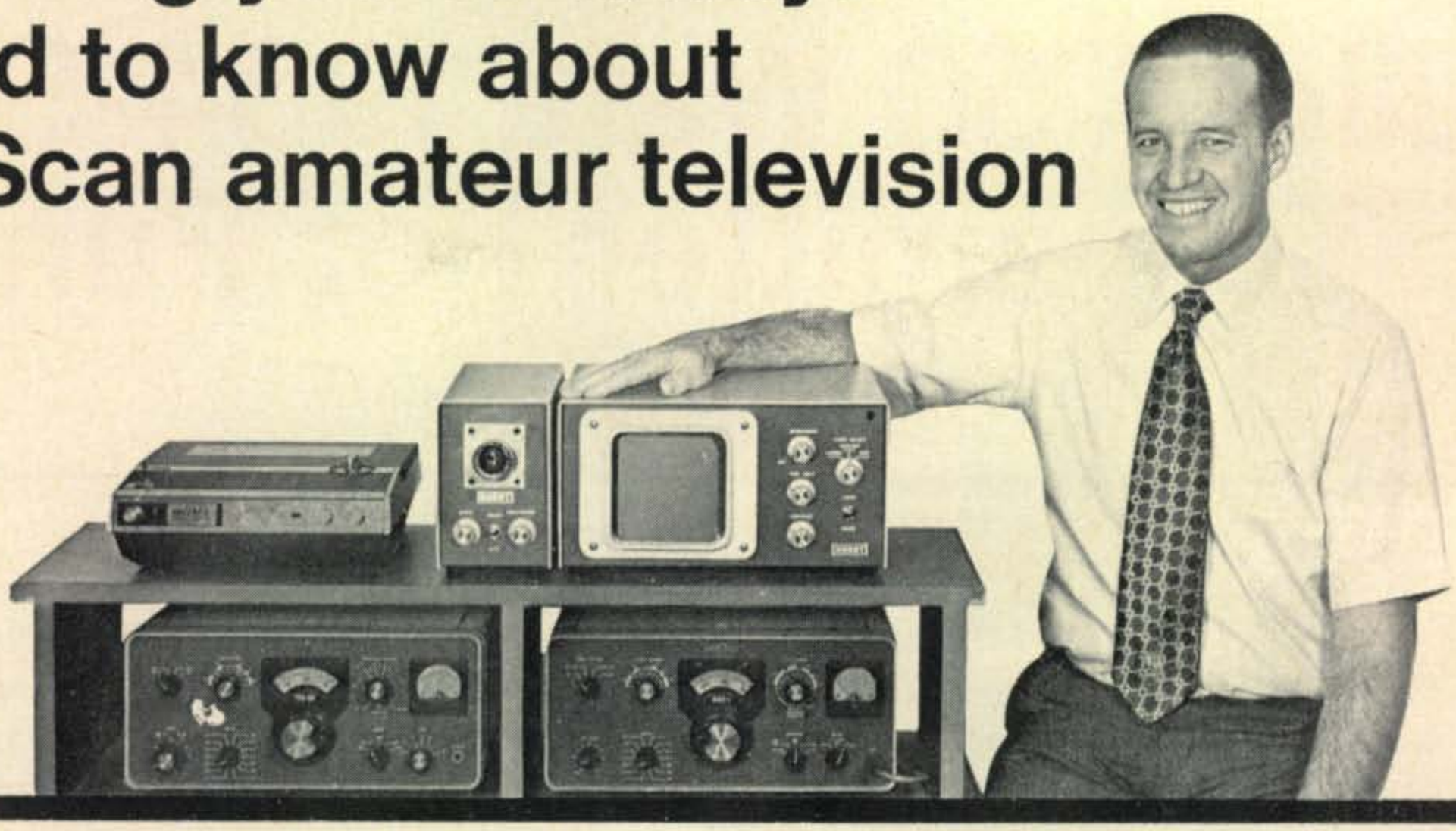
INJECTORALL's 650 photo-etch printed-circuit kit is a completely packaged unit (nothing else to buy) using a photosensitive method for producing professional quality printed circuits. The kit contains two photo-sensitized 3" × 4" copper clad boards, a photographic test negative and a ultraviolet light source. It also contains an exposure glass, clamps, developer, etchant, trays, resist remover, drill and complete instructions. The kit sells for $10.80. For additional information write to: Injectorall Electronics Corp., 98-100 Glen St., Glen Cove, N.Y. 11542 or circle C on the Reader Service coupon.



Cornell-Dubilier Electronics

A NEW economy priced rotor has been introduced by CDE called the AR-20. The rotor is housed in heavy duty cast aluminum colored gold. The control box is automatic and operates in the same manner as their AR-22 rotor. The rotor with control box sells for $34.95. For complete specifications write to Marketing Services Department, Cornell-Dubilier Electronics, 150 Ave. "L", Newark, N.J. 07101 or circle D on the Reader Service coupon.

verything you've always anted to know about low Scan amateur television



What is slow scan television?

It is a system which permits the transmission of all the electronic components of a video signal in the same bandwidth required for an audio signal.

Do I need a special license, or any unusual technical knowledge to operate SSTV?

No. Any licensed amateur operator can easily set up and operate an SSTV station, (you even tune your Robot Slow Scan equipment the same way you tune for voice). The impression that SSTV required advanced technical knowledge was due to the fact, that until now, amateurs operating SSTV had to build their own sets.

What kind of radio equipment is required for SSTV?

The SSB or VHF/UHF radio set and antenna you now use for phone contacts are all that are required. To install the Robot Monitor, simply plug in the cord, furnished with the monitor, into the earphone jack on your receiver.

To install the Robot Camera, plug the cord furnished with the camera into the microphone jack. The station microphone then plugs into the Robot slow scan set.

On what bands is SSTV authorized?

The FCC has authorized SSTV operation on all phone bands except 160 meters, and the General Class portion of the phone band on 80, 40, 20 and 15 meters. With the exception of the General Class portion, a licensed amateur can operate SSTV on the same frequencies he operates phone.

Presently, slow scan activity can be frequently found on 3845, 7220, 14230, and 21340 kHz. Call-ins with or without SSTV gear are welcome, and you'll find that slow scanners are happy to answer any questions you may have.

What does an SSTV picture look like?

Slow scan television requires eight seconds to send each new image. Therefore, the monitor displays the transmitted video as a sequence of still pictures. As each picture is formed, it is "stored" by the persistence of a P-7 phosphor, and appears as varying shades of yellowish brightness on the cathode ray tube. When the picture is viewed in subdued light, it is comparable to a newspaper photo in clarity and detail.

Can I record SSTV pictures?

Yes. An inexpensive *audio* tape recorder running at 3¾ IPS is more than adequate. Present SSTV stations practice includes use of tape for preserving off-the-air contacts as well as preparing an interesting program to be transmitted.

How much does the Robot slow scan television equipment cost, and where can I obtain it?

The Robot Model 80 Camera costs $465, the Model 70 Monitor costs $495, and the f1.9 lens is $30. You can purchase Robot equipment from your favorite amateur dealer, or direct from the factory. Mail in the coupon below and we will send you complete information on SSTV and the Robot SSTV equipment.

ROBOT

ROBOT RESEARCH, INC.
7591 Convoy Court
San Diego, California 92111

ROBOT RESEARCH, INC.
7591 Convoy Court
San Diego, California 92111

Gentlemen:
Please send me your complete information on the Robot camera and monitor.

Name _____

Street _____

City _____

State _____ Zip _____

Call _____

Build A 50 Watt, 1934-Style Transmitter For Fun!

BY WILLIAM I. ORR*, W6SAI

The reader response to W6SAI's article about the old-time National SW-3 receiver in the July, 1971 issue of CQ *was amazing. Undoubtedly a large number of today's radio amateurs are seriously interested in antique ham gear. More and more of it is being rehabilitated and put back on the air. To introduce today's amateur to the joys of "breadboarding," W6SAI describes in detail an uncomplicated, 50 watt c.w. transmitter that was the "last word" in 1934, and is puts out a clean, 1971-style signal! If you can scrounge the old parts, why not build up this masterpiece and join in the fun? Half the enjoyment is finding the parts!*

In a following article, W6SAI will describe his two tube, 1932-style bandspread communication receiver that you can build as a companion unit to this dandy transmitter.

PENDERGAST softly muttered an oath and the latest copy of *Appliance Operator* magazine he had been reading described a graceful arc through the air and landed in the streamlined, naugahyde-covered wastebasket.

Trueheart removed his Osaka stereo earphones, turned down the volume on his Kamikaze-400 transceiver and snapped off the filaments of his Yokohama-2000 linear amplifier. He turned towards his chum. "What's wrong, Buddy?", he asked genially. "Are your saddle sores bothering you?"

Pendergast reached down and retrieved the *Appliance Operator* magazine from the wastebasket. He riffled through the pages with a mark of distaste on his face.

"Look at this issue," he spoke rapidly. "Pages of advertisements featuring transistorized economy transceivers; digital, solid-state keyers; 2-kilowatt desk-top linear amplifiers and 5-cent-a-card QSL services. And the text is full of pay-your-buck and stand-in-line DXpeditions." He sighed heavily. "What's ham radio coming to?" he asked.

Truehart braced himself for the forthcoming blast. His vasemotor and respiratory systems contracted, as if under undue stress.

Pendergast continued, "There's no *fun* left in amateur radio. It's much too serious. The only fellows having fun and building and experimenting are the way-out groups like the v.h.f.'ers, the RTTY gang, the slow-scan TV boys and the moonbounce experimenters. The rest of us amateurs are disenfranchised from having any *fun* at all."

He warmed to his subject. "Why, when I was a kid and just got my ticket, I built all of my station with a dull Boy Scout knife and a screwdriver. I had a two-tube home-made receiver and a single tube home-made transmitter. The only thing I bought was a key and a power transformer." He paused, then as an afterthought added, "I swiped the microphone from a pay telephone, too."

Truehart shifted uncomfortably in his padded, pink leather operating chair and toyed with his Tora-Tora interdigitated sequential keyer. The nixie tubes blinked at him as he sent a string of aimless dots.

"So what does all this prove?" he asked weakly. "Just what are you getting at?"

Pendergast looked him in the eye. "I'm getting at *this*. How can you have *fun* with an unromantic, tubeless, solid-state, circuit-boarded transceiver in a wrap-around TVI-proof cabinet when you can't see the tubes light up, and can't even read the schematic of the thing?"

He mused for a second, then continued, "I can remember when I had a breadboard DX rig with a 203A and a copper tubing tank coil. It *looked* like a radio transmitter *should* look.

*48 Campbell Lane, Menlo Park, CA 94025

The glow from the 203A filament lit up the DX QSL cards tacked to the wall behind the transmitter. If I called a DX station who didn't come back—well, I just pulled out the copper tubing coil and polished it with steel wool until it gleamed. Then I'd put it back in the rig and call again. And the DX station *always* came back after that!"

Pendergast gulped miserably, and asked: "How do you steel wool a tank coil in a Kamikaze-400 transceiver?"

"The romance has gone out of ham radio. No more building, no nothing. Just working DX set-ups with store-boughten gear. The wrap-around cabinet and the integrated circuit have just about killed off ham radio."

Pendergast arose slowly and carefully placed the copy of *Appliance Operator* magazine in Truehart's lap. "Goodbye, old buddy," he said. "I'm going home and build a *real* ham transmitter. One that lights up and has real tubes and coils and all sorts of loverly parts that you can see and feel. A breadboard rig. Just like my Pappy had. And I'm going to have fun with it, too." He walked towards the door of the shack, shuddering slightly as he observed the "on the air" sign on the wall.

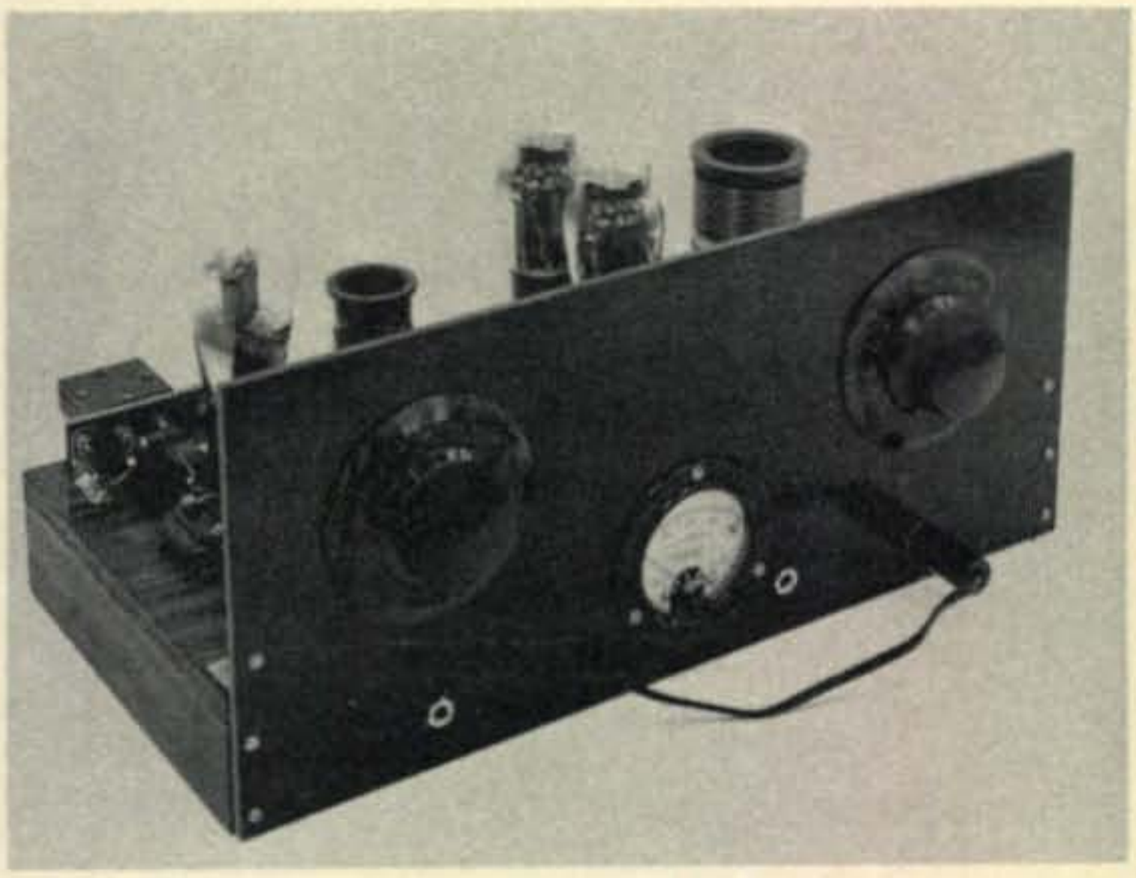
"You are merely retreating into the past because you cannot stand the pressures of today's society and the accelerated progress," said Truehart, turning back to his transceiver as the door closed silently behind his friend.

* * * * *

Connoisseurs of the Golden Years of amateur radio have noted that 1931-34 was a critical period for this hobby. A perusal of old copies of *QST* and *Radio* magazines of that era show that modern circuitry was beginning to supplant mythology and that the metal chassis was starting to displace the venerable breadboard.

That was the age of the first single-signal superhet receiver, the popular crystal control transmitter, and the Zepp antenna. Amateur transmitter design, too, was undergoing vast changes as new consumer-type tubes were being announced in large numbers. Some of these tubes were well suited to amateur transmitters, and of these tubes one of the most popular was the 46, a dual grid tube intended for high power Class B audio service.

Amateur experimenters quickly discovered that the 46 made a good high frequency r.f. amplified tube which, when connected in the zero bias mode, obviated the need for an external bias supply. In addition, the high-mu of the triode-connected 46 simplified keying matters, as the tube could be turned off by merely breaking the grid return circuit.



Designed for operation on 160, 80 or 40 meter c.w., this nifty crystal controlled transmitter is a replica of a typical 1934 design. Plug-in coils are used for band change, two coils being required for each band. The 47 crystal oscillator stage is at the left and the two parallel-connected 46 amplifier tubes are at the right. The oscillator tuning control is at the left of the panel with the meter jack directly below it. The grid current jack (also used for keying) is at the right of the meter, with amplifier plate current jack at the extreme right. Components are mounted to a plywood chassis stained a dark brown. The Masonite panel is sprayed a dull black to resemble bakelite. Note that the meter jacks are in the B-plus leads and are "hot."

Within a few years the cheap, readily available 46 supplanted the venerable 210 as a low power buffer or amplifier in many amateur transmitters. Old timers fondly remember the popular transmitter dubbed the "46 job" which used the 46 as an oscillator, buffer, amplifier, modulator and speech amplifier! Until the advent of the 6L6 and 807 beam power tubes in the late thirties, the dual grid 46 proved to be the universal answer for a cheap and dependable r.f. amplifier tube.

Alas, the wonderful 46 is no longer manufactured, but it is still available to some extent in the bins of surplus electronics stores. It serves in the amplifier stage of the 50 watt transmitter described in this article.

A second popular receiving type tube of that age, used in many amateur transmitters as a crystal oscillator was the 47. This was a pentode tube, intended for use in small table model radios as an audio output tube which could be driven directly from the detector.

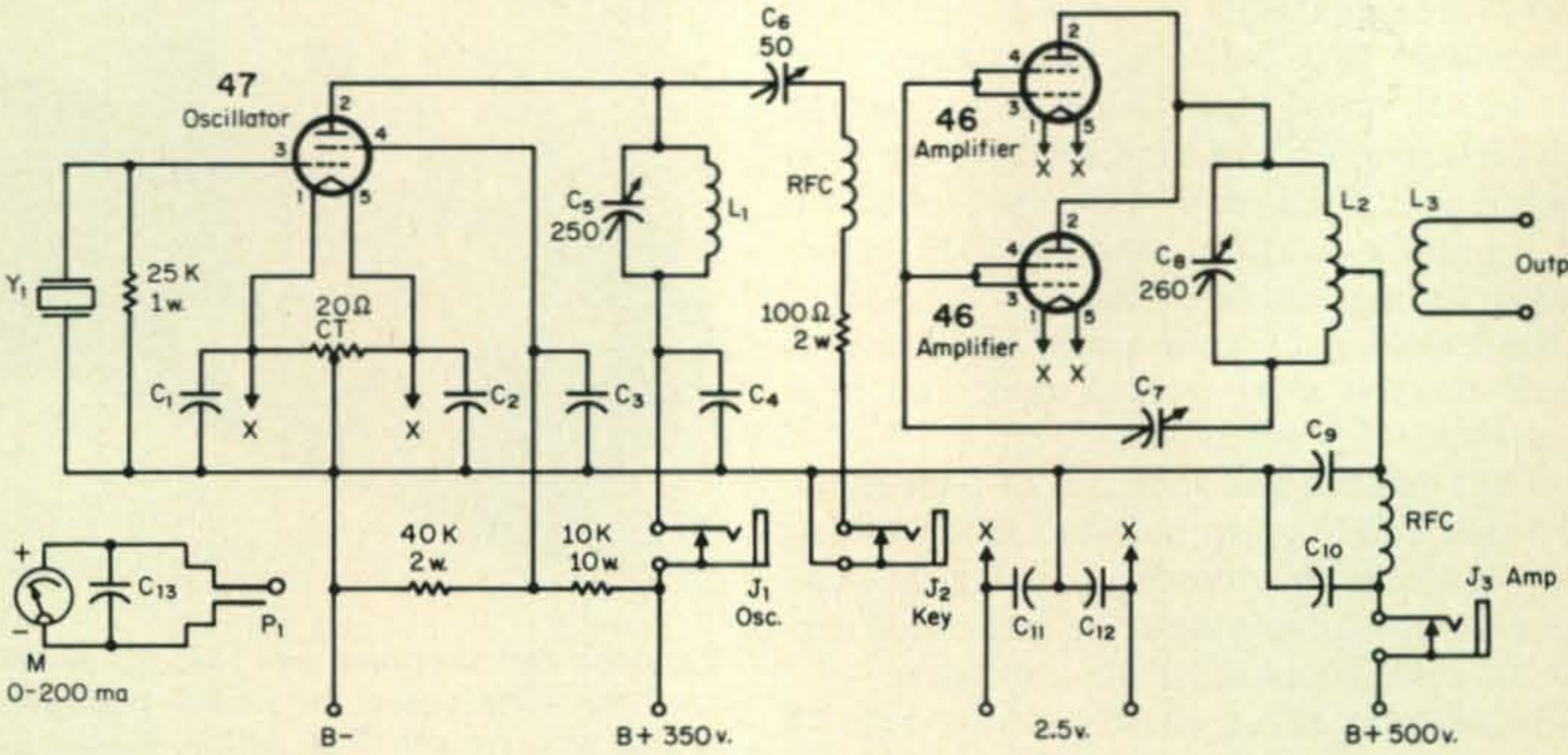


Fig. 1—Schematic of a 1934-style 50 watt transmitter for 160, 80 and 40 meters.

C_1, C_2—.001 mf, 500 volt mica (Cornell Dubilier 31-5D1).

C_3, C_4, C_9, C_{10}, C_{13}—.002 mf, 500 volt mica (Sangamo).

C_5—250 mmf variable (Cardwell).

C_6—70 mmf mica variable (Hammarlund MICS-70).

C_7—Approx. 30 mmf (Pilot J-23 with alternate plates removed).

C_8—260 mmf (Cardwell MR-260-BS).

C_{11}, C_{12}—.01 mf (Faradon).

RFC—2.5 mh, 100 ma (National R-100).

M_1—0-200 ma d.c. (Triplett 327).

Miscellaneous parts:

5-prong bakelite socket (oscillator tube). Eby 12B.

4-prong bakelite socket (oscillator coil). Eby 12A.

5-prong Isolantite sockets (three required). Hammarlund S-5.

1—plug-in coil, 4 prong 1½" dia. (one per band). Bud 125.

1—plug-in coil, 5 prong, 2¼" dia. (one per band). Bud 735.

Chassis: plywood, ⅝" thick measuring 9" × 18"

Panel: masonite, ¼" thick, 8" × 18"

NOTE: Component part numbers taken from 1935 edition of *Radio's Master Encyclopedia*, United Catalog Publishers, Inc. The tubes are available from Barry Electronics Corp., 512 Broadway, New York, N.Y. 10012

The 47 was found to serve as an excellent crystal oscillator, combining relatively high output with low crystal current. Like the 46, the 47 is no longer manufactured.

The 46 and 47 tubes make an ideal combination for today's amateur who is interested in recreating a workable breadboard transmitter in the grand, 1934 style. The 50 watt transmitter described in this article is an accurate replica of a typical 1934 design and may be easily duplicated. It is inexpensive to build and foolproof in operation. In spite of the old-style construction and lack of shielding and modern components, the transmitter is relatively free of TVI producing harmonics and may be operated in a TV fringe area with no problems.

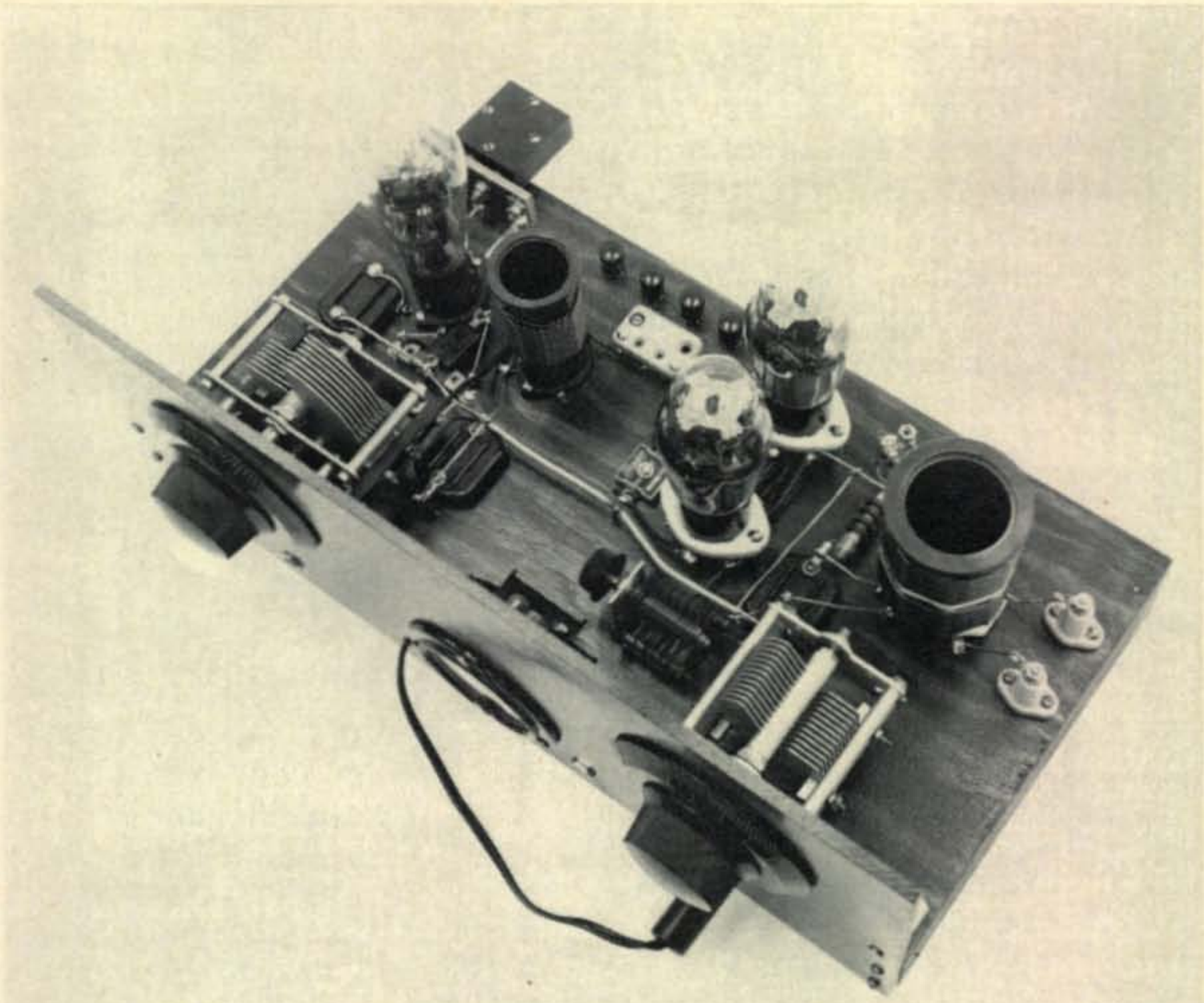
The transmitter will provide you with lots of building fun, and plenty of scrounging around for old-time components. Under stress, of co.-se, you are permitted to substitute new comp.-nents for the oldies, but that spoils half the fun!

Transmitter Circuitry

The circuit of the old-time transmitter is shown in fig. 1. It comprises a 47 fundamental crystal oscillator capacitively coupled to two 46's parallel connected as a neutralized amplifier. With 500 volts on the amplifier, a power input of about 50 to 60 watts can be run on the 160, 80 and 40 meter c.w. bands. Fundamental frequency crystals are used.

The transmitter is keyed in the grid circuit of the final amplifier and the output is inductively coupled to an external antenna tuner, or to a modern 50 ohm transmission line, as will be discussed later.

Closed circuit jacks are provided in the power leads so that oscillator plate current,



Placement of major components corresponds approximately with the circuit diagram. Crystal oscillator stage is at left and amplifier stage at right. Ground buss can be seen running along the breadboard behind the tuning capacitors. Neutralizing capacitor is supported on small metal bracket. Amplifier tube sockets are mounted on ¾-inch spacers with long wood screws. Chassis is cut out to clear panel meter at center. All power connections are made to binding posts mounted along the rear of the breadboard. The antenna connections are to the standoff insulators at the right end of the chassis.

amplifier grid current and amplifier plate current may be monitored on a 0-200 ma d.c. meter mounted on the panel of this fine equipment.

Technical Problems

To the modern amateur brought up on the TVI-proof, screened cabinet, breadboard construction may seem heresy and as formidable as metal chassis construction did to the amateur of the early thirties. Perhaps so. "Breadboard" is simplicity in itself, as layout of parts simply follows the schematic drawing. Such sophisticated ideas as short leads, lead filtering and low impedance ground returns had not yet been invented in the thirties, and thus may be conveniently ignored by the recreator of an old time transmitter.

However, pitfalls are at hand, nonetheless. The old circuits were cranky and erratic and full of parasitics and problems that the designers were not aware of. As an example, the simple circuit of fig. 1 had a nasty 80 mc parasitic in the oscillator stage until filament bypass capacitors C_1 and C_2 were added to the layout and the ground return to screen capacitor C_3 was reduced in length. (The original circuit after which this replica was modeled had no filament capacitors on the oscillator stage and boasted a rather long ground return from screen to filament at the 47 socket. Chances were that the parasitic existed in the original design—but who cared? —nobody was listening to 80 mc in those days!)

Other serious technical problems exist.

Table I — Coil Winding Data

Oscillator Coils:

160 m.: 28 t. #20 e., closewound on 1½" dia. form

80 m.: 17 t. #20 e., spaced to 1¼" on 1½" dia. form

40 m.: 10 t. #20 e., spaced to 1¼" on 1½" dia. form

Amplifier Coils:

160 m.: 34 t. #16 e., center tapped, with ⅜" space at center for link coil. 3" long on 2¼" form. Link winding is 9 t. #22 d.c.c.

80 m.: 18 t. #16 e., center tapped, with ⅜" space at center for link coil. 3" long on 2¼" form. Link winding is 5 t. #22 d.c.c.

40 m.: 12 t. #18 e., center tapped, on 1½" form, with ⅜" space at center for link coil. 2½" long. Link winding is 3 t. #22 d.c.c.

Where can one obtain a breadboard? Impossible. Plywood will have to do. Should it be stained or painted? Or merely left unpainted? Grabbing the bull by the horns, the author decided to paint his breadboard. Walnut stain, wiped off with a cloth in a few minutes after application gave the board a deep, warm color which was enhanced by an overcoat of semi-gloss, transparent vinyl shellac.

The front panel was cut from a section of ¼-inch masonite and spray painted to resemble bakelite. Panel, breadboard and end pieces are glued and held in position with unplated brass screws.

Parts Layout

Parts are conveniently laid out on the ample breadboard, and tastefully arranged somewhat in the manner shown. The oscillator stage is at the left (when viewed from the front) with the amplifier stage at the right. A ground buss wire runs from one end of the assembly to the other and all ground returns go to this buss. Parts are mounted firmly in place with brass wood screws.

The builder must strictly observe convention and not mix 1971-style components with real-life antique parts as he goes along, or he'll shatter the illusion of antiquity. Here is where the fun comes in. Junk boxes, surplus radio stores and old time amateurs may permit you to scrounge the necessary parts, listed under fig. 1. Care spent in selecting the authentic components insures that the transmitter looks authentic, even to the most jaundiced eye of the purist. In this transmitter, for example, the oscillator socket is an Eby and the ceramic sockets are Hammarlund, units of the highest pedigree. Tuning capacitors are by Cardwell and the neutralizing capacitor is a genuine Pilot midget, carefully double spaced. Fixed capacitors are Sangamo, Faradon or Dubilier.

Coils are wound on Bud, EBY or ICA forms and the dials are genuine National. The meter is a Triplett (bought by the author while in high school, many eons ago) and the r.f. chokes are early National R-100's, wound with green silk covered wire.

It would be fatal from the standpoint of authenticity to use the World War II surplus type FT-243 crystals, so a round-up of prewar Bliley crystals was made from other amateurs. In the batch, a few beautiful old crystal holders, complete with brass plates and banana plugs were unearthed. One of these beauties is shown in the top view photographs.

Transmitter Assembly

Let's go! Once breadboard and panel are painted and the chassis assembled, wiring goes rapidly. Filament and d.c. wiring are done with insulated wire and r.f. connections made with #14 tinned wire. Good old cloth covered wire is hard to find these days, so you'll probably have to cheat and use plastic coated wire. Most parts are atop the breadboard and connections to the power supply are made via binding posts along the rear of the board. The board and chassis are cut out to accept the panel meter. Everything goes together smoothly, provided you remember that all ground returns go to the ground buss, and don't omit a few ground connections, as the author did at first.

Winding the Coils ???

Sure! Even a ten year old newcomer in the Golden Years soon became adept at winding plug-in coils. A 4-prong form is used in the oscillator stage, and a giant 5-prong form is used in the amplifier stage for 80 and 160 meters. Carefully drill very small holes in the wall of the form at the points the windings pass through the wall. Cut the approximate length of wire (allowing a foot or so extra) and place one end in a vise. Clean the free end of the wire, pass it through an end hole in the form and into the appropriate pin, soldering it in place. Now, grasping the form firmly, carefully start winding the coil, keeping the wire under tension. Walk towards the vise as you wind. When you have the required number of turns on the coil, estimate the additional length needed to pass into the pin. Cut and clean the wire, soldering the end in the pin as previously done.

The amplifier coil is made as two separate windings, spliced at the center point, with only one lead passing down into the center coil pin. The link coil, L_3, is wound last between the two segments of the amplifier coil. Insulated wire is used here, as the winding of coil L_2 is at plate potential.

When you have completed the coils, daub the winding ends with colorless nail polish to hold the turns in position.

Ready to go? First of all, resonate the oscillator and amplifier tuned circuits to frequency with the aid of a grid-dip oscillator. Plug the

meter into jack J_1. Apply filament voltage and +350 volts to the oscillator stage. Tune around with capacitor C_5 and you should hear the oscillator in a monitor receiver. The oscillator stage draws about 50 ma when not oscillating, dropping to about 35 ma or so when active. Now, plug the meter into J_2 and monitor amplifier grid current. You should read from 30 ma to 50 ma, depending upon oscillator tuning. Adjust coupling capacitor C_6 for maximum grid drive consistent with reliable oscillator operation. Too much capacity at this point will load the oscillator so that it will not start readily.

The next step is to neutralize the amplifier stage. This is done with no plate voltage on the 46's. The B-plus lead to the amplifier, moreover, must be disconnected, or a faulty indication of neutralization may result.

Connect a 12 volt flashlight bulb to the antenna terminals and apply drive power to the amplifier. When capacitor C_8 is tuned to resonance, the bulb will light. Adjust neutralizing capacitor C_7 until the bulb goes out! Presto! You are neutralized.

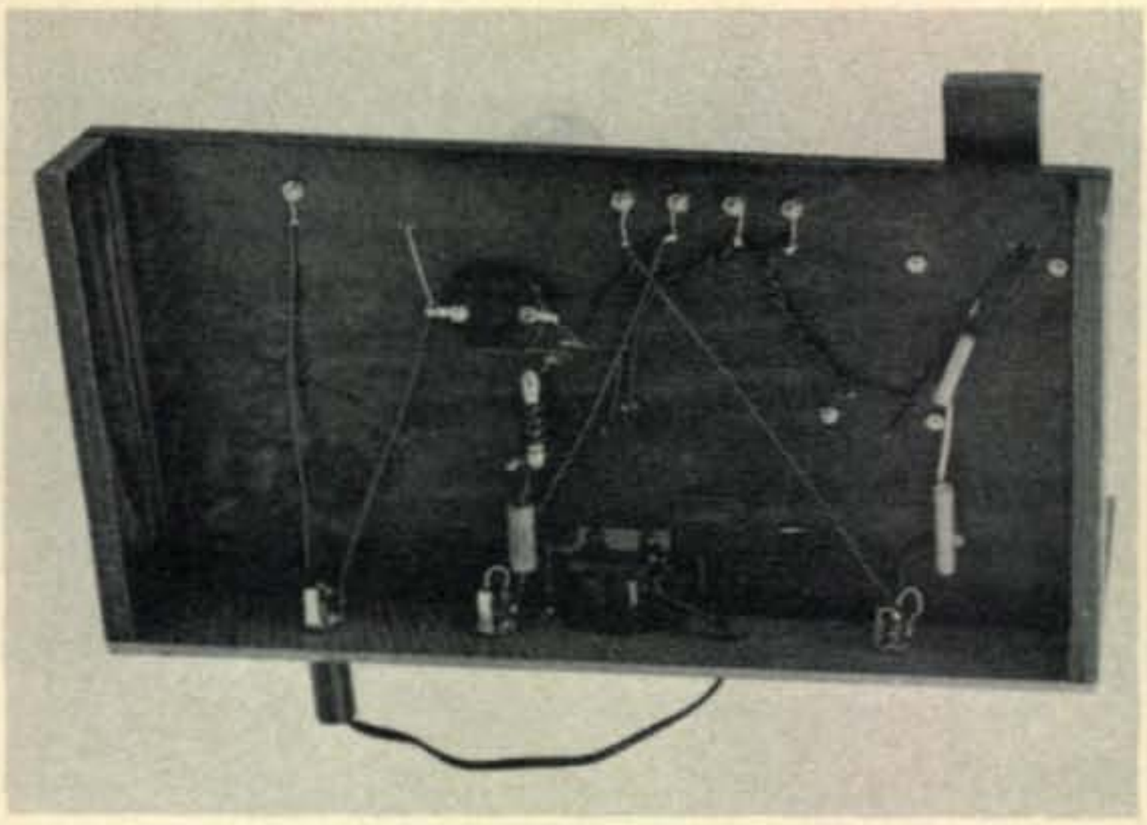
On the Air!

The Moment of Truth is at hand. The transmitter is ready to go on the air, or on to a dummy load. The output coupling circuit is designed to work into a 50 ohm load or low impedance antenna. Coupling is over-critical, and a variable capacitor of about 500 mmf should be placed in series with one leg of the antenna circuit to vary the amount of coupling. A two section, 365 mmf broadcast capacitor, with sections strapped in parallel will do the job. About 300 mmf is required for 80 meters; twice that for 160 meters, and half that for 40 meters. Set the auxiliary loading capacitor, apply plate voltage and excitation and resonate the final amplifier, aiming for a maximum loaded plate current at resonance of about 100 ma with grid current of about 25 to 35 ma.

The transmitter is keyed by breaking the grid return circuit at J_2. In congested areas, a bit of keying filter may be needed to reduce key clicks.

Final Notes

Remember that panel jacks J_1 and J_2 are in the B-plus leads and are exposed. Keep your hands clear of them as they are shock hazards. A wise idea is to recess the jacks behind the panel so that they cannot be touched. But who did that in 1934?



Simplicity rules under the breadboard chassis. Only a few resistors and capacitors take up under-chassis space. Wiring is point-to-point. Capacitor at center of chassis is C_{10}.

Finally, it should be noted that the 46 tube should be limited to 50 or 60 ma of plate current and not more than 20 ma of grid current, otherwise it may exhibit the interesting phenomena of "run-away." This manifests itself by steadily increasing plate current, until the tube overheats and destroys itself. Holding the plate current to a reasonable amount deters this destructive action.

Television Interference?

What about the wrap-around TVI cabinet? Obviously, the breadboard rig is completely open, from a TVI point of view? Will it wipe out TV receivers for miles around?

The answer to this pregnant question is that this transmitter is as clean as most modern equipment. This is partly because the transmitter works on fundamental frequency crystals and no doubler stages are used. In addition, the tank circuits are high-C which aid in reducing harmonics and the amplifier stage is run closer to class B than to class C. All of these contribute to a rather low level of harmonics and—even when used with no external filter in the antenna line—no apparent TVI results on the home receiver.

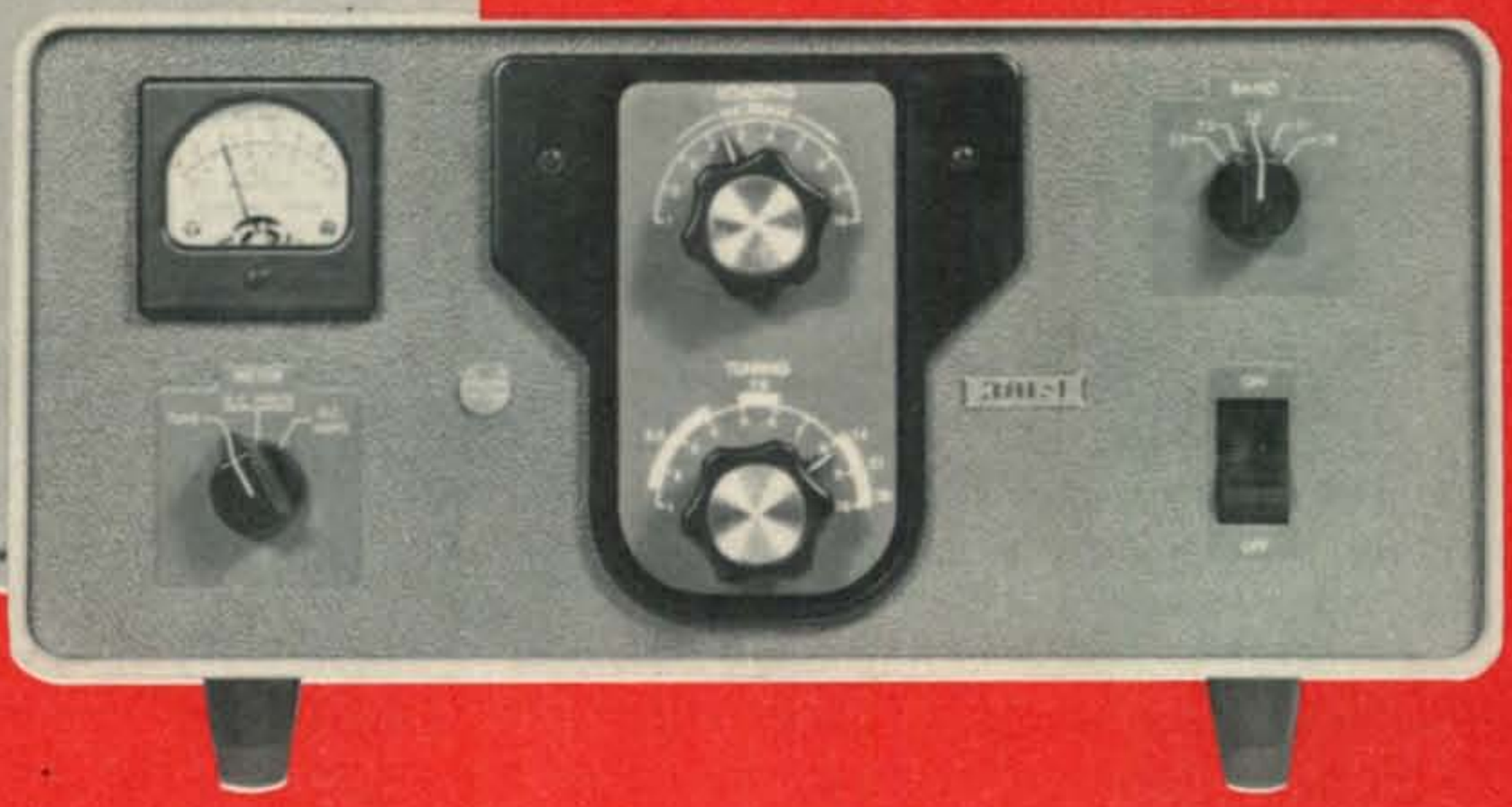
Of course, no blanket guarantee of TVI-proof operation can be given, but extended operation of the little breadboard transmitter has caused no difficulties to date, even in a semi-fringe area of TV reception.

* * * * *

So now you have a genuine replica of an old timer's 1934-style c.w. transmitter! Armed with your trusty National SW-3 receiver

[*Continued on page 94*]

sound investments



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Both these great PA's feature highest quality workmanship, appearance and performance. Proven circuitry design and quality construction techniques can mean years of trouble-free operation.

The 30L-1 provides 1000 watts PEP on SSB and 1000 watts average on CW. The 30S-1 provides full legal power input for SSB, CW, RTTY, slow-scan TV, and data.

Either unit can be driven by Collins 32S-3 transmitter, the KWM-2 transceiver, or most 70-100 watt exciters.

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COLLINS

A Simple IC F.M. Detector

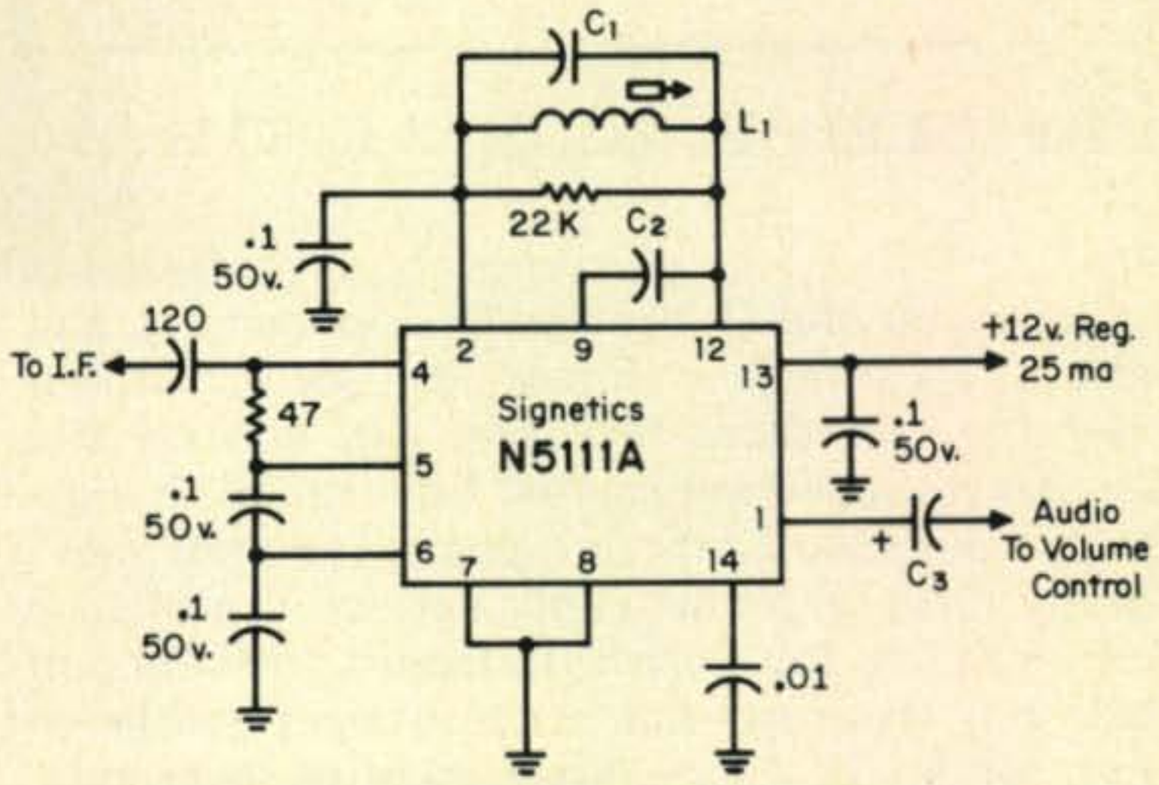
BY IRWIN MATH,* WA2NDM

AFTER converting a couple of two meter a.m. transceivers to f.m.,[1] I found that the digital detector I had been using had a few drawbacks. Audio output was low, and the quality was not what one would expect although it was certainly usable.

A search through the literature turned up an inexpensive integrated circuit manufactured by the Signetics Corporation that was designed specifically for f.m. detector service. The results of using this "chip" were so satisfying that the digital circuitry was thrown out and the new detector immediately installed.

The Signetics N5111A is a 14 pin dual-inline integrated circuit containing a three stage limited and balanced product detector connected internally for f.m. detection. Detection is accomplished by mixing the limited f.m. signal with a phase shifted signal derived from the input. Figure 1 is a diagram showing the method of connecting the circuit to an a.m. receiver.

The actual circuit of an f.m. detector is shown in fig. 2. Component values for different i.f. frequencies are also given. All inductors are standard commercial types such as the J. W. Miller Co. 44000 series. All capacitors other than the tuning capacitor, C_1, are disc ceramic types. The leads from pins 5, 6, and 12 should be as short as possible and the input to pin 4 should be as far away as possible and the input to pin 4 should be as far away as possible from pins 9, 10, or



IF	C_1 (mmf)	C_2 (mmf)	L_1 (μh)
10.7 mc	120	4.7	1.5-3
4.5 mc	120	3.0	7-14
2 mc	300	3.0	16-30
455 kc	650	3.0	135-240

Fig. 2—Circuit of the simple f.m. detector using a Signetics N5111A integrated circuit for application in existing a.m. receivers. For transistorized circuits C_3 should be 10 mf 25 v.; for vacuum tube receivers, use 0.1 mf 200 v.

12. The .1 mf bypass capacitor at pin 13 should be as close to the actual pin as possible.

After construction, check all wiring and

[*continued on page 98*]

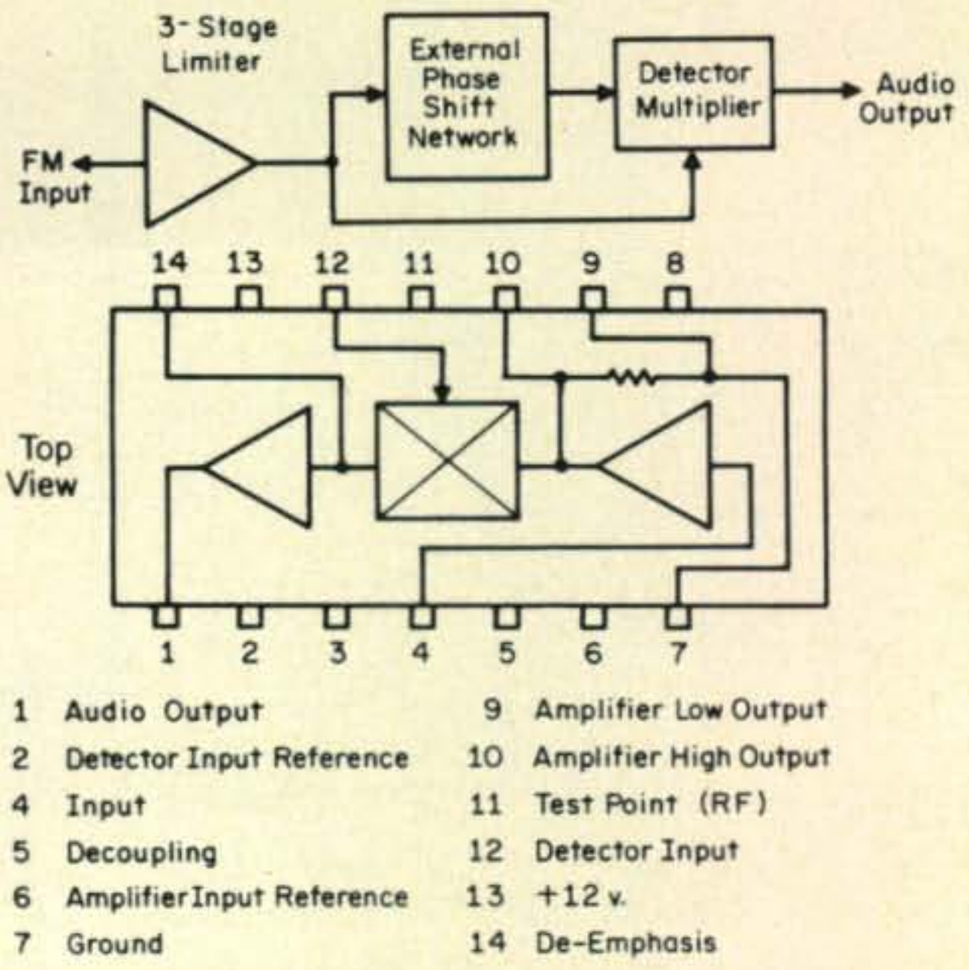


Fig. 3—(A) Block diagram of f.m. detector. (B) Internal connections of Signetics N5111A integrated circuit.

[1]Math, I., "2-Meter F.M. Simply and Economically," *CQ*, Oct. 1971, p. 43.

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

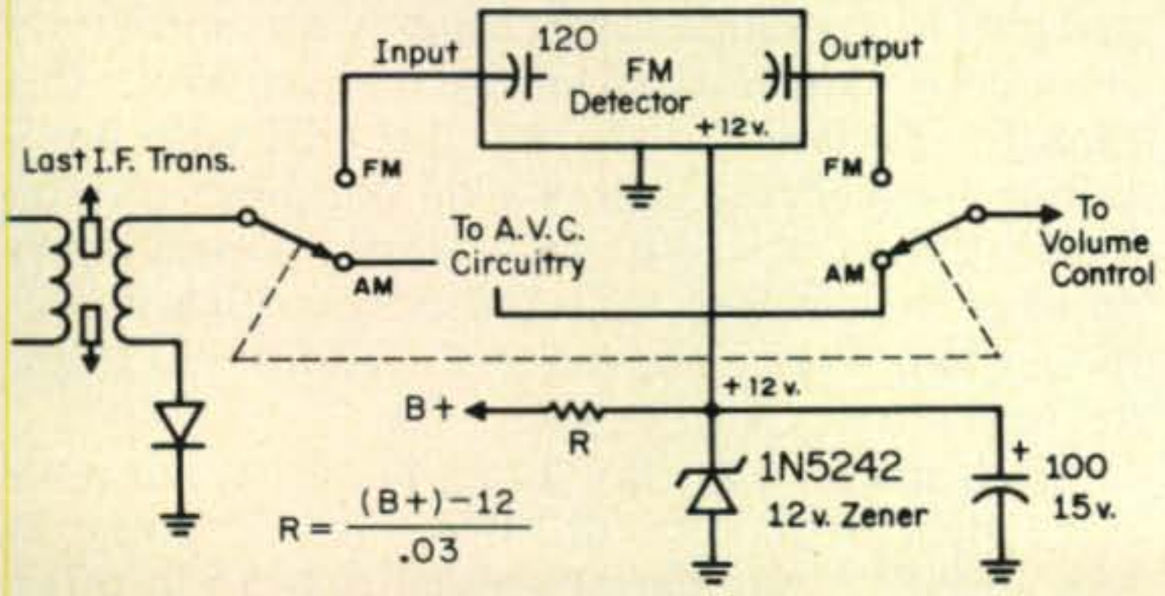


Fig. 1—Method of connecting the simple IC f.m. detector to an a.m. receiver.

F. M.

BY GLEN E. ZOOK, *K9STH / 5

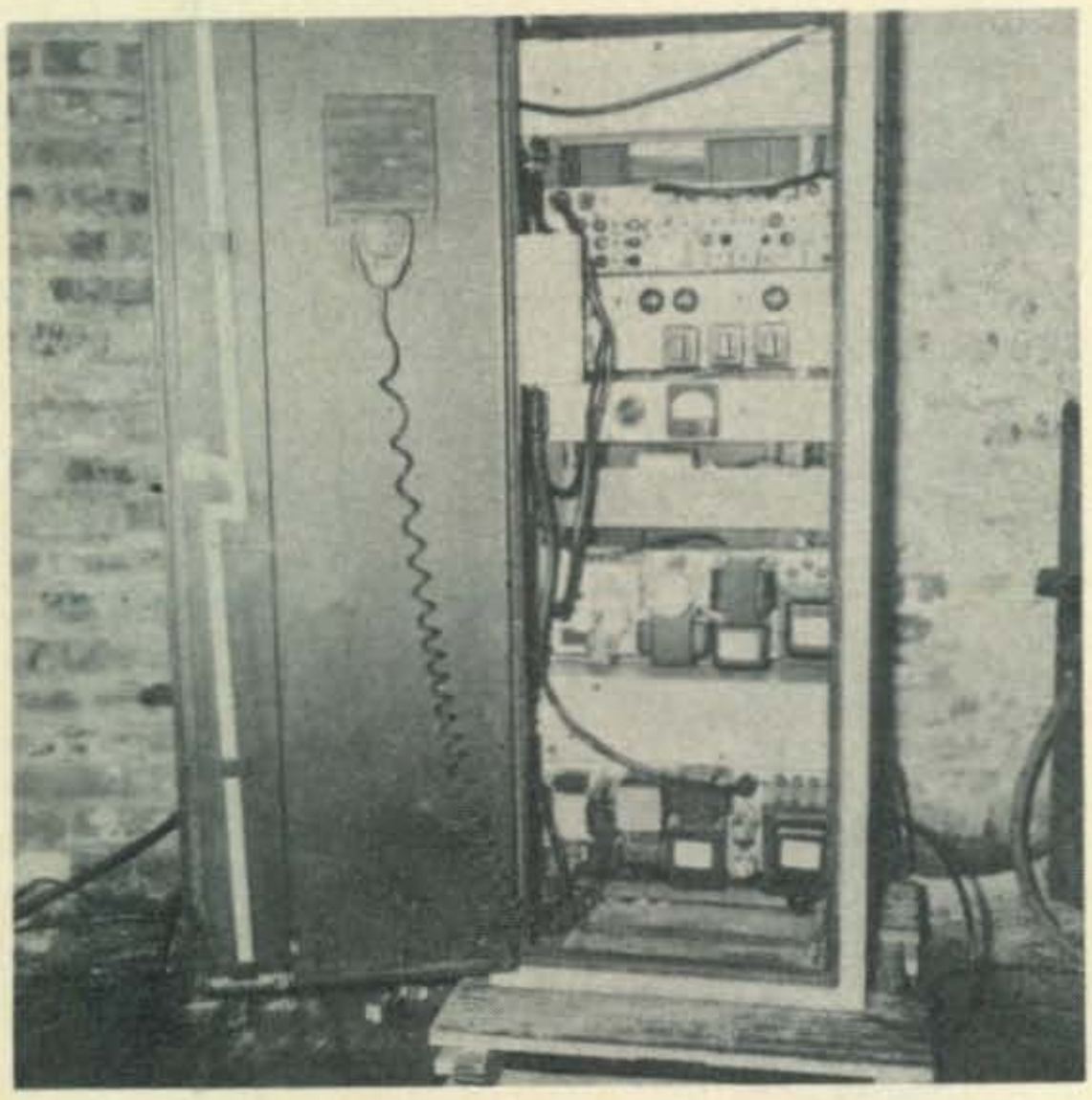
THANKSGIVING Day is rapidly approaching, and after it, Christmas. I can just see Christmas morning. All those new f.m. rigs hooked into the nearest coathanger. Just listen to all that activity on the local repeater, just pure chaos. Why? Many amateurs who either receive a new ham only f.m. rig for Christmas from a loved-one or who buy their own Christmas present will be on f.m. for the first time. Since most of these amateurs will not be familiar with f.m. procedures, they will make many mistakes.

There is a solution to this problem of the uninformed newcomer. The solution has several facets, but, with a little cooperation, chaos can be avoided. The primary responsibility for giving the new f.m. amateur started on the right foot is the retailer (or wholesaler as the case may be) who sells the unit to the amateur. Unfortunately some outlets know nothing about f.m. activity. Thus, all the new amateur is told is how to turn the rig on and that on Channel 1 he can use the local repeater, on Channel 2 he can work some more stations, and Channel 3 is no good in the area. It's no wonder that many new f.m. operators don't even know what frequencies they are transmitting and receiving on. When a rig is purchased, often an antenna and everything else needed for a base and mobile station are purchased at the same time. Since the f.m. unit is ready to go, the newcomer is often on the air before he has left the store, let alone before he has had time to read the instruction manual.

The responsibility of learning about local f.m. practices and frequencies rest heavily with the owner or manager of the retail outlet. He in turn should make sure that every person employed knows about f.m. and passes it along to the buyer. The local repeater group or f.m. club can help out also. A single page handout giving local calling procedures, frequencies for repeaters and simplex activity, a brief description of national activity, whom to contact for more information, and an invitation to join the local group. The importers or manufacturers can help by insisting that the retail outlets know about f.m. The new editions of instruction manuals give an excellent picture of f.m. activity as a whole, but the buyer needs a little local and personal information which can be supplied by the retail outlet.

Why put the responsibility on the retailer? Well, he is the first contact the newcomer has with f.m. Also, the new ham only f.m. units have been the savior of many outlets catering to the amateur trade. When other sales have dropped off, the f.m. unit boom has helped keep sales up. Therefore, the retailer should accept the responsibility placed on him by the increased sales. Many of these outlets used to tell the new low-band amateur about operating, so there is really nothing new about passing on information. Many outlets now selling to the f.m. operator are doing their part. It's time for all outlets to do their part. How about it?

*818 Brentwood Lane, Richardson, Texas 75080



The La Porte, Indiana, 146.22/146.82 mc machine is built from Motorola "A" strips along the lines described in earlier columns. Coverage is about 40 mile radius.

Technical Talk

Many letters have been received requesting information as to the method of using the present station equipment to make checks, and how to operate it properly. Many amateurs are interested in simple add-on gadgets to either improve operation or to modify operation to suit a particular need or preference. In terms of add-on gadgets or modifications requests for additional frequency capabilities run the highest. Well, this month's Technical Talk will not deal with additional frequencies, but watch out next month. Sentry has a series of transistorized oscillators which, when mated with the proper high stability crystal, seem to be made for additional channel operation.

Well, since we are not going to talk about multi-frequencies this month, what are we going to talk about? A number of amateurs seem to think that too much emphasis has been given to items of use on 2 meters, and not enough attention

paid to items which could be used on 10 or even 6 meters. The most asked for item along those lines has been a method of using some of the older 80-10 meter a.m. equipment on 29.600 mc. f.m. The first to ask was W6ZI, who was having trouble making the f.m. circuits in the various handbooks and publications work right with his a.m. equipment. Since then a number of others have asked for the same information. Although a rig originally designed for f.m. work is the best way to go, there is still those who like to build.

True f.m. is difficult to tame. That is why most commercial and amateur f.m. manufacturers use phase modulation. A phase modulator assembly can be inserted between the crystal oscillator or v.f.o. (or buffer stage if desired) with little effect on the c.w. or a.m. operation of the transmitter. By turning the deviation control all the way down, the phase modulator circuits act as a buffer stage. When the control is turned up, and microphone audio applied, an f.m. signal is available.

The circuit for the phase modulator is lifted from tube-type lowband Motorola f.m. equipment. Since most of the older a.m. equipment uses tubes, this is no handicap. The circuit was tried by W6ZI in a B&W 5100 with very good results. The circuit utilizes the lower audio stages in the transmitter. However, any good microphone preamp circuit can be added at the point indicated. Since different transmitters use various frequencies from the v.o.f., the output circuit values have not been set. These can be determined either with a grid-dip oscillator or by looking in the *ARRL Handbook* for circuits in the right range for your v.f.o.

Since the input v.f.o. frequency determines how many times the signal must be multiplied to hit 29.6 mc, the setting of the deviation control will vary from transmitter to transmitter. The lower the input frequency, the lower the deviation control will have to be set for the desired frequency "swing." Since a 160 meter v.f.o. has to be multiplied 16 times to hit 29.6 mc a little deviation at the input frequency will mean a lot of deviation at the carrier frequency (± 1 kc at 160 will be ± 16 kc at 10 meters). In contrast, a 40 meter v.f.o. is multiplied only 4 times to hit 10 meters, so more deviation at the input frequency will be required (± 4 kc at 40 meters will be ± 16 kc at 10 meters).

Because of the various input frequency possibilities two capacitors besides the output tank may have to be varied. These are indicated on the schematic. The input capacitor will probably have to be increased if a low frequency v.f.o. is used, and the capacitor from the plate of the 1st section of the 12AT7 will have to be varied for symmetrical audio. Don't be alarmed if the audio is not perfectly symmetrical. The human male voice, for some reason, is not symmetrical.

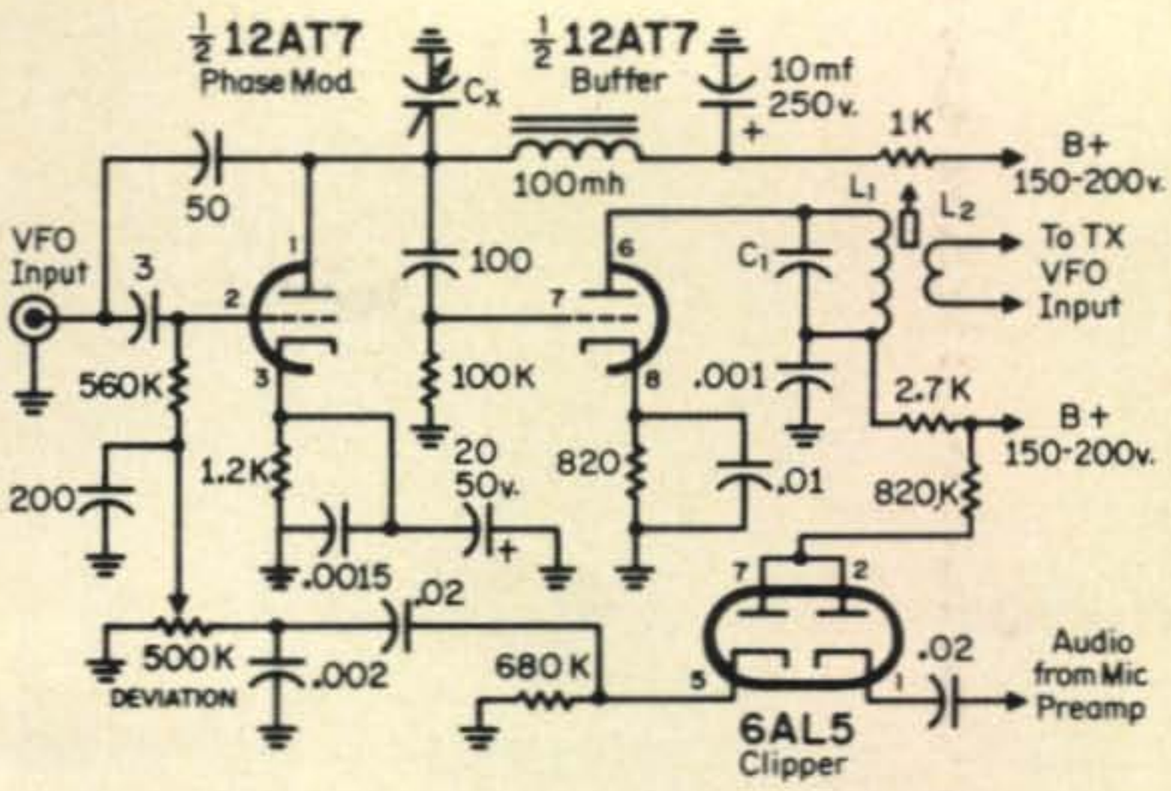


Fig. 1—A phase modulation adapter for v.f.o.'s.
C_x—May be 100 mmf variable. Adjust for symmetrical audio.
L_1, C_1—Resonate at v.f.o. output or twice v.f.o. output frequency.
L_2—Matching to transmitter v.f.o.

Note: Input may be crystal oscillator instead of v.f.o. Also 3 mmf input coupling capacitor may have to be altered depending on v.f.o. frequency.

The lower side will deviate usually about 80-90% as much as the positive side.

Installation consists of inserting the unit between the v.f.o. output and the 1st multiplier stage. The existing microphone preamp circuit can be either permanently disconnected from the a.m. modulator, or passed through a switch which can select either the plate modulator or the phase modulator. The unit should be operated with the transmitter in the c.w. position. A modification may have to be made to the mode switch to apply B+ to the audio preamp in some transmitters. The deviation control should be advanced until the proper amount of deviation exists. Then the variable capacitor C_x should be varied while watching the output of a good f.m. receiver on a scope. An alternate would be to listen to both sides using slope detection, but the scope method is much better.

The phase modulator is not confined to the older 80-10 meter rigs. It can be used with 6 and 2 meter transmitters. The deviation control settings will be at the low end of the control (especially when working with narrowband systems). Again let it be emphasized that the phase modulator will not do the job a good transmitter designed for f.m. will do. However, it is a good way for the low band operator to get his feet wet with gear that would either be gathering dust or be used on a.m. in the 11 meter band if sold. This circuit is for the experimenter.

Correction

VE6TW was the only person to catch an error in the values of the 20 db pad in the July col-

The antenna installation of the La Porte, Indiana, 146.22/146.82 mc repeater is a 90' telephone pole with pipe extension. The physical location is the old State Highway Barns, now part of Concord Corporation.

umn. They should be 40.9 ohms for the two series resistors, and 10.1 ohms for the resistor going to ground. This would mean 43 ohms and 10 ohms for 5% stock resistors. I don't know how the error crept in, but my calculations using textbook formulae agree with VE6TW.

News

K9LHC, who, by the time this is published, is a newly wed, took time off from courting to take photos of the La Porte, Indiana, 146.220 input 146.820 output repeater. If Jim could take a few minutes for photos, then you old married men can too. How about showing the world what *your* repeater looks like?

The Edmonton, Alberta, Canada, repeater is on 146.46 mc input and 147.00 mc output rather than 146.33 mc input as previously reported. Correct that other magazine's April directory also. The sources reporting this one were wrong.

Docket 18803 should have been finalized by this printing. Rumors have been flying both good and bad. When the docket is released it will be printed in its entirety in the first available issue of *CQ*. No matter what the outcome of 18803, the amateur f.m. world did a fine job of representing itself before the FCC.

On the matter of dockets: The EIA 220 mc proposal is rumored to be stagnated. Of course things could change by publication time. However, this is a good time to get amateur activity going on the 220 mc band. *73 Magazine* had a 220 mc plan once. I will take a close look at it and make some suggestions as to a workable plan for amateur 220 mc f.m. activity next month. W2JTP has some articles in recent issues of *CQ* on converting high band gear to 220 mc. Also, this columnist is working on some different pieces of equipment for 220 mc conversion. With commercial interests pushing for 220 mc we need activity up there to keep the band.

Speaking of commercial interests, we need more activity on six and ten meters. Two meters is full in many areas, and six and ten meter gear is available at reasonable (read "cheap") cost because of low demand. TVI is a problem in channel 2 fringe areas, but that can be licked. Besides, not all of us live in a channel 2 area.

The Summer meeting of the Texas VHF FM Society was hosted at the Cibola Inn, Arlington, Texas, on 14 and 15 August by the North Texas Repeater Association. Several door prizes were given away, and a Motorola HT-200 on .34 and .94 was raffled (eat your hearts out). More on this meeting next month.

K4HTY has come up with an excellent suggestion for the travelling f.m'er. By drawing a 50 mile radius circle around each town with a repeater (on a road map, of course) and by color coding for input/output frequencies, one can easily see about where the repeater can be hit and heard. The color coding helps show the frequency pair without a lot of reading or taking eyes from the road.

The summer months (this was written in late summer) were slack in news items. Most f.m'ers were on the move or building equipment. The fall months should bring more news and items of interest to you, the f.m. operator. While you're at it, take some photographs of the local repeater and installation.

Tips and Tidbits

Most questions received for the past few months have been too long or complicated for publication. Therefore, the Q & A section this month will be replaced by some tips and tidbits of f.m. information.

Tip: When substituting new versions of old final amplifier tubes be careful. The 6146 can be replaced with the 6146A and 8298. The 6883 can be replaced by the 6883A, and the 8032. The 6146B (a slightly higher powered version of the 6146) which is also cross-branded the 8298A and the 6883B which is also called the 8032A and 8552 should not be used in equipment originally designed for the 6146 or 6883. The operating voltages must be changed to keep down parasitics and to prevent overheating of the tubes. This is especially true in the A through D versions of the Motorola Motrac equipment.

Tidbit: One doesn't have to be crazy to be in amateur f.m. or in Commercial f.m. or in writing game. However, when one is in all three . . .

Tip: A new fiscal year is either beginning or near the beginning for many companies. This often means new radio equipment with the older units either traded-in or sold. This is especially true of utility companies.

[*Continued on page 100*]

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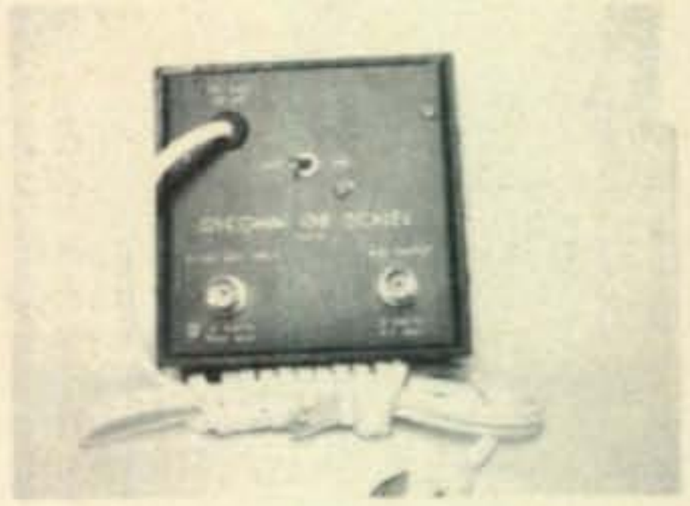

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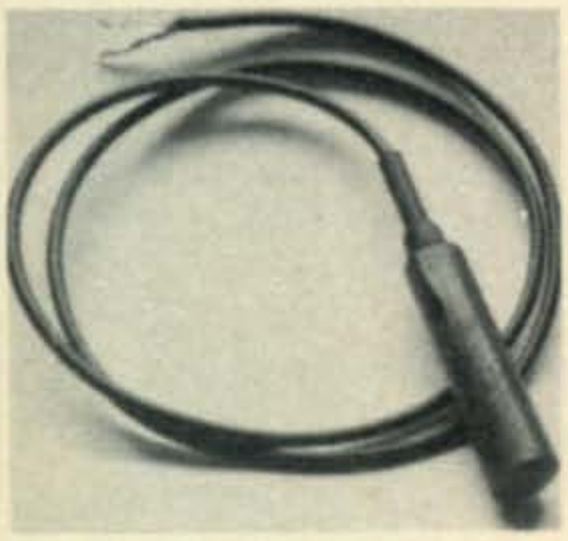

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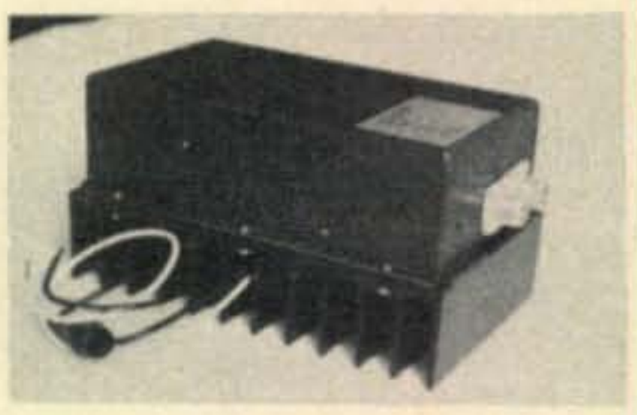

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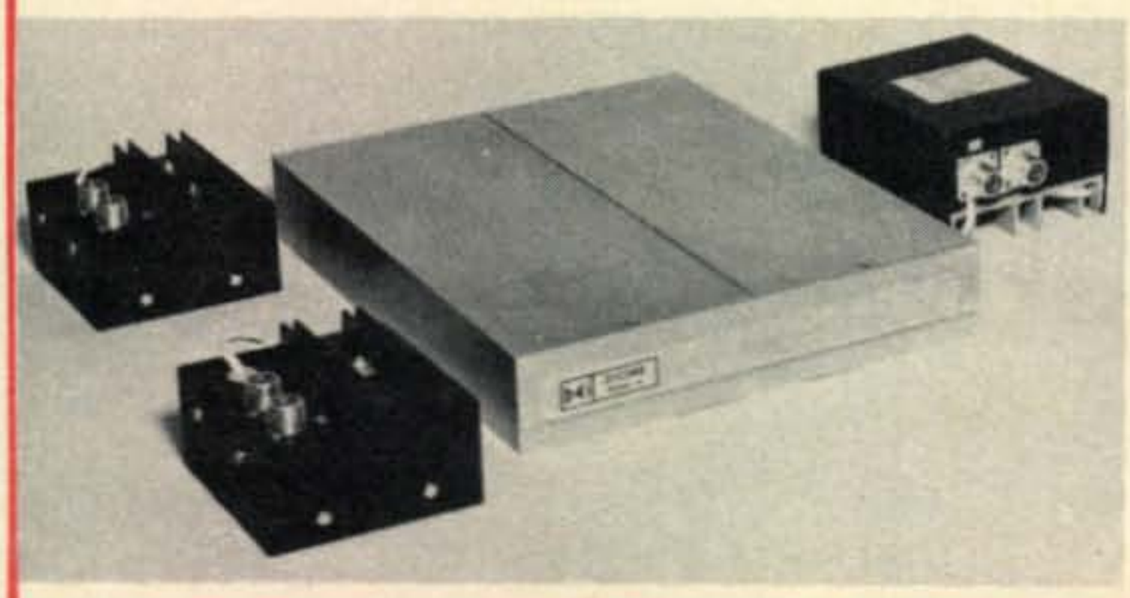

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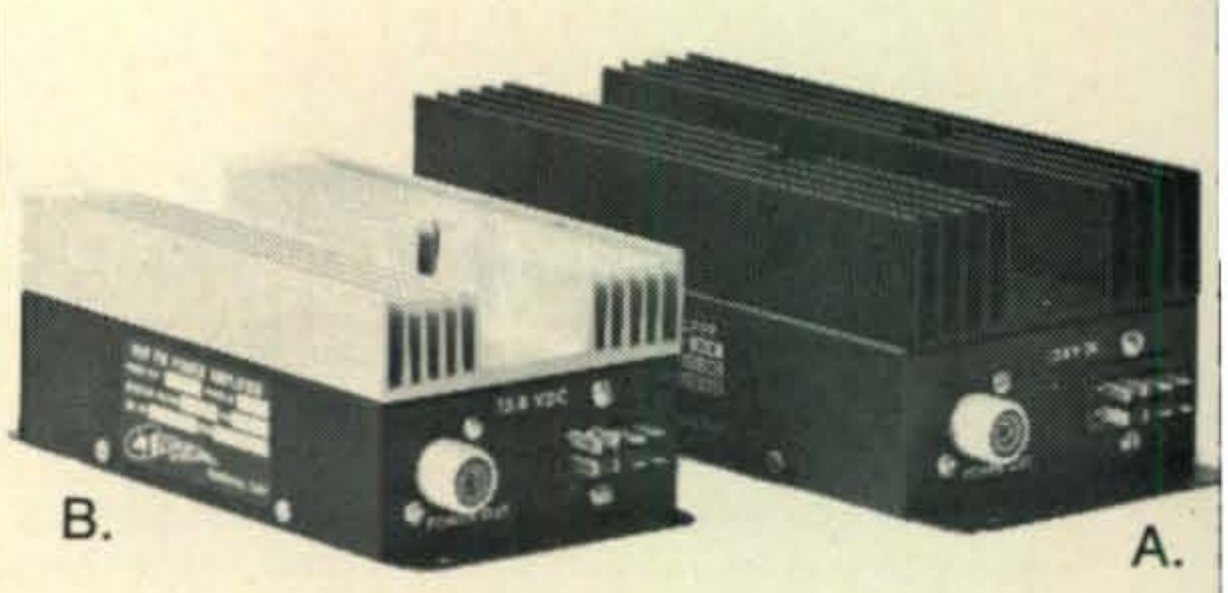

B. A.

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CT602-2	5-10 W	60 W	2 M
CT606-B2	1 W	60 W	2 M
CT452-2	5-10 W	45 W	2 M
CT452-B2	1 W	45 W	2 M

MODEL NUMBER	POWER INPUT	POWER OUTPUT min.	BAND
CT252-A2	1 W	25 W	2 M
CT352-2	8 W	30 W	2 M
CT220-40	4 W	40 W	220 MHz
CT220-80	4 W	80 W	220 MHz
CT445-1	100 mw to 300 mw	1 W	440 MHz
CT445-5	200 mw to 1 W	5 W	440 MHz
CT445-15	1 to 5 W	15 W	440 MHz
CT445-30	1 to 10 W	30 W	440 MHz
CT445-50	1 to 10 W	60 W	440 MHz

Tempo CT equipment may be obtained from select dealers throughout the U.S. or from:

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11240 W. Olympic Blvd., Los Angeles, Calif. 90064 213/477-6701
931 N. Euclid, Anaheim, Calif. 92801 714/772-9200
Butler, Missouri 64730 816/679-3127

An Audio Tape-Controlled CW Keyer

BY ALAN DAY,* DJØVB, EX-K8ITH

DURING a recent c.w. contest, the author fell to contemplating the considerable amount of energy expended, in the course of the weekend, in hammering out "CQ TEST." How nice it would be to have a machine that would do the job. But, alas, the few commercial items available were expensive, and required custom-made punched tapes for each text desired. Then a glance at the little cassette tape recorder gave rise to an idea, and a few hours of fumbling with the contents of the spare parts box produced the gadget to be described here.

Briefly, this device will enable you to use a common tape recorder (preferably of the cassette variety) to key your c.w. transmitter. Whatever you want sent automatically, you first put on tape by means of any tone generator (code practice oscillator, buzzer, etc.). Then you connect the recorder to the keyer, on the face of which is a button, which you push, thereby causing the recorder to play your recorded code into the keyer, which, in turn, keys your transmitter. The transmitted signal is a virtually perfect reproduction of the recording. You can stop the automatic transmission at any point simply by tapping your hand key; the tape recorder is thereby deactivated, and from this point the transmitter can be keyed manually. Automatic operation can be resumed at any time by pressing the button on the keyer.

As an example of how this can be practically applied, the author made a tape for contests which is simply a continuous repetition of "CQ TEST DE DJØVB." This is allowed to run as many times as thought necessary, and then termiated after the callsign by sending "K" with the bug; all callers are worked, then the CQ button is pushed again. In addition, this machine is quite a time- and sanity-saver when used for directional CQ's which must be repeated many times before an answer is received. And with a little imagination, many other applications can be found, like for example, code practice, bulletin transmission and TVI tests.

*8906 Gersthofen, Theresienstr. 4a, Western Germany.

Theory of Operation

The unit requires a supply voltage of 20 to 24 volts d.c. which is provided by an 18 volt transformer and a bridge rectifier. The transistors are all BCY58's, the American equivalent to which is supposedly the 2N222. CR_1 can be almost any silicon diode. K_1 is a 24 volt reed relay with a coil resistance of about 1K; K_2 can be another of the same, unless the current to be switched in the tape recorder is so high as to require heavier contacts. Lamps I_1 and I_2 are 24 volt pilot lamps, up to 3 watts.

In the circuit, Q_6 and Q_7 comprise a static flip-flop, the two states of which determine whether the keyer is automatically or manually operated. For automatic transmission, S_2 is pressed, cutting off Q_7, thus causing Q_6 and Q_8 to conduct, lighting lamp I_1 and activating

The audio tape-controlled c.w. keyer is neatly packaged in small metal cabinet which sits atop the station speaker. To the right is the inexpensive cassette tape recorder used in conjunction with the keyer. Construction and wiring are not critical.

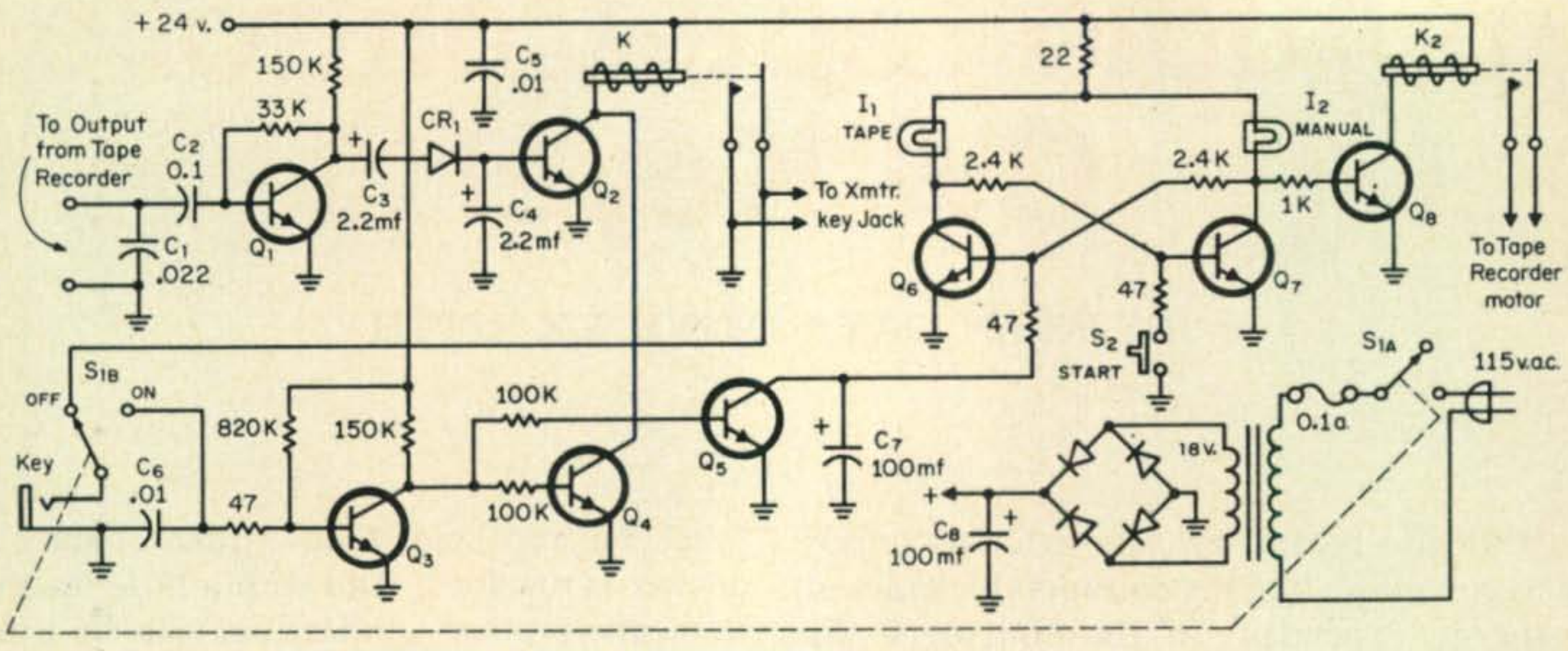

Fig. 1—Schematic of the audio tape-controlled keyer which acts as an interface between an inexpensive cassette tape recorder and the transmitter. C.w. recorded on tape is played back at the touch of a button to a transistorized keyer which keys the transmitter. A tap on the hand key stops the recorder and restores control to the hand key or electronic keyer. All transistors are 2N2222 or the European type BCY58. K_1 and K_2 are 24 v. reed relays with 1k coil resistance. I_1 and I_2 are 24 v. pilot lamps up to 3w. All resistors are ½ w.

K_2; the contacts of K_2 engage the motor of the tape recorder in use. The audio signal from the recorder then enters the circuit through C_2, and is somewhat amplified by Q_1, then eak-rectified by CR_1 and C_4; thus whenever the recorder emits a beep, a positive signal appears at the base of Q_2, causing it to conduct, activating K_1, whose contacts go to the transmitter's key jack.

When the hand key is depressed (an electronic keyer can also be used), Q_3 is cut off, causing Q_4 to conduct; Q_4, being parallel to Q_2, also activates K_1. Simultaneously, Q_5 conducts, cutting off Q_6, thereby resetting the flip-flop; Q_8 is cut off, causing K_2 to turn off the tape recorder; Q_7 conducts, and lamp I_2 is lit.

C_1, C_5 and C_6 are included solely for the purpose of keeping r.f. out of the circuit. C_7 assures that when power switch S_1 is turned on, the flip-flop is put in the manual state. S_1 is a d.p.d.t. toggle switch, one side of which connects the a.c. voltage; the other side connects the hand key straight through to the transmitter when in the OFF position.

Mechanical Construction

The circuit lends itself quite well to construction on a printed circuit board, and the device can be made much smaller than that shown in the photograph, which was built to allow for further experimentation and development. The arrangement of the components on the PC card, or whatever, isn't very critical. A metal chassis (grounded!) is strongly recommended, as otherwise a strong r.f. field can cause the keyer to send exerything except what you want it to. Care must also be taken that the tape recorder is free from r.f. interference.

External Connections

Connecting cables should be shielded. The connections themselves are simple, as indicated by the diagram. If a typical cassette recorder is used (this type is recommended because of its relatively low cost, and the fact that its motor starts and stops quickly, which is essential to effective operation of the system), the audio signal for the keyer is taken from the output which is intended to drive an external amplifier; the contacts of K_2 are connected to the points which normally go to the push-to-talk switch on the recorder's microphone; the cable from K_1's contacts is plugged into the transmitter's key jack.

Of course you can modify or simplify the keyer circuit in accordance with the characteristics of your rig; for example, in many cases it should be possible to eliminate one or both relays, and key the transmitter and/or switch the tape recorder directly through the transistors. The circuit described here represents the author's attempt to make the device compatible with as many different conceivable setups as possible. ■

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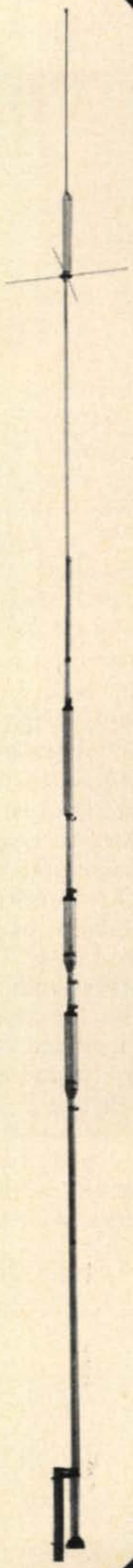

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CQ Reviews:
The Standard SR-C826M 2M Transceiver

BY GLEN E. ZOOK*, K9STH/5

ALTHOUGH the Standard SR-C826M 2 meter FM transceiver has been available since early 1971, it has recently undergone several physical and electrical revisions to improve both the serviceability and performance. Basically the SR-C826M is a solid-state, 12 channel, 10-watt-output, 2-meter f.m. transceiver designed for use by amateurs. The receiver employs dual conversion techniques and the transmitter employs the usual phase modulation. Front panel controls include channel selector, volume control, squelch control, high-low transmit power (10 watts and 0.8 watts output), and microphone connector. The rear apron has a jack for external speaker, receiver test metering, transmitter test metering, and antenna connector. The SR-C826M comes equipped with crystals for 146.94/.94 mc, 146.34/.76 mc, 146.76/.76 mc, and 146.34/.94 mc (transmit/receive). This gives both simplex and repeater capabilities on the most used 2 meter frequencies. Also included is the microphone, installation hardware, and a line filter to eliminate alternator whine.

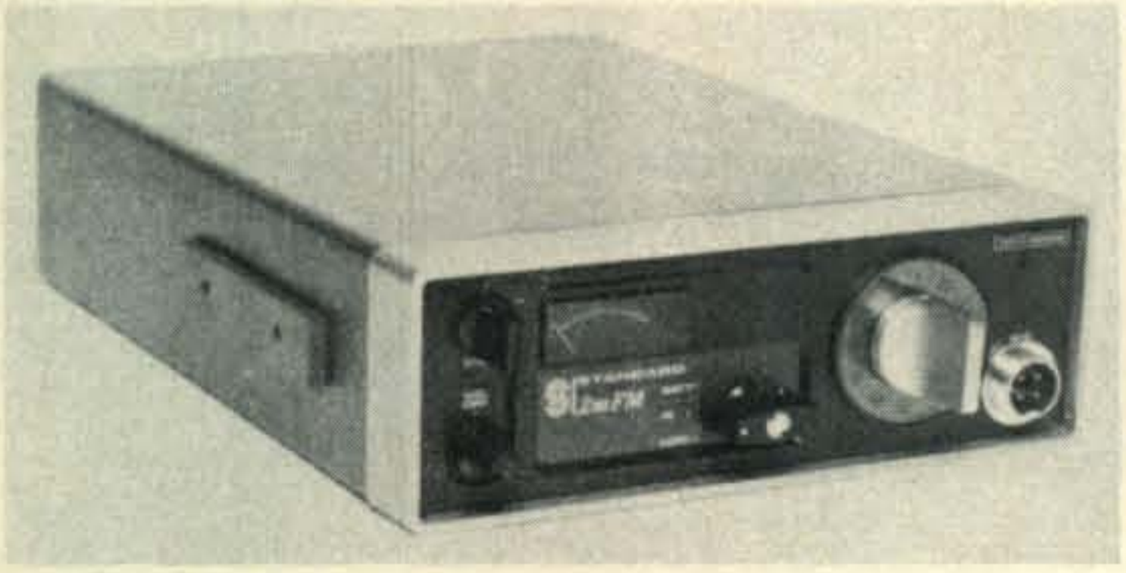
Technical Details

The unit is fully solid state. Special features include test meter jacks, relative output and received signal strength meter, external speaker jack, and removable power cable.

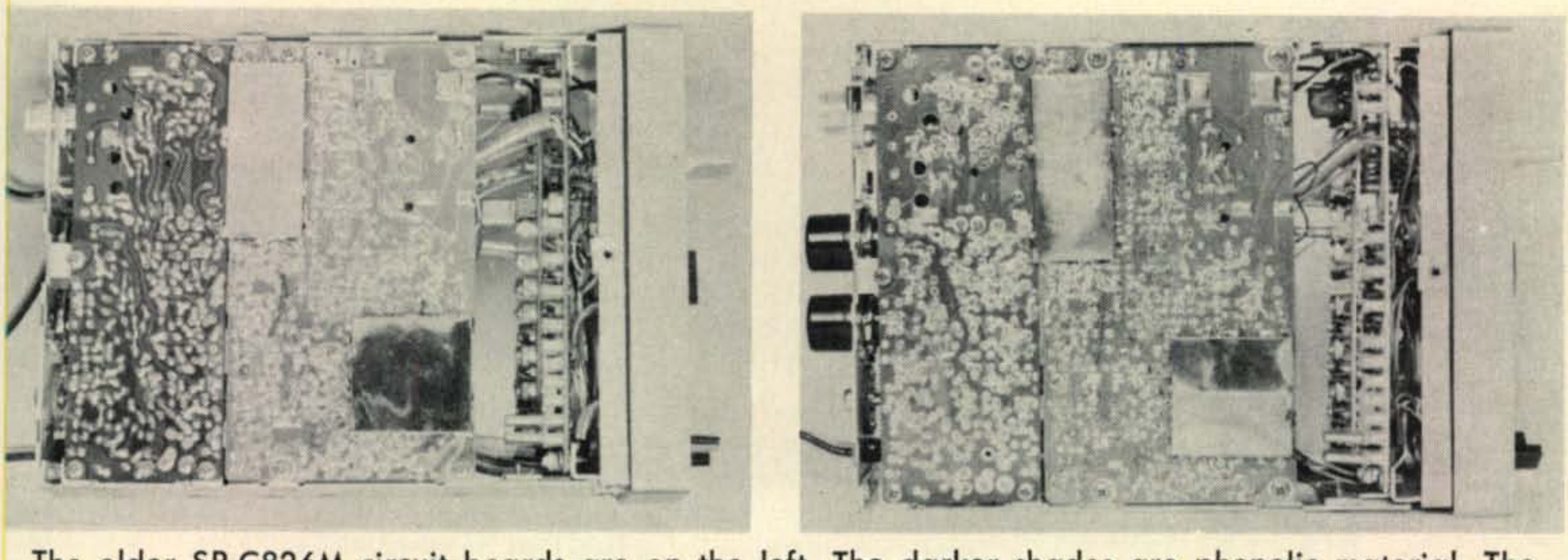
Transmitter: The transmitter section of the Standard SR-C826M uses crystals in the 8 mc range on each of the 12 channels. Crystal multiplication is 18 times (3 × 3 × 2) in a fully solid-state circuit. The r.f. circuitry is straightforward. The oscillator transistor for the transmitter is located on the crystal switching board for increased stability. A total of eight transistorized stages (including phase modulator) are employed in getting from the 8 mc crystal to the 147 mc 10 watt output. The audio portion of the transmitter uses two transistors to amplify the microphone audio, adding 6 db per octave pre-emphasis while in the process of amplifying, a peak limiting circuit consisting of two diodes, and a single transistor integrator/de-emphasis (6 db per octave to counteract the pre-emphasis) circuit. The processed audio is then applied to the phase modulator. Maximum deviation can be set by means of an internal deviation control (pre-set by factory to ±7 kc). Final amplifier overload protection is provided in the form of an automatic current control (ACC) which senses the level of reflected power from the antenna circuit and shuts down the pre-driver stage when the reflected power is sufficient to cause damage to the final amplifier stage.

Receiver: One of the major changes in the SR-C826M over the earlier models manufactured by Standard is the use of MOSFET's in both stages of 144 mc amplification and in the first mixer stage. This makes for much less noise in the v.h.f. circuitry and for reduced tendency to intermod. The first r.f. stage MOSFET is diode protected to prevent damage from strong signals or transients. The high i.f. is 11.7 mc, which results when the 2 meter signal is heterodyned with a signal from one of the 12 crystal oscillators. The

*FM Editor, *CQ*.



The Standard SR-C826M 2-meter transceiver is a 12 channel, solid state f.m. unit designed strictly for amateur use.



The older SR-C826M circuit boards are on the left. The darker shades are phenolic material. The white board in the left photo and all boards in the right photo are the newer polyclad design.

1st oscillators operate in the 15 mc range (multiplied 9 times for 135 mc injection energy). The 11.7 mc signal is amplified one time and applied to a bi-polar mixer stage. In this stage 12.155 mc energy is supplied from the 2nd oscillator for conversion to 455 kc. The low i.f. signal is passed through a 9-section ceramic filter and amplified by five stages of transistor circuitry. A single limiter stage and discriminator complete the r.f. portions of the receiver. A noise actuated squelch and conventional audio circuitry complete the receiver.

Metering: A metering circuit is provided in the Standard SR-C826M transceiver for both received signal strength and relative output from the transmitter. Also, the meter can be used to indicate the relative input battery or source voltage. When used as an S meter the metering circuit samples the 455 kc low i.f. signal and amplifies the voltage in 2 stages of transistors. In the transmit mode the meter circuit samples the output of the transmitter and applies the voltage to the same circuit as the receiver S meter.

Specifications and Performance

The SR-C826M was put through exhaustive tests under controlled circumstances. In all cases the unit met or exceeded published specifications. Transmit power output was in excess of 10 watts and the receiver sensitivity was 0.18 microvolts at the worst frequency. Audio quality of the transmitter was good, and the audio output of the receiver was right at the 5 watts specified by Standard. When using a sine-wave input to the receiver it was noted that slight distortion occurred when the deviation was increased over ±12 kc. However, the audio output was the same at ±5, ±7.5, and ±15 kc, which indicated very good audio recovery and satisfactory performance in narrow band, wideband, and compromise systems. An external speaker helps the receiver audio somewhat, but the internal speaker is satisfactory for most casual use of the unit.

Standard SR-C826M

GENERAL SPECIFICATIONS:

Size: 2½" × 6⅞" × 9⅞"; 4½ lbs.

Power Requirements: 13.8 VDC 0.15A receive, 2.4A transmit.

Accessories Furnished: Microphone, power cable, mobile installation hardware, manual.

TECHNICAL SPECIFICATIONS:

Receiver:	*Claimed*	*Achieved*
Sensitivity (20 db quiet)	0.4 μv	0.18 μv
Adjacent Channel Rejection		
30 kc	65 db	68 db
60 kc	none	75 db
Audio Recovery (full quieting signal)		
±5 kc dev.	5 w.	5.1 w.
±7.5 kc dev.	5 w.	5.1 w.
±15 kc dev.	5 w.	5.1 w.†
Number of Channels	12	12
Frequency Stability	0.001%	0.0007%
TRANSMITTER:		
Power output (13.8 VDC)	10 w.	10.5 w.
Deviation		
Preset	±7 kc	±7 kc
Maximum	±10 kc	±18 kc
Number of Channels	12	12
Frequency Stability	0.001%	0.001%

†See text

Construction

The Standard SR-C826 unit examined has come a long way towards being a really good piece of f.m. equipment. Quality control has been tightened and workmanship has been improved greatly. An earlier production run of the SR-C826M showed a need for tighter quality control and improvement in workmanship. Although there is no such thing as too much quality control, Standard has tightened standards and workmanship. Also, the latest production runs of the SR-C826M employ all "poly-clad" boards rather than the phenolic boards of the earlier production runs. This type of board is easier to service and more durable than the phenolic boards. The boards are machine soldered, but the leads are not ground off afterwards as in the usual TV type boards most often seen. This presents a cluttered appearance of the plating side of the boards, but the performance and reliability are not affected. The hand wiring shows the most improvement between early and later production runs of the SR-C826M. There is still some room for improvement in the hand wired sections, but those portions are now structurally and electrically sound.

General Comments

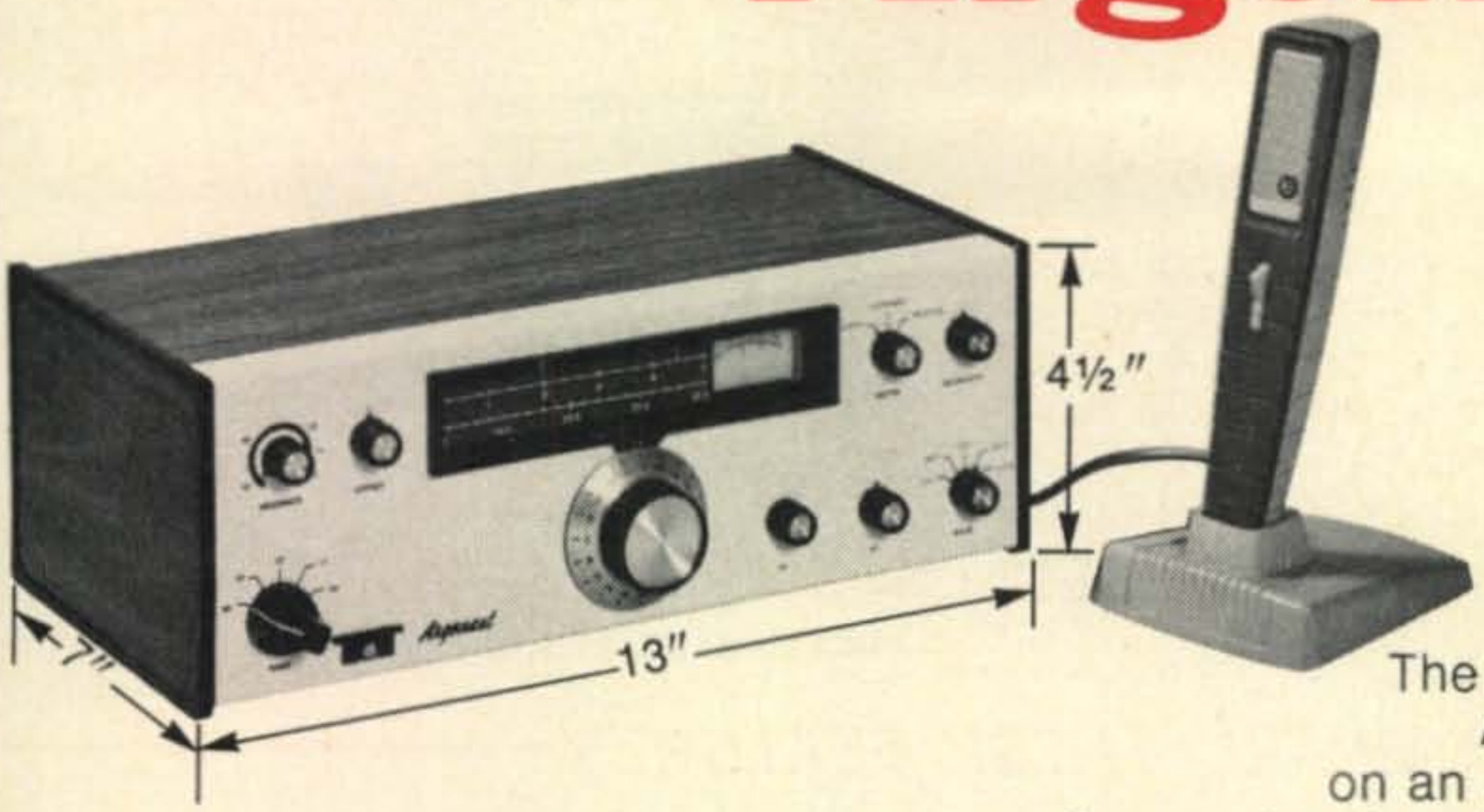
One of the best things which can be said about the production of the Standard SR-C826M is the use of feedback from the field in improvment of the unit. Workmanship and quality control problems have been greatly reduced and performance improved. The new manual reflects the need for service information including alignment, schematic, and pictorial portions.

There are still a few minor physical features which can be changed to better the unit, including the placement of the power cord connector closer to the basic unit, making the channel numbers more visible in direct sunlight, and new styling of the microphone. However, considering the improvements made since the early production runs of the SR-C826M, these are relatively minor.

Because of previous workmanship and quality control problems it is suggested that the individual unit be examined. Most amateurs know what workmanship to expect for the price. If the unit doesn't meet the expectations of the buyer, then it should be passed

[*Continued on page 96*]

introducing the Argonaut.



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AC Power Supply	**$ 24.95**
Microphone, EV PTT	**$ 17.00**

SPECIFICATIONS

GENERAL: Frequency range in MHz: 3.5 - 4.0, 7.0-7.5, 14.0-14.5, 21.0-21.5, 28.0-30.0. 9 MHz crystal filter. 2.5 kHz bandwidth 1.7 shape factor at 6/50 dB. Automatic sideband selection, reversible. Completely solid state. All circuits permeability tuned. Tuning rate approximately 25 kHz per revolution. Size: HWD 4½" x 13" x 7". Weight approximately 5 lbs.

RECEIVER: Sensitivity less than ½ uv for 10 dB S + N/N. Backlash less than 50 Hz. S - meter. AGC fast attack, slow delay. CW side tone. Incremental tuning. Separate af and rf gain controls. Frequency response 300-3000 Hz. Distortion less than 2%. Built-in speaker. Drift less than 100 Hz. Dial accuracy ±5 kHz (slightly more in 28 MHz).

TRANSMITTER: Power input: 5 watts PEP SSB, 5 watts CW. Output circuit: broad band 50-75 ohm impedance. Actuation: Press-to-talk. Full break-in for CW. Built-in SWR bridge. Integral TVI filter. Drift less than 100 Hz.

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Amateur Radio and the 1971 ITU Space Conference

BY GEORGE JACOBS*, W3ASK

Defeat was turned into victory during the last hectic days of the ITU space conference, and the "amateur satellite service" was born with allocations in 7 bands between 7 MHz and 24.05 GHz. Here's the story by W3ASK, CQ's Space Communications Editor, who also covered the previous space conference held in 1963.[1]

As the sun slowly rose over the lofty Jura mountains and the famous clock in the old city of Geneva struck 6 A.M. to mark the morning of July 17, tired, red-eyed representatives from 102 countries formed a line in the main auditorium of the Palais des Expositions to affix their signatures to the *Final Acts* of the World Administrative Radio Conference for Space Telecommunications, or WARC-ST for short.

Thus ended six hectic weeks of arduous discussion, debate, negotiation, drafting and editing, climaxed by 15-hour work sessions daily during the final week, and with an 18-hour session marking the final meeting of the conference.

Every space satellite or space vehicle launched, whatever its purpose, is dependent upon telecommunication systems for its link with earth. The need for such systems has increased greatly since the last ITU space conference held in 1963, as a result of the momentous advances made in space utilization and exploration. The task assigned the 740 delegates and staff attending the conference, representing 102 of the 140 member countries of the International Telecommunication Union, was to revise the Radio Regulations and to allocate sufficient frequencies to meet these increased needs, as well as those envisioned for the next decade or so. To make this task even more difficult, the delegates had to protect the existing rights and allocations of *terrestrial* telecommunication systems, and ensure that space systems would not interfere with them!

The inch-thick *Final Acts* contain revisions and allocations affecting a myriad of space telecommunication services, among them requirements for communications, broadcasting, navigation, manned and unmanned space vehicles, moon exploration, exploration of the sun and planets, as well as amateur radio.

As far as amateur radio is concerned, despite some disappointment, the results were quite good. The *Final Acts* contain frequency allocations which will permit amateur radio satellites to operate in *seven bands* rather than in the single band allocation at the 1963 conference.

Amateur Radio Participation

Amateur radio was represented officially at the conference by the International Amateur Radio Union. The IARU is an affiliation of 83 national societies in almost as many

Seen in action are some of the 700 delegates from 102 countries who attended the 1971 ITU Space Conference. The Conference was held in Geneva's Palais des Expositions. *(ITU Photo)*

*11307 Clara Street, Silver Spring, Md. 20902

[1]Jacobs, G., "Amateur Radio and the 1963 ITU Space Communication Conference," *CQ*, Jan. 1964, p. 43.

Although small in size, the radio amateur exhibit at TELCOM-71 was very popular. Looking on are IARU delegates (from left-to-right) Stevens, G2BVN; Denniston, WØDX; Clarkson, ZL2AZ; Dalmijn, PAØDD, and Eatin, VE3CJ. *(W1RU Photo)*

countries, and represents approximately a half-million radio amateurs. The Union has two major objectives: to do everything possible for preserving the amateur bands, and to form the connecting link between amateurs of all countries in scientific, technical and operational matters.

Recognized by the ITU as a bona fide international organization, the IARU is permitted to attend ITU conferences with observer status. Observers can participate fully in the proceedings of a conference, but cannot vote on issues, since this is a right reserved exclusively for member countries.

The IARU had a strong team at the 1971 space conference, consisting of representatives from the three ITU regions as follows: Win Dalmijn, PAØDD from Region 1 (Europe and Africa); Noel Eaton, VE3CJ from Region 2 (Western Hemisphere) and Tom Clarkson, ZL2AZ from Region 3 (Asia and Oceania). Also present were Bob Denniston, WØDX, the President of the IARU (and ARRL), Dick Baldwin, W1RU and John Huntoon, W1RW, of IARU Headquarters and ARRL, Perry Klein, K3JTE, of the Radio Amateur Satellite Corp. (AMSAT), and Roy Stevens, G2BVN of the RSGB. Several other distinguished radio amateurs also participated in the work of the IARU at the conference.

In addition, there were at least thirty licensed radio amateurs from twenty countries among the delegates attending the conference. While having primary responsibility to their national delegations in other areas of space telecommunications, several of them came to the assistance of amateur radio, one way or another, when the chips were down.

Amateur Satellite Requirements

At the 1963 space conference, amateur space activity was given official recognition in only one band, the segment of the 2 meter band between 144 and 146 MHz, which is allocated exclusively to the amateur service.

As the development of *OSCAR* satellites continued, it subsequently became necessary for the US, under a broad interpretation of the Radio Regulations, to permit the operation of transmitters aboard amateur satellites in the 420 and 28 MHz bands as well, provided no harmful interference would be caused to terrestrial stations also operating in these bands. The immediate frequency requirements for amateur satellites are in the 28, 144 and 420 MHz bands, with longer range plans for the use of the 7, 14, 21 and 1215 MHz bands as well.

Taking into account the immediate and longer range requirements for amateur space activities, and not wanting to exclude space experimentation in the other amateur bands, the IARU, more than three years before the 1971 conference began, urged member societies to secure national approval for space allocations in *all* of the amateur bands above 7 MHz. (For technical reasons the bands below 7MHz are not considered practical for amateur space activities.) This was followed by an intensive campaign to supply member societies with the information they would need to gain national support, especially for the bands that are shared between the amateur and other services. This included the widespread distribution of technical data showing that any interference caused by an amateur satellite would be insignificant, and the results of the *OSCAR-5* mission which demonstrated that a transmitter aboard an amateur satellite can be successfully controlled from the ground, in the event interference should develop.

The US adopted the IARU position as its own, and officially proposed to the 1971 space conference that space radio communication techniques be permitted in the following bands allocated *exclusively* to the amateur service, without limitations:

7.0 — 7.1 MHz
14.0 — 14.35 MHz
21.0 — 21.45 MHz
28.0 — 29.7 MHz
144 — 146 MHz

The US also proposed that space techniques, on a secondary basis, be permitted in

all bands shared by the amateur service either on a regional basis or with other services, on the condition that control functions be established to alleviate any interference that might develop. The following bands were included:

50 — 54 MHz
146 — 148 MHz
220 — 225 MHz
420 — 450 MHz
1215 — 1300 MHz
2300 — 2450 MHz
3300 — 3500 MHz
5650 — 5925 MHz
10.0 — 10.5 GHz

Early Conference Results

The work of the conference was accomplished first in working groups established according to specific areas of interest, the results of which were acted upon in Committees arranged according to broader interests, with final decisions taken in Plenary meetings of the entire conference.

Amateur radio was assigned, along with some other tasks, to Working Group 5C. This group reported to Committee 5, which was responsible for Allocations.

Early in the conference it was agreed that there should be separate definitions for each of the space and terrestrial services. Action was taken to define those space services, including amateur radio, for which no definitions previously existed in the Radio Regulations. Accordingly, the conference agreed to the following definitions for the "amateur satellite service":

> A radiocommunication service using space stations on earth satellites for the same purposes as those of the amateur service.

The definition of the "amateur service," which applies to terrestrial stations, remains unchanged:

> A service of self-training, intercommunication and technical investigations carried on by radio amateurs, that is, by duly authorized persons interested in radio techniques solely with a personal aim and without pecuniary interests.

The significance of the new definition is that the amateur satellite service is now a separate and distinct service from the amateur service, with each requiring specific frequency allocations. The frequencies previously allocated to the amateur service were not considered at this conference, *and remain unchanged*. The conference did, however, consider frequency allocations for the amateur satellite service.

Delegates from about a dozen countries, interpreters and conference staff preparing for a sub-committee meeting dealing with amateur radio. In forefront are representatives of the International Amateur Radio Union, from left-to-right, John Huntoon, W1RW; IARU President Bob Denniston, WØDX; and Dick Baldwin, W1RU.

In this connection, the pre-conference planning of the IARU payed off handsomely as far as the bands allocated exclusively to the amateur service were concerned. There were an overwhelming number of proposals supporting the allocation of the following bands to the amateur satellite service, to be shared equally with the amateur service:

7.0 — 7.1 MHz
14.0 — 14.25 MHz†
21.0 — 21.45 MHz
28.0 — 29.7 MHz
144 — 146 MHz
24.0 — 24.05 GHz‡

Then the trouble began. It soon became very apparent that there was no support at all, except from the US and a handful of other delegations, for the allocation of any of the shared bands to the amateur satellite service. Most of the objections were based on the fear that an amateur satellite might cause harmful interference to existing terrestrial services using these bands.

Conference Debate

The IARU began an intensive campaign to show the conference that these fears were

†The segment 14.25 to 14.35 MHz *was not* allocated to the amateur satellite service since it is shared with the fixed service in the USSR.

‡A *new* band allocated by the conference to be shared equally between the amateur satellite service and amateur service world-wide. This is at the extreme upper limits of the radio spectrum, and GHz should not be confused with MHz!

Bob Denniston WØDX, raising IARU card to ask for floor in support of amateur radio. Tom Clarkson, ZL2AZ, is to his left and John Huntoon, W1RW, to his right. Active IARU participation is credited for allocation of seven amateur bands between 7 MHz and 24 GHz to the radio amateur space service. *(VE3CJ Photo)*

unfounded. Discussions were held with selected key delegates emphasizing that there was very little liklihood of an amateur satellite causing interference to terrestrial operations, and if interference did occur it would be insignificant. Furthermore, the IARU observers pointed out that any amateur satellite operating in shared bands would be equipped with ground control circuitry so that its transmitter could be silenced, if harmful interference did develop.

The IARU distributed copies of technical articles to each delegate summarizing the results of previous OSCAR missions, and highlighting the successful ground control of the OSCAR-5 beacon transmitter. Delegates were also invited to an IARU exhibit at the TELECOM-71 exhibition of space and telecommunication hardware being held in conjunction with the conference, where a model of an OSCAR satellite was on display, as well as some of the completed components that will go into future OSCAR satellites.

Despite this effort, there was still little evidence of support for any additional allocations to the amateur satellite service. As the looked as if some of the plans for future looked as if some of the plants for future OSCARS might have to be changed.

Working Group 5 C completed its work by deciding *against* the use of space techniques by amateurs in all of the bands shared between the amateur and other services. There was a ray of hope, however, for the segment 435-438 MHz. The working group agreed to refer to Committee 5 that the amateur satellite service be authorized to operate in this segment, on condition that harmful interference shall not be caused to other services operating in this band. This recommendation, unfortunately, was defeated in Committee 5 by a 31 to 25 vote. The defeat, in part, was due to the chairman, who called for the vote on the entire band 420-450 MHz, rather than the 435-438 MHz segment! Only one chance now remained, and that was to find some way to bring the matter up again at a Plenary meeting, but the time was growing very short.

Apparently dissatisfied with the manner in which the Chairman of Committee 5 handled the 435 MHz vote, delegates from several countries privately approached the IARU delegation, offering to support a proposal to vote on the 435-438 MHz segment in a Plenary meeting. In fact, the United Kingdom submitted such a proposal officially, along with a conference document applauding amateur space activities. Expressions of support came also from the US, Canada, Israel, Italy, New Zealand and several other countries. Italy, for example, submitted an additional proposal for the 1215, 5650 and 10,000 MHz bands.

The UK proposal came up for discussion in a Plenary meeting less than 36 hours before the conference was scheduled to end. Despite the hectic pace at the time, the proposal received full and fair discussion. The many friends of amateur radio at the meeting held their breath as the proposal was brought to a vote.

This time amateur radio scored a victory! The vote—63 to 3 in favor of authorizing amateur space activity in the 435-438 MHz segment, on an non-interference basis. Even the head of the Soviet Delegation flashed a warm, friendly smile as he voted in favor of the proposal.

Coupled with this authorization, the conference approved the following addition to Article 41 of the Radio Regulations to ensure that any interference caused by an amateur satellite will be alleviated.

> Space stations in the Amateur Service operating in bands shared with other services shall be fitted with appropriate devices for controlling emissions in the event that harmful interference is reported in accordance with the procedure laid down in Article 15. Administrations authorizing such space stations shall inform the I.F.R.B.,[2] and shall ensure that sufficient

[2]The International Frequency Registration Board of the ITU.

ground command stations are established before launch to guarantee that any harmful interference that might be reported can be terminated by the authorizing Administration.

Unfortunately, the Italian proposal for the higher frequency bands did not do as well, and was rejected by a substantial majority.

Conclusions

The significant results of the 1971 World Administrative Radio Conference for Space Telecommunications, as far as amateur radio is concerned, can be summed up as follows:

- The *amateur satellite service* has been created and defined for the Radio Regulations. This marks the official birth of this service.
- The number of bands in which amateur radio satellites can operate has been increased from one to the following seven:

7.0 — 7.1	MHz
14.0 — 14.25	MHz
21.0 — 21.45	MHz
28.0 — 29.7	MHz
144 — 146	MHz
435 — 438	MHz
24.0 — 24.05	GHz

- A new Article (#41) was added to the Radio Regulations requiring amateur radio satellites operating in bands shared with other services (this would be the case in the 435-438 MHz allocation) to be fitted with ground control equipment capable of terminating their transmissions in the event harmful interference should develop.
- The International Amateur Radio Union, representing amateur radio at the conference, gained additional stature and recognition and played a vital role in achieving these favorable results.

The *Final Acts* signed on July 17, will become an integral part of the Radio Regulations, and will come into force on January 1, 1973. They are expected to remain in force at least through the present decade, and perhaps longer.

It is hoped that the results of the conference meet the present requirements of amateur space activity and those envisioned for the remainder of this decade. The IARU deserves a strong vote of thanks for their efforts, and for the results they achieved.

The 1971 space conference is certain to go down as one of the most important held in the more than 100-year history of the ITU, and it marks a milestone in the history of amateur radio as well. ■

EDITOR'S NOTES: The conference officially agreed to the use of Hertz instead of cycles per second for both the English and Spanish languages, and the Radio Regulatinos will be so modified. Other major languages made this change previously. The Hertz terminology has been used in this report, and the following conversions may be helpful:

1 hertz (Hz) = 1 cycle per second (c.p.s.)
1 kHz = 1 Kc = 1,000 Hz or (c.p.s.)
1 MHz = 1 Mc = 1,000 kHz or Kc
1 GHz = 1 Gcs = 1,000 MHz or Mc

In other than the field of amateur radio, the results of the 1971 space conference may have interest to readers of *CQ*, especially those who have become satellite-listeners or have participated in weather satellite transmissions. These events will be reviewed in another article now being prepared by W3ASK, and scheduled for publication early next year.

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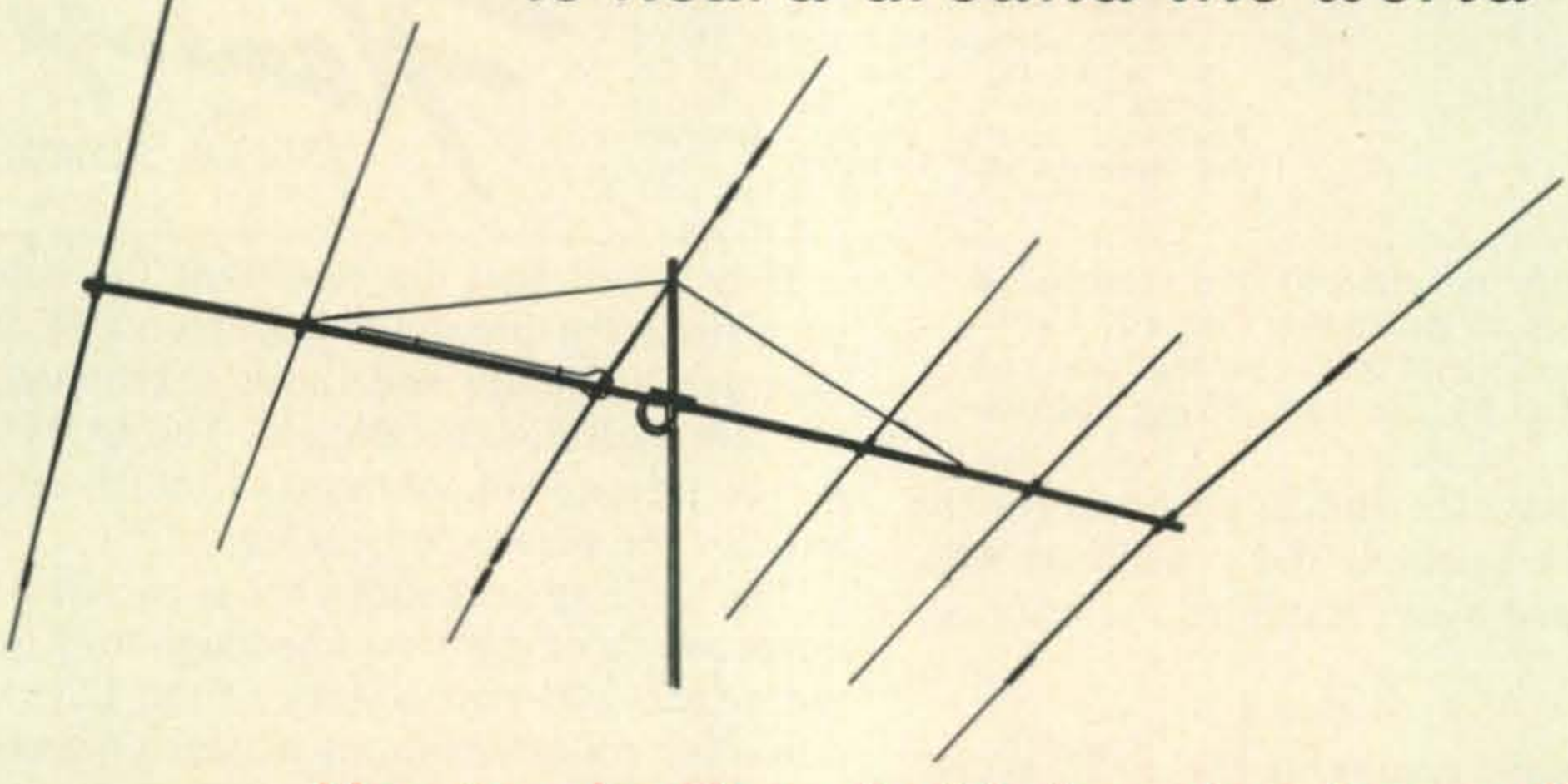

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CQ Reviews:

The Heathkit HM-102 R.F. Power Meter

BY WILFRED M. SCHERER,* W2AEF

MANY radio amateurs employ some form of s.w.r. meter, but most of these devices seldom indicate actual r.f.-power levels. The Heath HM-102 R.F. Power Meter is an instrument that does both these jobs at a cost substantially lower than otherwise incurred in doing both jobs.

Forward r.f. power readings of up to 2000 watts are obtained with the HM-102 over a frequency range of 1.8-30 mc with a rated accuracy of ±10% of full scale into a non-reactive load of 50 ohms. An extra dividend, particularly for the low-power buffs, is that the instrument also may be set up for a low range, enabling power levels down to 1 watt to be observed. S.w.r. indications are made up to a ratio of 3:1. The instrument has a negligible insertion loss and may be left connected in the transmission line at all times for continuous monitoring. A self-calibration feature is included in the unit.

Details

The HM-102 consists of two sections. One is the detecting unit that is connected in the transmission line to sense forward and reflected voltages. The other houses the meter that indicates the results obtained by the detecting unit.

The two units are connected together by means of a six-foot-long five-conductor cable, enabling the meter to be conveniently placed at the operating position for easy observation while the detector is located remotely in the transmission line. On the other hand, the detector unit may be placed and secured in a rear compartment of the meter box when the system can be set up as one integral unit.

Principle of Operation

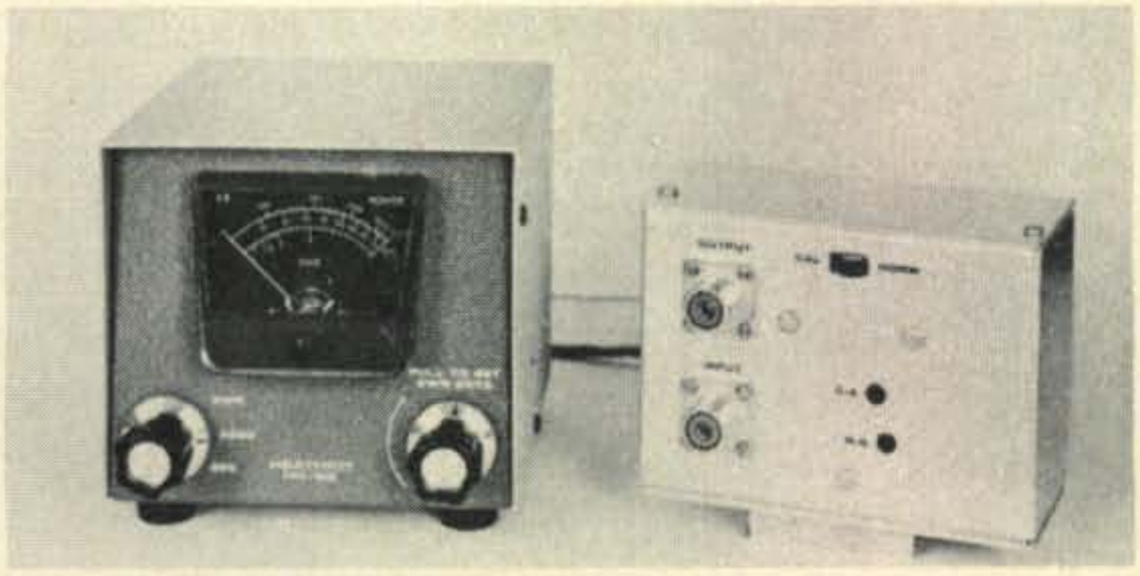
A simplified schematic for the HM-102 is shown at fig. 1. The principle of operation is similar to that of the familiar in-line directional wattmeter using a toroid transformer as the pickup element with its primary consisting of the center conductor of the transmission line which passes through the middle of the toroid on which a discrete number of turns of wire are bifilar-wound with a center tap to form a balanced or "push-pull" secondary. Forward and reflected line voltages induced in the secondary are detected at one end of the winding or the other, depending on the phase relationships which add or cancel the relative voltages.

Capacitive balance at the secondary winding, needed for precise phase relationships, is obtained by adjustment of a capacitive voltage-divider circuit between the line and the ground return for the center tap of the secondary winding. Proper adjustment is indicated by a null in the s.w.r. reading when the instrument is terminated with a 50-ohm non-reactive load (representing an s.w.r. of 1:1).[1]

The instrument is calibrated for forward power only. Reflected power is read in terms of s.w.r. For this operation the FUNCTION switch is placed at S.W.R., the SENSITIVITY switch set at B and the SENSITIVITY control

*Technical Director, *CQ*.

[1]For a more detailed description on the workings of a similar device see, W. Bruene, "An Inside Picture of Directional Wattmeters," *QST*, April 1959, p. 24.



The Heath HM-102 R.F. Power Meter shown with the detecting unit placed externally.

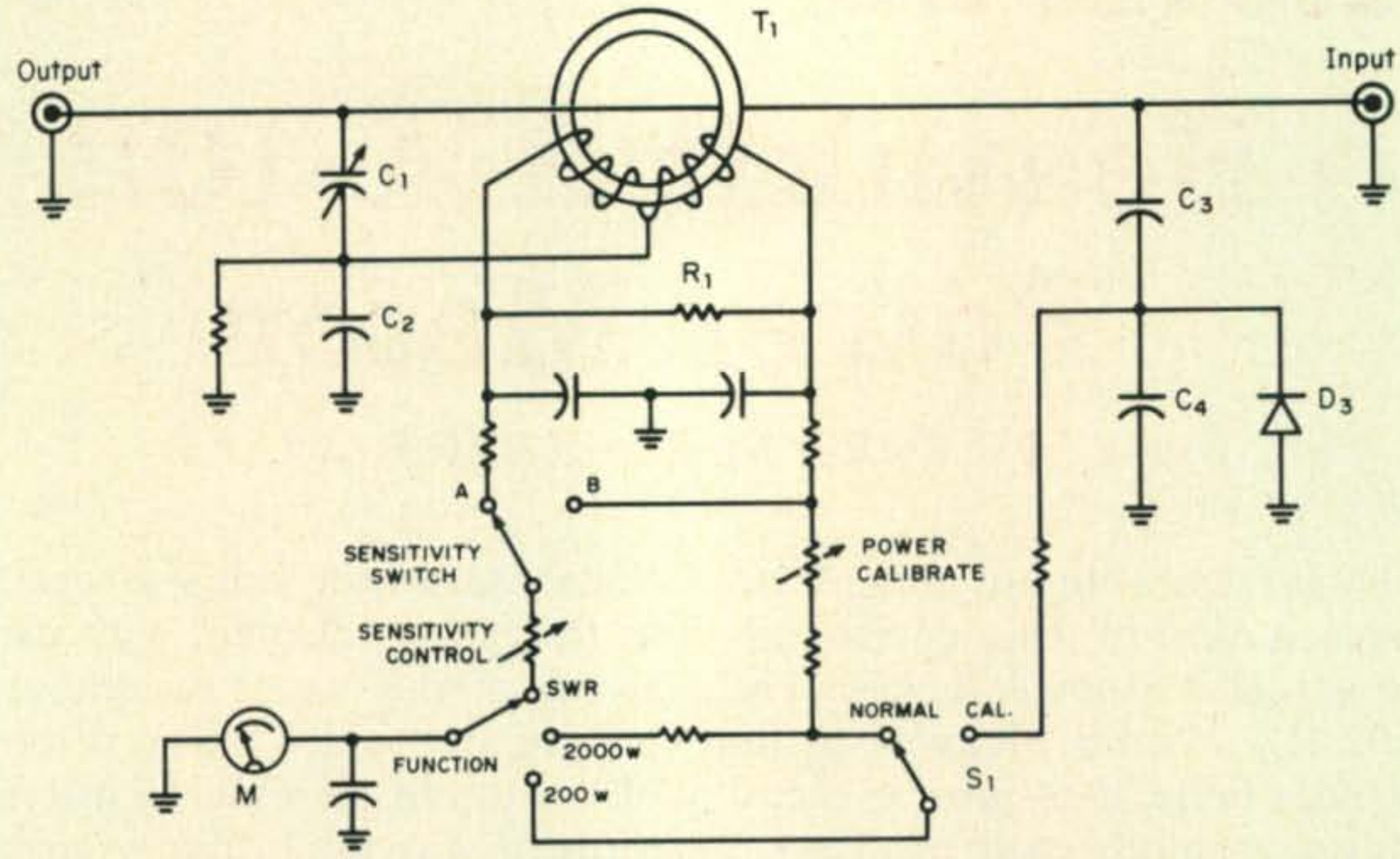


Fig. 1—Basic setup for the Heath HM-102 R.F. Power Meter. C_1-C_2 are capacitive dividers for balancing the circuit. D_1 detects the reflected voltage, D_2 the forward voltage. The calibrating voltmeter circuit consists of dividers C_3-C_4, and D_3 with the meter switched to the calibrate position. R_1 broadbands the transformer for operation over 1.8-30 mc. Other details are given in the text.

adjusted for a full-scale deflection while 10-200 watts of power are applied. The s.w.r. reading is then obtained by leaving the control set and placing the SENSITIVITY switch at A. The meter then deflects according to the reflected-power voltage from D_1 the relationship of which to the forward-power voltage is indicative of the s.w.r. as per the meter calibrations.

Self Calibration

The self-calibrating set up is a diode voltmeter circuit connected across the transmission line through a capacitive voltage divider. The constants are so proportioned that the meter, when switched to this circuit (by S_1) indicates the r.f. power level when the instrument is terminated by a *50-ohm non-reactive* load.

Calibration is then conducted by first applying an amount of power that causes a 100-200 watt indication at the calibrating position. The meter is then switched back to the normal 200-watt power range by setting S_1 at NORMAL and the CALIBRATE control is adjusted for the same power reading as experienced at the calibrate position.

Calibration in this manner is conducted on the 7 mc band for which the calibrating-meter constants have been optimized. Calibration at other frequencies requires the use of a suitable accurate r.f. voltmeter or r.f. probe with a v.t.v.m., plus the required load and applying the formula:

$$P = \frac{E^2}{R}$$

where R is the load resistance and E is the voltage measured across R.

Construction

The HM-102 can be assembled in about 2 hours. The components for the detecting unit are installed on a printed-circuit board mounted on metal standoff's in the detector box. The transmission line conductor goes from the center pin of an SO-239 input connector, through the center of the toroid inductor that lies flat against the board, and then to the center of the output connector. The interconnecting-cable leads for the meter section are soldered to the required points on the circuit board where each lead has a ferrite-bead choke to prevent inducement of any stray r.f. energy on the cable that might otherwise effect proper operation of the instrument.

A slide switch on the detector box is used to set up the device for calibrating purposes or for normal operation. Access holes are provided for adjusting the s.w.r. null balance and for setting the power-calibration control.

Conventional type of construction is used at the meter box where there are two controls. One switches the meter for s.w.r. readings or to either of two power-scale ranges. The s.w.r. scale is calibrated in small steps for ratios up to 3:1. One power range is 0-200 watts calibrated in 5-watt steps between 10

and 100 watts and in 25-watt steps the rest of the way. The other power range goes up to 2000 watts and is calibrated in 100-watt steps between 100 and 2000 watts. The other control is used to set the s.w.r. sensitivity after the control knob is pulled outward.

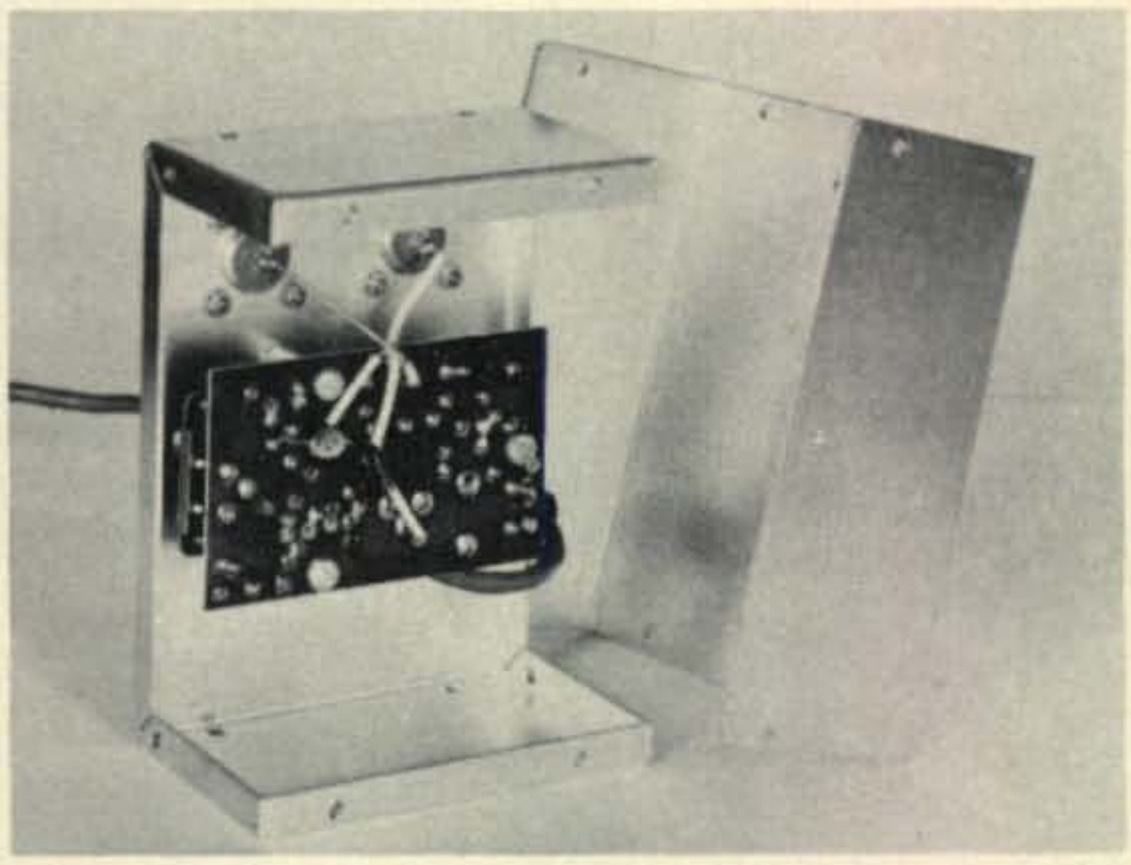
The size of the meter box is 5 1/16" × 5 1/4" × 6 1/2" (H.W.D.); the detecting unit is 3 3/4" × 2 3/8" × 5 1/8". Weight for the two units is 2 1/2 lbs.

Accuracy of Power Readings

The accuracy of the HM-102 largely depends on that of the associated equipment used during the calibration. This primarily involves the load which as previously stated should be *50 ohms non-reactive*. Under such conditions the power-reading accuracy of our unit fell well within that of Heath's rating; as a matter of fact, checks against several commercial wattmeters, voltmeters and dummy loads of known accuracy, or characteristics revealed the HM-102 to be within at least ±3%, while the accuracy of the calibrating-meter setup was within ±2%.

Nevertheless, since the test eqiupment available to most radio amateurs may not be up to the standards usually found under laboratory conditions, the manufacturer's accuracy rating is specified as ± 10% to allow for such contingencies.[2] Even a load representing as low an s.w.r. as 1.1:1 (relative to 50 ohms) can produce a 10-percent calibrating error.

For example: at 200 watts with a 50-ohm purely resistive load the r.f. potential is 100 volts ($E = \sqrt{PR} = \sqrt{200 \times 50} = 100$ v.). Since the constants of the calibrating-meter setup have been set to indicate the power according to the voltage across a 50-ohm resistive load, the meter under the above conditions indicates 200 watts. Now, suppose the load were 45 ohms resistive, representing an s.w.r. of about 1.1:1 (50/45). Then 100 volts across the load would result in a power level of 220 watts ($P = \frac{E^2}{R} = \frac{(100)^2}{45} =$ 220 w.). Since with 100 volts the meter would still indicate 200 watts, the error is 10%. It likewise could be shown that with a load s.w.r. of 1.25:1 the actual power level at 100 volts would be 250 watts while the calibrating meter still indicates only 200 watts, with a resulting error of 25%. It thus may be seen that the calibrating accuracy deteriorates quite rapidly as the s.w.r. presented to the meter rises.[3]



Interior view of the detecting unit for the HM-102. A lead from one transmission-line connector (at the top) goes through a tiny toroid winding (T_1) on a printed-circuit board to the other connector. The leads passing downward go to two of the divider capacitors. Other components are mounted on unseen side of the board.

[2]The percentage of accuracy is related to the full-scale range. Thus for a rated full-scale accuracy of ±10%, the error on the 200-watt range can be 200 × ±10% = ±20 watts at *any* point on the scale. Similarly the tolerance on the 2000-watt range would be ±200 watts.

[3]The above examples are based on the assumption that the accuracy of the calibrating meter is on the nose. Also, the results could vary somewhat when a reactive load is involved. A good way to ensure a test load with a low s.w.r. is to use about 500 feet of 50-ohm coax terminated with the 50-ohm load that would otherwise be used directly. Losses in the cable will tend to wash out any residual s.w.r. that may be due to a slight mismatch or reactive effects at the termination.

S.W.R.	*Refl. Pwr.*
1.2:1	1.0%
1.4:1	3.0
1.6:1	5.5
1.8:1	8.0
2.0:1	11.0
2.25:1	14.0
2.5:1	18.0
2.75:1	23.0
3.0:1	25.0

Table I—S.w.r. *vs* Reflected power as a percentage of forward power. Percentages are approximate.

Similarly, even though the instrument may have been accurately calibrated, the accuracy of the normal power-range readings also will depend on the s.w.r. produced by the load and is best at s.w.r.'s below 1.1:1, as would be the case with other devices of a similar nature.

When the HM-102 is used to monitor s.s.b. transmissions, it should be kept in mind that with proper modulating levels the meter will kick to no more than 10-20% of the maximum steady-state output-power level. Any attempt to push the meter higher will only result in overdrive, distortion products and inferior unwanted-sideband suppression; ending up with a rotten-sounding signal and a potential cause of unnecessary interference.

S.W.R. Readings

Since the instrument normally would be used at the operating position while connected between the transmitter and the input to the transmission line, the s.w.r. readings obtained are not necessarily indicative of the actual s.w.r. *along the line*, but rather relate to the *line-input* s.w.r. or that as *seen* by the transmitter. This is what determines how near the impedance at the line input will fall within the matching or loading capabilities of the transmitter.

As with any s.w.r. indicator so installed, the accuracy of the actual *line*-s.w.r. reading depends not only on the degree of mismatch at the load (antenna), but also on the line length, the frequency and the inherent line losses. A further discussion in respect to the meaning of the s.w.r. readings and loading conditions is given in the instruction manual for the HM-102. The subject also was covered in the Q & A Column for the September 1971 issue of *CQ*, page 84.

Reflected Power

Reflected-power readings are not directly obtainable; however, these may be determined by noting the s.w.r. reading and converting it to reflected power according to Table I. Subtracting the reflected power from the forward power (normal power reading) will indicate the power taken by the *load*, which usually will be the antenna.

Low-Power Readings

Low-power readings may be obtained by first applying 10 watts of r.f. power as indicated on the 200-watt power range, then switching over to the s.w.r. position, pulling out the SENSITIVITY control knob and adjusting the SENSITIVITY control for a reading at the 100-watt point on the 200-watt scale. Use of the s.w.r.-position with its sensitivity so adjusted and with the SENSITIVITY control knob kept pulled out then leaves the instrument set up for low-power readings of 1-20 watts by dividing the 200-watt scale calibrations by ten.

The Heath HM-102 R.F. Power Meter is priced at $29.95 (kit). It is a product of The Heath Company, Benton Harbor, Michigan 49022.

—*W2AEF*

CQ Reviews: The Dycomm Model PSU-13 VHF Scaler

BY WILFRED M. SCHERER,* W2AEF

DYNAMIC Communications, Inc. has come up with a number of new products some of which are indicated at advertisements in current issues of *CQ*. Among these products are f.m. power boosters, an f.m. transceiver, an f.m. repeater and the R.F. Sniff-it.

The f.m. gear will soon be reviewed by our f.m. reporter. In the meanwhile we shall take a look at another one of their items, the Dycomm Model PSU-13 v.h.f. Scaler that operates over a minimum frequency range of 10-240 mc. This device is primarily employed to extend the range of a frequency counter

*Technical Director, *CQ*.

to include much of the v.h.f spectrum. Its use is not restricted to this application, however, as it also can be utilized with a calibrated general-coverage receiver for checking frequencies in the v.h.f. region. Another application is that for synchronizing v.h.f. signals with oscilloscopes having a frequency response in the 10-30 mc range.

The PSU-13 Scaler functions as a 10:1 frequency divider; that is, the output frequency is 1/10 that of the input frequency. For example: where the signal to be measured is 221 mc, the scaler output is 22.1 mc, making it possible to obtain a measurement with a counter the range of which is limited to the 22-23 mc area.

Similarly, with the scaler connected to a 3-30 mc general-coverage receiver, a 221 mc signal may be tuned in at 22.1 mc. Likewise, a 50 or 144 mc signal may be read on a counter at 5.0 or 14.4 mc (5000 or 14,400 kc) respectively.

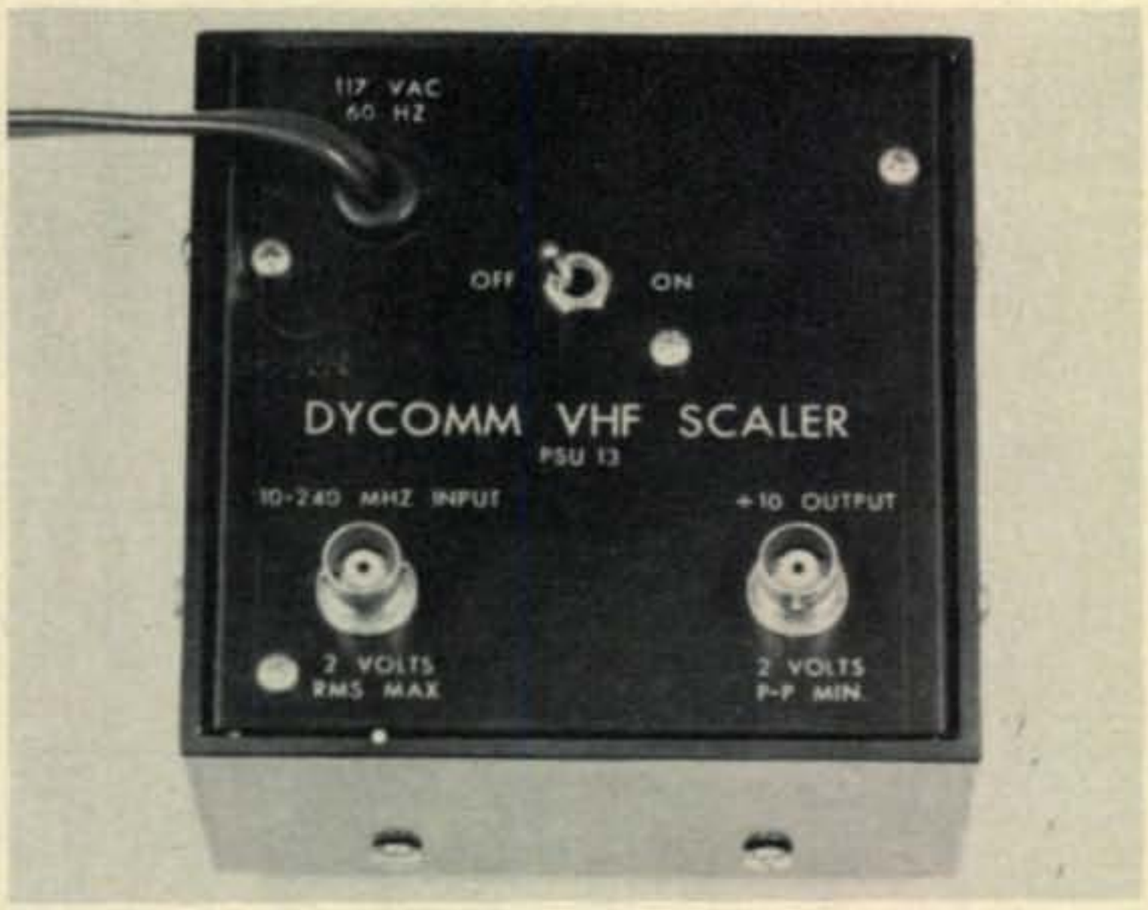
The inherent sensitivity of the unit is rated as providing proper operation throughout its frequency range with input levels under 500 millivolts and it is guaranteed to operate at 180 mc with an input level of 100 mv. Less input is required at the lower frequencies, while the larger inputs are needed at the higher frequencies.

The maximum allowable input is 2 volts r.m.s. The input circuit is a.c. coupled, allowing the device to be connected across a circuit at which a d.c. potential is present; however, a limitation here is specified as 50 v.d.c. maximum.

The minimum open-circuit output potential is 2 volts peak-to-peak with typical output levels found to be 3.5 v. p-p. This is quite constant regardless of the input potential above that specified for proper operation. The unit operates from a 117 v.a.c., 60 c.p.s. source.

Technical Tidbits

The PSU-13 employs one integrated circuit, two transistors and four diodes. The IC incorporates a diode-protected dual-gate MOSFET used for the input amplifier, and transistors in a NOR gate circuit along with a divide-by-two and a divide-by-five divider (for a total division of ten) connected in the above order. Frequency compensation is used at the input amplifier to provide correct operation over the wide frequency range.



The Dycomm PSU-13 Scaler.

Back-to-back diodes at the input also offer a measure of protection. The divide-by-ten output of the IC is brought up to a higher output level by means of a two-stage transistor amplifier. The input sensitivity is an internal adjustment optimized at the factory. No readjustment is required by the user for proper scaler operation over the rated frequency range.

Silicon diodes in a full-wave rectifier circuit at a 12 v.a.c. center-tapped winding on the power transformer provide 5 v.d.c. operating potential.

Construction

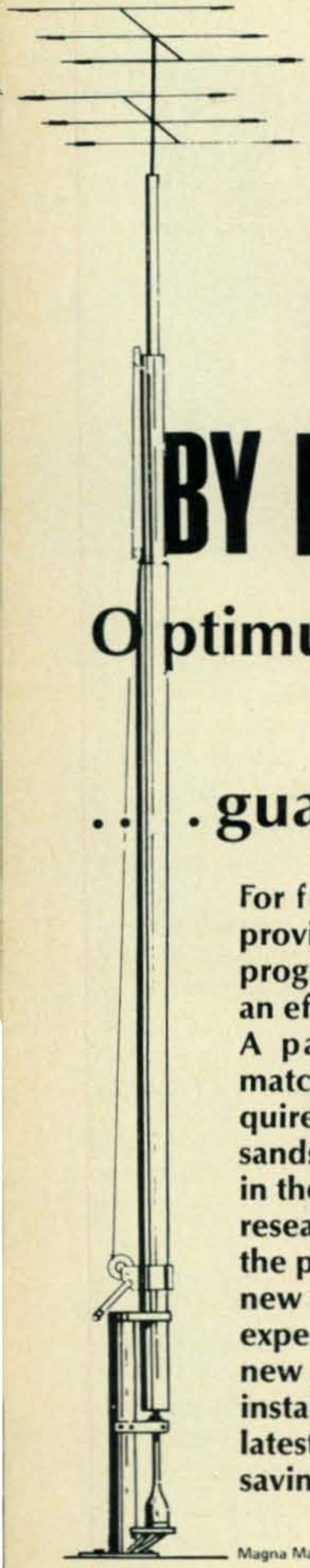
The scaler itself is assembled on a printed-circuit board which, along with the power-supply components, is installed in a small machined-aluminum box 4″ square and 2″ high. Rubber feet on the bottom and BNC type input and output connectors at the top of the unit extend the overall height to 2¾″. The weight is 1¼ lbs.

A miniature toggle switch turns power on or off, but there is no provision to permit the scaler to be bypassed for eliminating the need of interchanging cables for normal counter or other operation without the scaler in use.

Performance

Positive and stable operation of our unit was experienced during use in conjunction with a frequency counter or a receiver. It functioned over the range of 2 to at least 260 mc. The sensitivity over the minimum rated range was somewhat better than the guaranteed rating of 100 mv at 180 mc and the typical figure of 150 mv at 225 mc. Operation

[*Continued on page 94*]



ANTENNA PACKAGES

BY HENRY RADIO

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Magna Mast illustrated

HR-"Mini" Antenna Package

Tristao MM-35 "Mini-Mast"*
tubular tower — crank-up
CDR AR-22R Rotator**
100 ft. RG-58A/U Coax
100 ft. 4 Cond. rotor cable
Complete with one of the following antennas:

Hy-Gain TH2MK3	**$260.00**
Hy-Gain TH3JR	**$260.00**
Hy-Gain Hy-Quad	**$290.00**
Hy-Gain 203BA	**$295.00**
Hy-Gain TH3MK3	**$300.00**

*MB-10 Free standing base, add $36.95
**TR-44 Rotator and cable, add $35.00

HR-"Standard" Antenna Package

Tristao CZ-454 crank-up tower w/mast*
CDR TR-44 rotator**
100 ft. RG-58A/U Coax
100 ft. Control cable
Complete with one of the following antennas:

Hy-Gain DB10-15A	**$585.00**
Hy-Gain Hy-Quad	**$600.00**
Hy-Gain 204BA	**$620.00**
Hy-Gain TH3MK3	**$615.00**
Hy-Gain TH6DXX	**$645.00**

*Free-standing base, add $10.00
**Ham-M rotator, RG-8/U Coax, add $50.00

HR-"Magna" Antenna Package

MA-490 "Magna-Mast"
MARB-40 Rotor base
CDR Ham-M Rotator
100 ft. RG-8/U Coax
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The Motorola 80D on 220 mc F.M.

BY BYRON H. KRETZMAN,* W2JTP

Part II—The Receiver

IF you read Part I, you know that converting the high band transmitter of the Motorola —80D to 220/225 f.m. is reasonably simple. Now, when it comes to the receiver, any one of several approaches may be made. The approach taken depends largely upon the type of f.m. receiver available. As you probably are aware, several different types of high band receivers were used with the —80D. And, remember, too, that there are several different types of low band receivers that are mechanically and electrically interchangeable. Let us examine the alternatives.

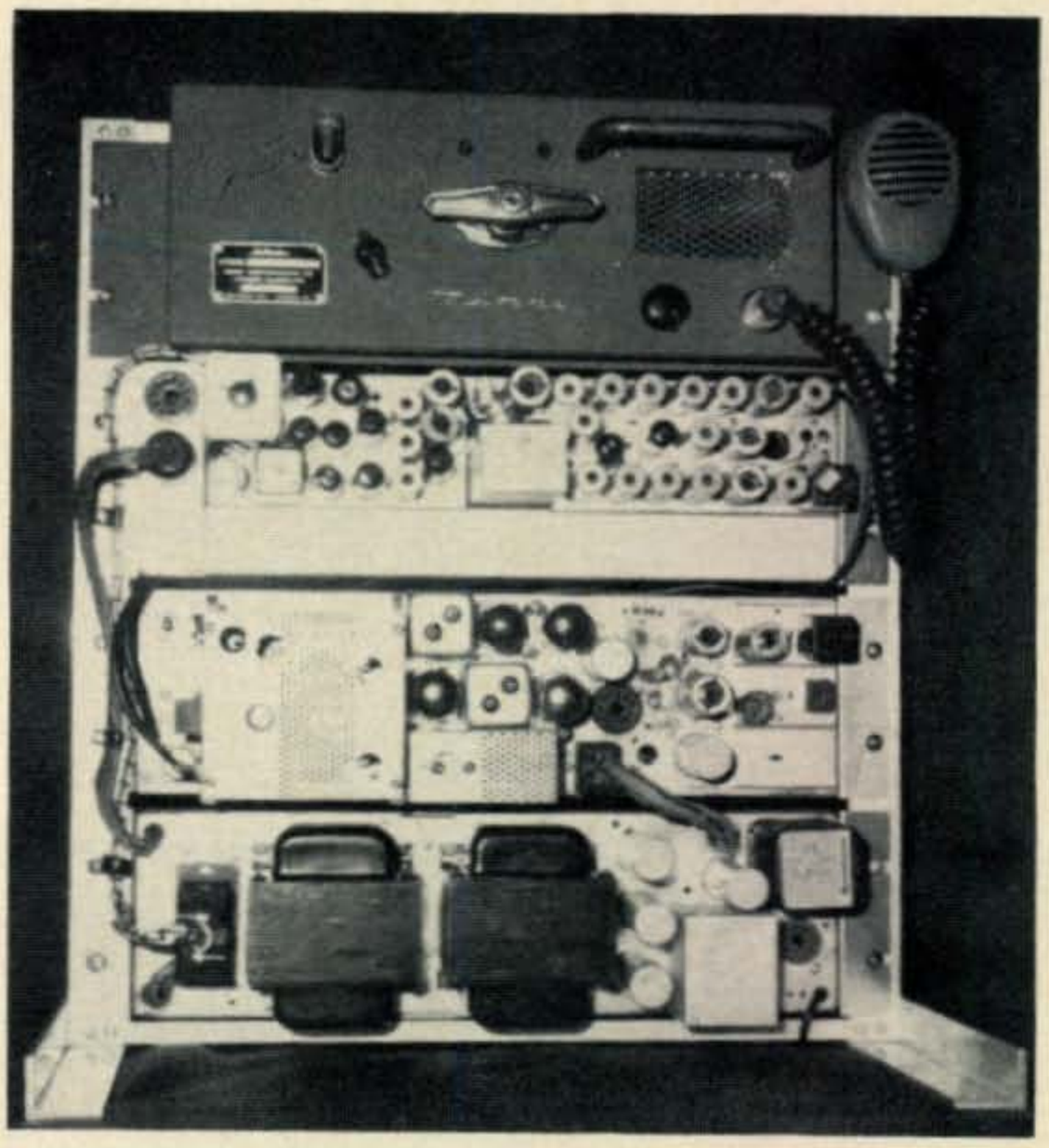
External Converters

The high band Sensicon and Unichannel receivers have either a 5.5 mc or an 8 mc 1st i.f. This would result in a poor image ratio if such a receiver were directly modified to operate on 220-225 mc. A 220/225 converter feeding into a high band input appears to be a simple solution, at first glance. The image would fall in TV Channel 4, 5, or 6, a second glance shows. (NOTE: TV stations are high power and broadband.) This means that the converter image ratio would have to be *extra* good. Such a converter is not easily built, nor are there any readily available at a reasonable price.

Now, supposing you just happen to have an f.m. receiver from a low band —80D. Let's look at the possibility of a 220/225 converter feeding into a low band receiver. The image will now fall in the aeronautical band. Aero stations are relatively low power and narrow band (a.m.), so they are unlikely to cause trouble unless you live near an airport. Even then a slight change in your i.f. will usually cure a specific isolated problem. This approach has worked well at the base station of W2JTP where a vacuum tube converter is fed into a spare 52.525 mc receiver. One disadvantage, if you are looking for one, is that an extra box is required, an extra box that also requires power. (This converter will be described in a future article in *CQ*. Watch for it.)

Direct Modification of a Receiver

Those of you who have been operating on f.m. are familiar with the Motorola high band "G" receiver strip. This is a narrow, short, strip, like a Unichannel strip, but the "G" receivers were part of the T33-GGV and T43-GGV combinations, a later series



A complete 225 mc f.m. base station. Bottom unit is the a.c. power supply, similar to that described in CQ, March, 1966, page 33. The second unit is the high band —80D transmitter, modified for 220/225 as per Part I. The third unit is the modified high band "G" receiver strip. The top panel is the rack mounted front panel of a standard —80D assembly with a 3" by 5" speaker in place of the connectors. Of course the three units below could be bolted together, with the front panel shown, and then put into the regular —80D case.

*431 Woodbury Road, Huntington, N. Y. 11743.

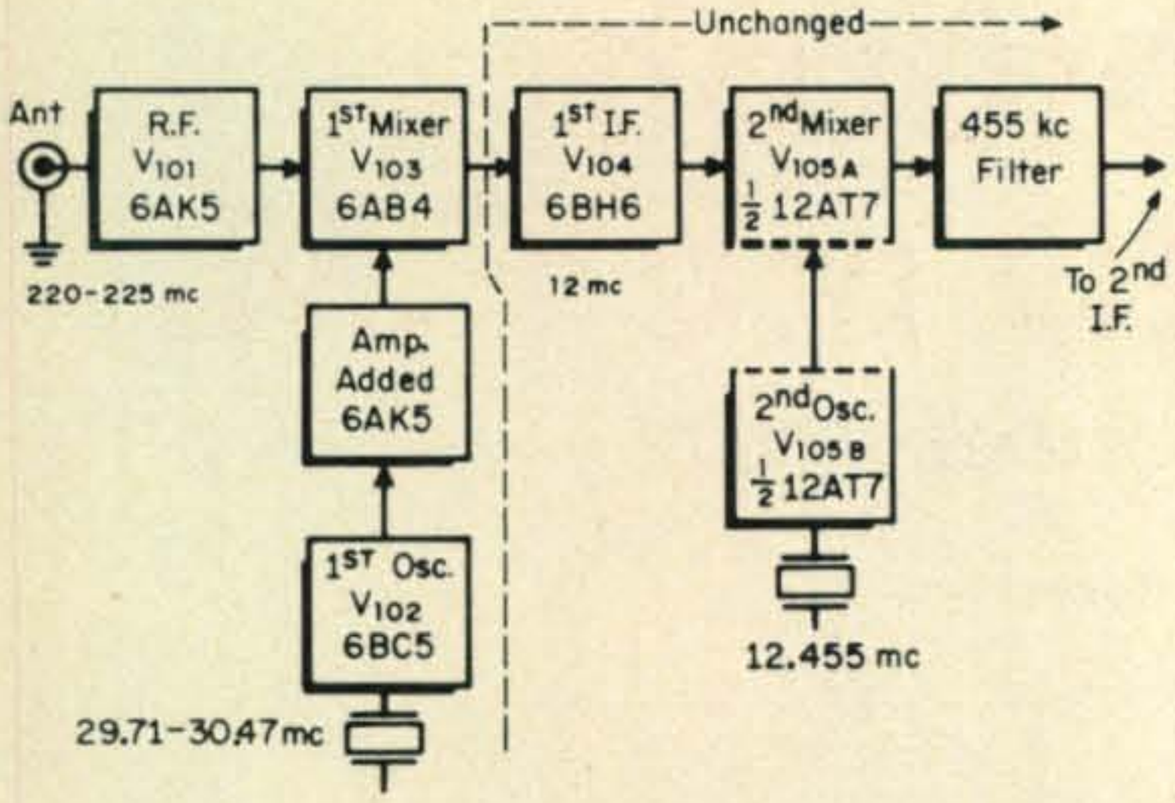


Fig. 1—Block diagram, modified front end of the "G" receiver strip.

of mobile sets in 10-inch cases. When provided with the TK-210 adapter chassis, or a K-9021 taken from a Unichannel strip, the "G" receiver will fit the —80D assembly, and then is easily rack mounted with simple L brackets on each end. What makes this receiver so suitable for 220-225 mc operation? It is its 12 mc 1st i.f.; *and,* its designer's special attention to image ratio. Sure, the image falls into the TV band, but even when converted to 220/225 the image ratio unexpectedly turned out to be better than extra good. This approach of direct modification, with the "G" receiver, appears to be ideal, especially for mobile operation.

The "G" Strip

The correct nomenclature of the "G" receiver strip is TA-140-( ) or TA-161-( ). The parenthesis describes the various versions. Early versions had a 12AT7 as the 1st oscillator/multiplier. Later versions have a 6BC5 in this position. The latter is the one we used for conversion to 220/225. Specifically, it was single frequency and it carried the number TA-140-BWH7. (It was narrow band so we wide-banded it, using a TA-145 filter.) On its original operating frequency, about 152 mc, it measured 0.5 microvolts for 20 db quieting after wide-banding.

The 225 mc Motorola "G" receiver strip, mounted in an adapter chassis fitted with rack mounting angles.

Equipment Required

At this point let us make one thing perfectly clear: This is *not* the kind of project to be attempted by a Novice or appliance operator on the kitchen table. Any Technician, worthy of that grade of license, should be able to do this—with the proper equipment. No machine shop is necessary. As a matter of fact, there are no holes to be drilled; and, no rat-tail file is needed. It is recommended that a 25 watt pencil and a 100 watt iron be kept heated up. (No soldering guns!) A good signal generator is required, such as a Measurements Corporation Model 80 or a Hewlett Packard 608. A test set[1] is needed to watch the discriminator and the limiter (pin 2) current. A multi-meter, clipped across the voice coil leads, is necessary to be able to find the 20 db quieting point, the final indication of success, or at least progress towards that goal.

Theory of Operation

The original "G" receiver covered 152 to 174. The 1st oscillator injection was on the low side, 140 to 162, for the generation of the 1st i.f. of 12 mc. The crystal, of the 3rd mode type, is in the range of 28 to 32.4 mc, therefore the 5th multiple was used for injection. A 6BC5 tube is used in a very complex, but very effective, circuit which is easy to adjust. The inductance L_5 is adjusted for maximum output, as indicated on position 6 of the test set, then the receiver is jockeyed on-frequency by variable capacitor C_{110} without substantially affecting the output. The plate circuit of the 6BC5, L_6, was tuned to the 5th multiple. Because the 6BC5 is a pentode, the adjustment of the plate circuit is virtually independent of the oscillator circuit itself. A second tuned circuit, L_7, further filtered the 5th harmonic output of the oscillator, (this reduces spurious responses), and by means of the ratio of the two capacitors C_9 and C_{10}, provided output at the low impedance required for cathode injection into the 1st mixer, V_{103}.

[1]Kretzman, B. H., "A Test Set for FM," *CQ*, Nov. 1963, P. 74.

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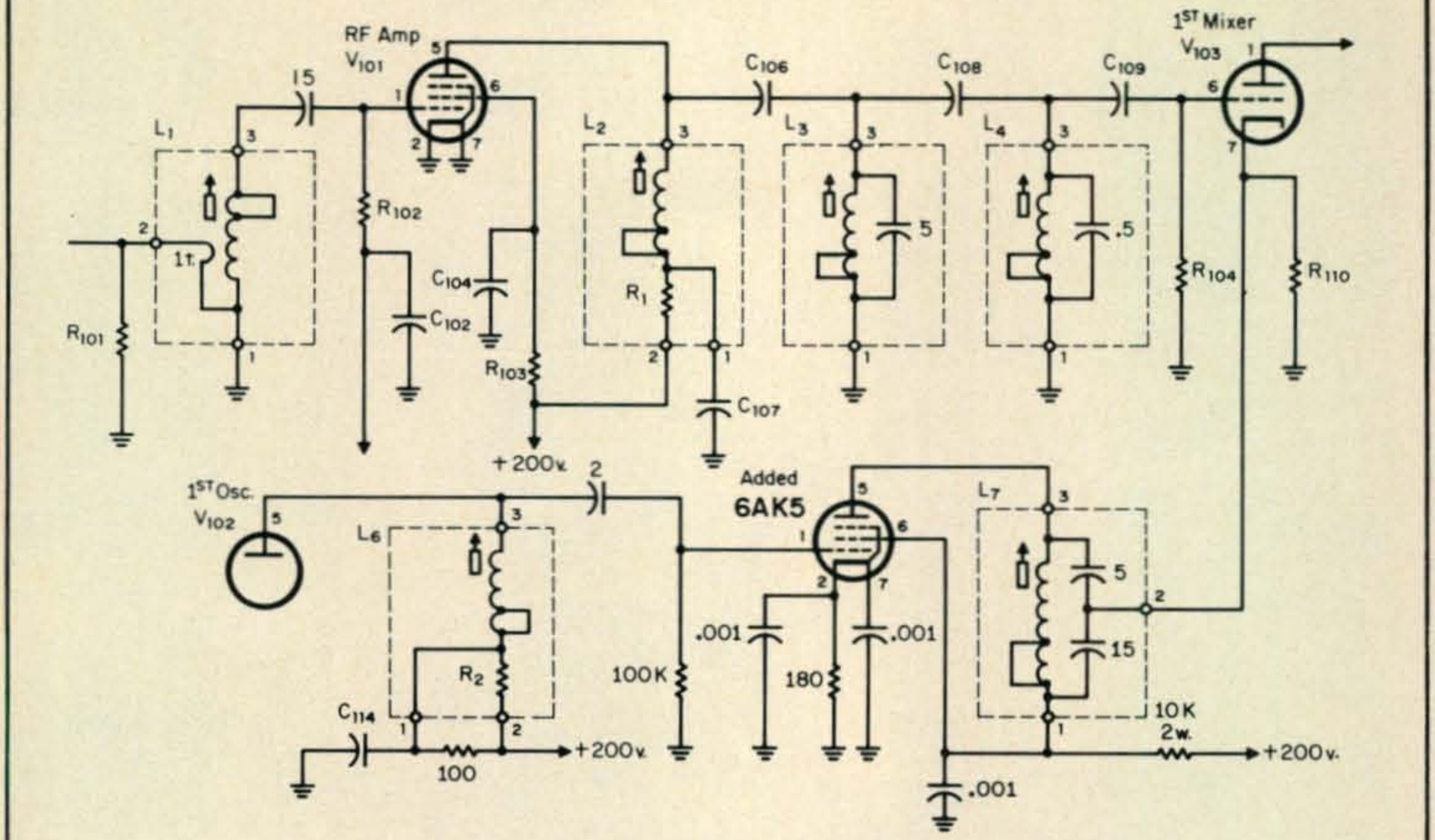


Fig. 2—Schematic diagram showing receiver changes.

Figure 1 is the block diagram of the front end of the "G" strip as modified for 220/225. All of the changes take place in the front end of the receiver. No changes were made beyond the plate circuit of the 1st mixer, V_{103}. No change was made either in the actual 1st oscillator circuit, except to its plate circuit L_6, now tuned to the 7th multiple. The 7th multiple was utilized mainly to keep the crystal frequency making it unnecessary to modify that circuit.

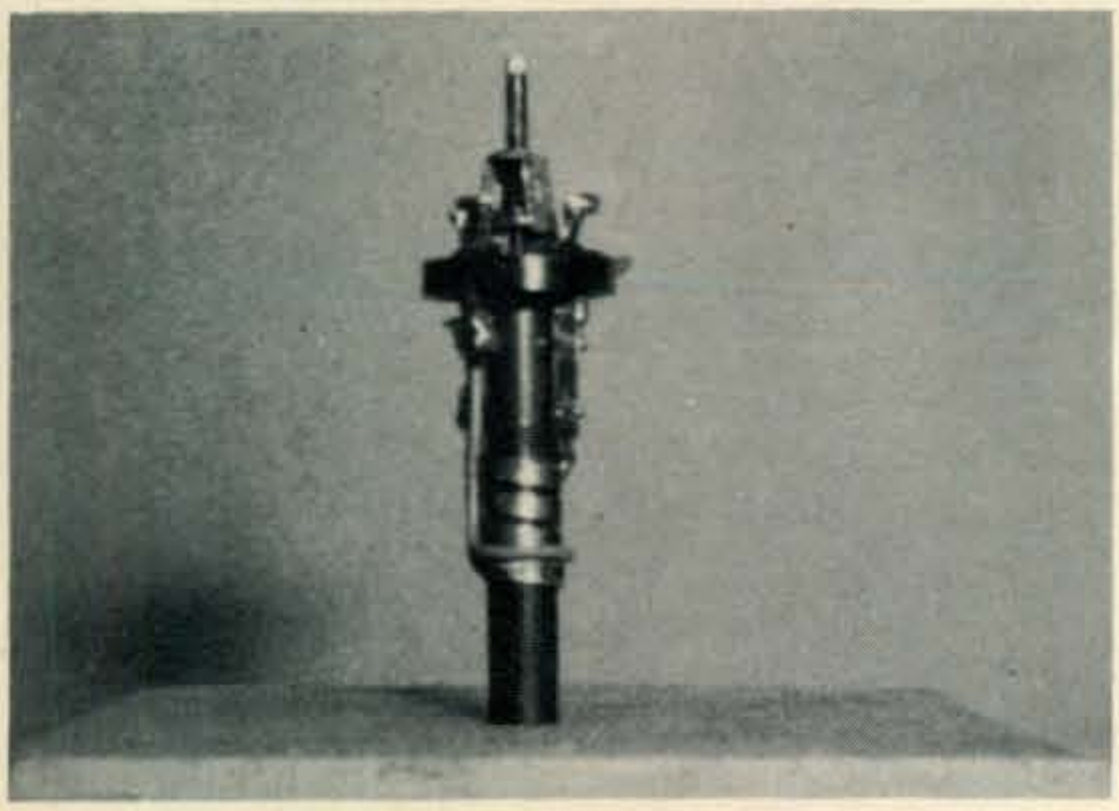
A commercial grade crystal, for oven operation, should be ordered and used. When ordering, refer to the Motorola crystal type number RM-10. To calculate the crystal frequency, f_x:

$$f_x = \frac{f_c - 12.00}{7}$$

where f_c is the carrier frequency in mc. For example, if the operating frequency is 224.94 mc:

$$f_x = \frac{224.94 - 12.00}{7} = 30.42 \text{ mc}$$

Use a gold oven known to be good, if possible. Check it to see that it cycles. (A stuck thermostat can ruin your crystal.) A black oven can be used, but check that thermostat.



The r.f. amplifier grid coil. Note the single turn antenna coil at the bottom end, the cold end of the grid coil.

Modifications

Of course the amplitude of the 7th multiple is far less than that of the 5th as used in the original receiver. This was solved by the addition of a 6AK5 injection amplifier between L_6 and L_7, the two multiplier circuits. (See fig. 2, the schematic diagram of the modified front end.) This is extremely simple to do because the receiver chassis is punched for 2-frequency operation even though only the single frequency components are installed. The second oscillator tube hole, marked V_{201} on the chassis, is where the 7-pin miniature tube socket for the added 6AK5 is installed. Very convenient. This stage then brings the level of the 7th multiple, 208 to 213 mc, up to

[*continued on page 96*]

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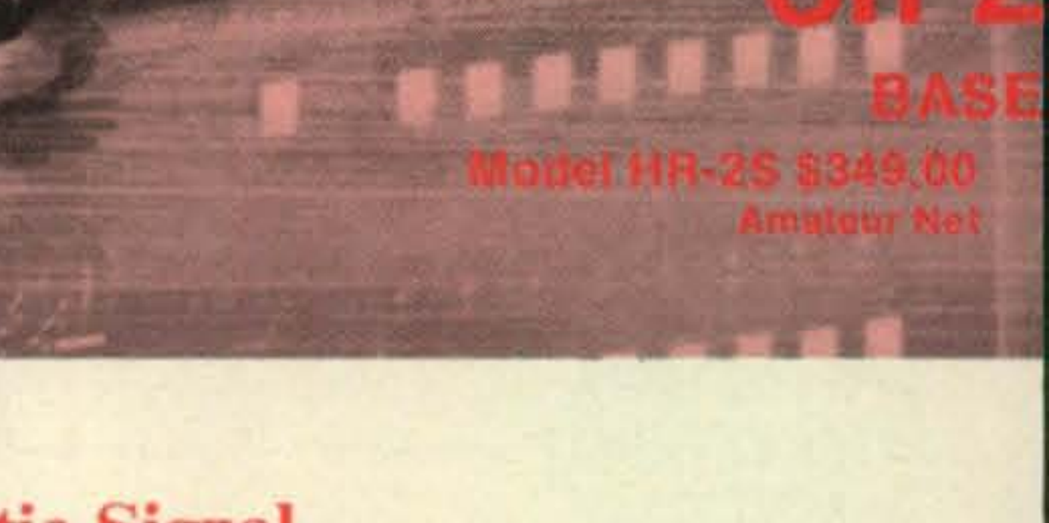

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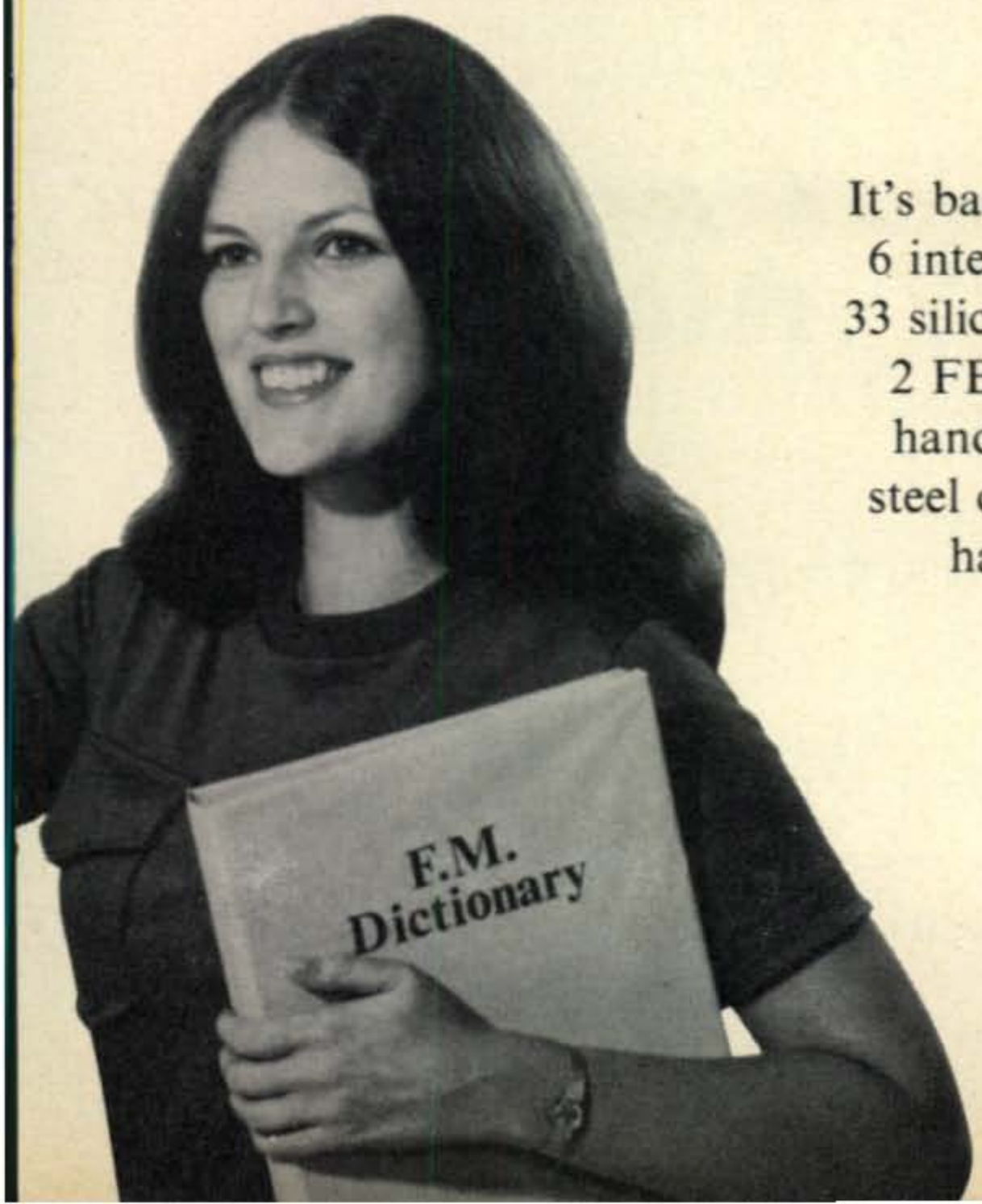

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The Second Coming of the Argonaut

BY JACK BIRCHFIELD,* K4DCD & ALBERT KAHN,† K4FW

Long-time readers of CQ will recall the original "SSB Argonaut" built by W6AVA for W6UOU in 1957 and sent around the world in an effort to give many DX stations an opportunity to put their country on the air with the then-new mode of s.s.b.[1] It is fitting, therefore, that a new low-power portable s.s.b. rig under development at Ten-Tec, Inc. should also be dubbed the Argonaut. The following article describes the development of the rig from an engineering and design standpoint. Note that this is not a review. The product will not be available for testing for a few more months, but we felt that there was strong reader interest in the thinking that goes into the eventual release of a new piece of gear.

In today's highly mobile society, the need for a small, light, portable rig is rapidly increasing. Reciprocal licensing, low-cost travel trailers, popularity of camping, proliferation of summer (and winter) homes all call for personal ham gear that is easily set up and takes little space.

For emergency service, stand-by equipment that can operate independently of commercial power is often a lifesaver.

Low power operation (QRP) is a growing facet of Amateur radio. Thousands of hams are finding an exciting challenge in conquering distance with a few potent watts.

With these applications in mind, work started several years ago to create an entirely new miniaturized transceiver that would be (1) ultra-compact, (2) easy to service, (3) operable on s.s.b. and c.w., (4) usable at maximum power that can be reasonably supplied with a 12 volt lantern battery, (5) to operate on the ham bands, 80 through 10 meters and (6) to include features that make operating easy and convenient. The Argonaut fulfills these objectives.

Mechanical Considerations

The output stage presented the most serious problem in total miniaturization, due to the size of the variable air capacitor and the placement of the panel controls. Through the encouragement and help of the RCA engineering department, a broadband final amplifier was developed. Surprisingly, the efficiency compared favorably with a tuned unit —and it was as clean. Just for insurance, however, a TVI filter was designed in to prevent any spurious signals generated in the driver stages from causing any difficulty. With 12 volts input the amplifier loads nicely at 5 watts input.

There are certain areas of miniaturization that can be a detriment. These we tried to avoid. The front panel for instance.

A person's hands need space. Controls should be optimumly located for conven-

The Argonaut s.s.b. transceiver by Ten-Tec.

*7609 Konda Dr., Knoxville, Tenn. 37920
†Old Cartertown Rd., Gatlingburg, Tenn.
[1]Ted Henry, W6UOU, "Adventures of the "SSB Argonaut," *CQ*, May 1960, p. 40.

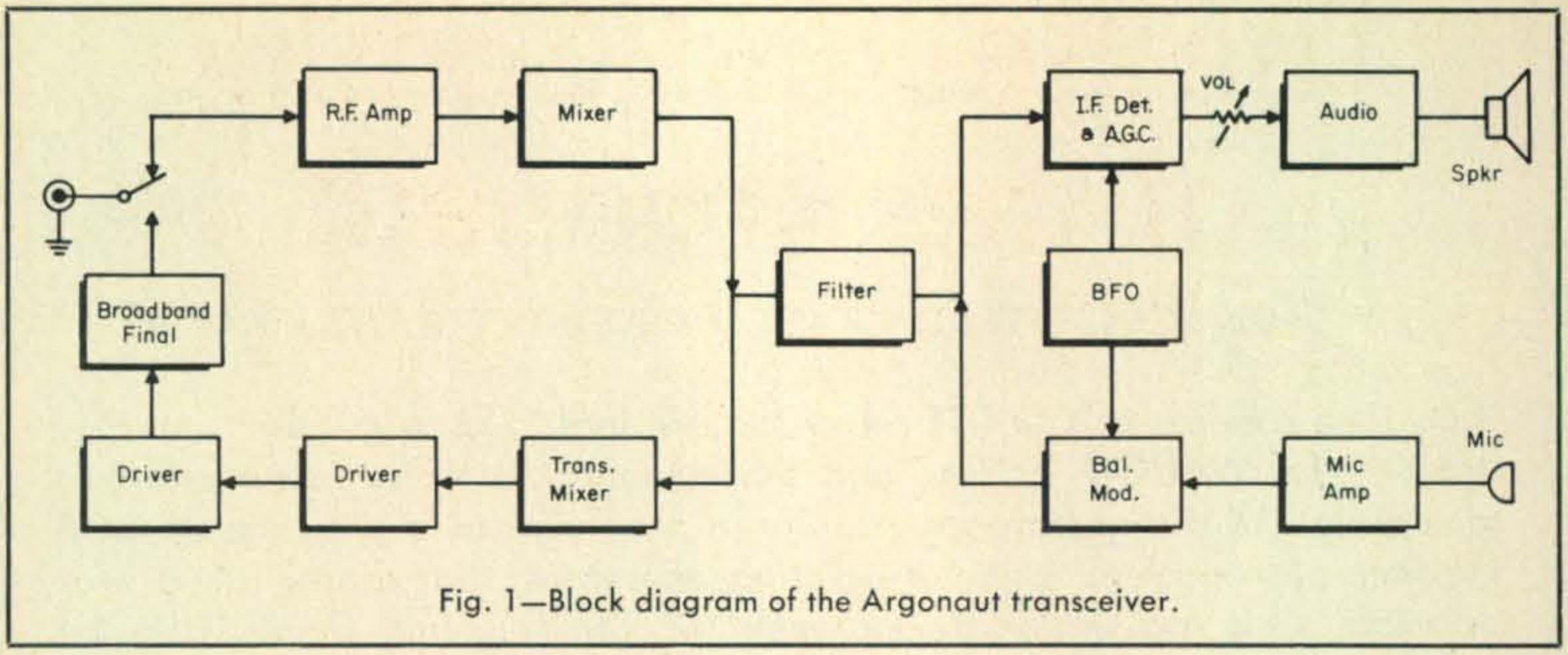


Fig. 1—Block diagram of the Argonaut transceiver.

ience. Dials should be easily read. Accordingly, the geometry dictated a nearly full size front panel, the space saving in depth.

The compact layout meant stacking circuit boards. With conventional inter-wired boards, servicing would be difficult and tedious. A perfect solution was found by designing plug-in boards so that all circuits are accessible. As by-products, field service is minimized and manufacturing done more efficiently.

Circuit

The Argonaut is a single conversion transceiver designed around a 3 mc crystal filter. Figure 1 shows a simplified block diagram of the general circuit layout. The only common elements in the transmit and receive modes are the main oscillator, (v.f.o.), and crystal filter. All switching from transmit to receive is accomplished by applying bias to all the transmit stages or to the receive stages. This method has several advantages. It reduces the standby current drain when receiving and eliminates the usual relay with possible contact trouble and clatter.

The only relay is an r.f. reed relay for switching the antenna from receive to transmit. This allows instantaneous c.w. break-in operation. All stages in the receiver and transmitter are gang tuned by ferrite slugs actuated by an integral molded rack and gear.

Tunable Oscillator

The heart of any transceiver is the main oscillator. In the Argonaut it had to be compact without sacrificing reliability, smooth tuning action and linearity. Linearity on all bands was particularly important so that one slide-rule dial scale reads kc directly. A circular dial below reads 0-100 kc. This construction allows considerable space saving, yet gives the operator a "big set" feel.

With single conversion the mixer injection is at the operating frequency. Consequently, it is difficult to provide identical linear tuning on all bands with this required change in injection frequency without the use of a "premixing" system. The solution was found by using sub-multiples of the injection frequency and shifting the frequency of the v.f.o. Thus, the v.f.o. operates over a narrower range.

The v.f.o. output is then multiplied to the necessary injection frequency. The multiplier output circuits are switched along with the v.f.o. to provide the proper injection frequency. The multiplied output is double tuned to eliminate harmonics and to provide a constant injection voltage across each band. Table I shows the injection frequency, multiple and v.f.o. frequency.

By running the v.f.o. at the frequencies in Table I the linearity can be better than ± 5 kc on 80 through 15 meters and not greater than ± 10 kc on the 10 meter band. However, the entire 10 meter band 28.0-30.0 mc can be covered without additional crystals. This greatly simplifies the dial treatment and enhances the readability of the frequency.

Table 1—Injection Frequencies vs. VFO Frequencies

Band	*Injection Freq.*	*Mult.*	*VFO Freq.*
80	12.5-13.0	×2	6.25 -6.5
40	16.0-16.5	×3	5.333-5.5
20	5.0- 5.5	×1	5.0 -5.5
15	12.0-12.5	×2	6.0 -6.25
10	19.0-21.0	×3	6.333-7.0

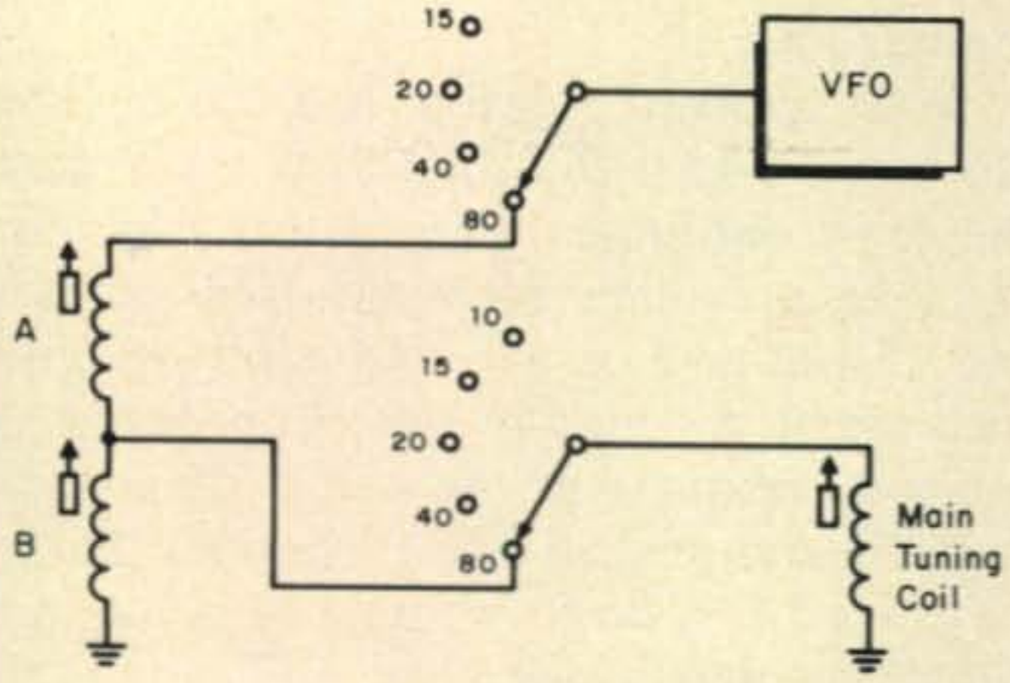


Fig. 2—V.f.o. frequency is shifted to the desired ranges by adding a combination of series and parallel inductances to the main inductor which is permeability tuned through the v.f.o. tuning dial. Different A and B inductances are switch selected for each band.

The round dial is calibrated directly in kc from 0-100. The horizontal slide-rule dial uses the conventional 0-5 markers to indicate which 100 kc segment of the band is being tuned. Ten meters is calibrated separately and covers the range of 28-30 mc. On this band the 0-100 dial will actually read 0-400 kc. This dial is a planetary drive, friction driven from the main shaft and can be precisely calibrated by checking with a frequency standard and the dial rotated to correspond.

The v.f.o. was designed around a permeability tuned coil. Band switching is accomplished by switching an auxiliary coil across the main coil and another in series as shown in fig. 2.

Adjusting both coil A and coil B will set the tuning range and frequency. The powered iron core is driven by a threaded shaft. This is coupled to the planetary speed reducer and results in 25 kc per revolution of the knob.

Receiver

Dual-gate diode protected MOSFETs are used in both the receiver r.f. and mixer stages. The advantages of low noise and efficiency have been covered frequently in past articles. The filter is a four-crystal cascade half-lattice type. It provides a pass band of 2.5 kc at 6 db down points and a 6/50 db shape factor of 1.7. While not the ultimate in selectivity, on-the-air tests prove it to be more than sufficient for reliable communication.

I.F., Detector, A.G.C. and Audio

A single stage bipolar i.f. amplifier feeds another dual-gate MOSFET as a product detector. The detector output is amplified by a three-transistor high gain audio pre-amplifier. The audio derived a.g.c. is taken from this output and controls the r.f., mixer and i.f. stage. The a.g.c. has a fixed fast-attack, slow-decay operation. The point at which the a.g.c. "takes hold" may be varied with the manual r.f. gain control. The a.g.c. figure of merit (the change in input voltage for a 10 db change in audio output) is over 100 db. The audio amplifier drives a self-contained loudspeaker to 1 watt at 2% distortion.

Transmitter

The carrier generator is crystal controlled. Transistor switches select capacitors in series with the crystal to place the oscillator at the proper frequency for u.s.b., l.s.b. and c.w.

The balanced modulator is designed around an integrated circuit differential amplifier. This type of circuit has an excellent balance. All the transistors that make up the differential amplifier are on the same silicon chip. This insures that all the transistor parameters are identical. This type of balanced modulator will hold characteristics quite satisfactorily over a range of supply voltages, input variation and temperature.

The output of the crystal filter and the main injection oscillator is combined in another integrated circuit differential amplifier used as a balanced mixer. The differential balanced mixer is excellent for the suppression of spurious signals. The output is brought to approximately ½ watt by two tuned driver stages. Between the mixer and the final amplifier are three tuned circuits. These tuned circuits aid in further suppression of any spurious signals.

Final Amplifier

The final amplifier is a broad-band design. It will amplify any signal between 3 and 30 mc. It is, therefore, important that all driver stages and mixer are clean. The final output is designed for a 50-75 ohm load. This type of final amplifier has several advantages. It is extremely compact, complicated band-switching and tuned circuits usually found in transistor power amplifiers are eliminated and transceiver tune-up and band-changing are simplified. In addition, the final amplifier may be placed in a convenient location in the transceiver instead of being tied to the usual controls.

Information on the operation of transistors for linear power amplifiers is very

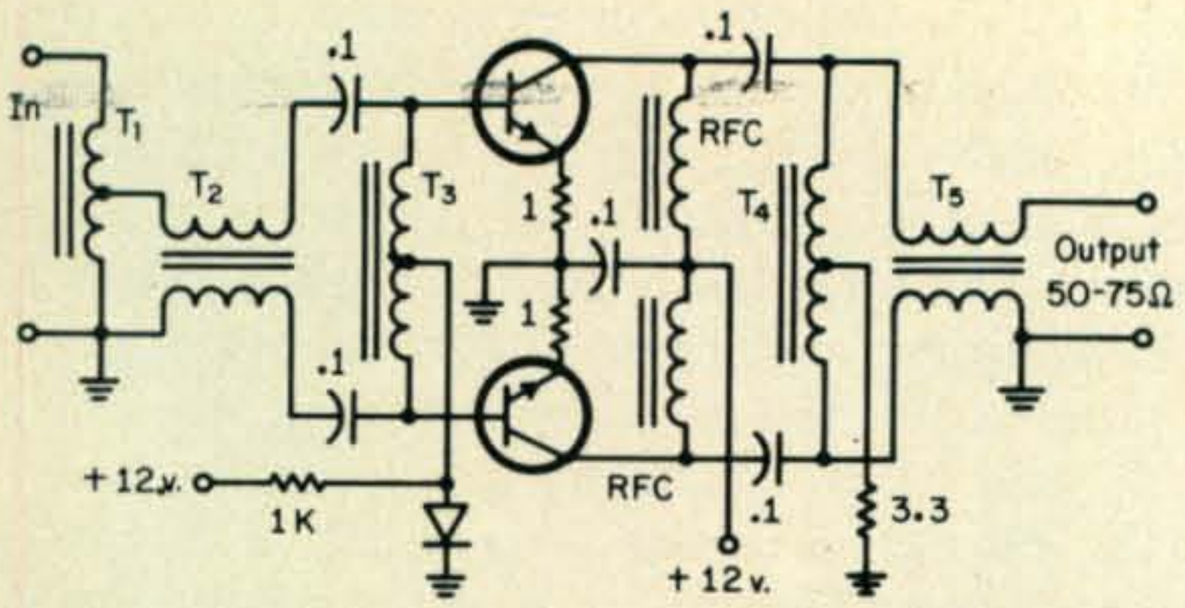
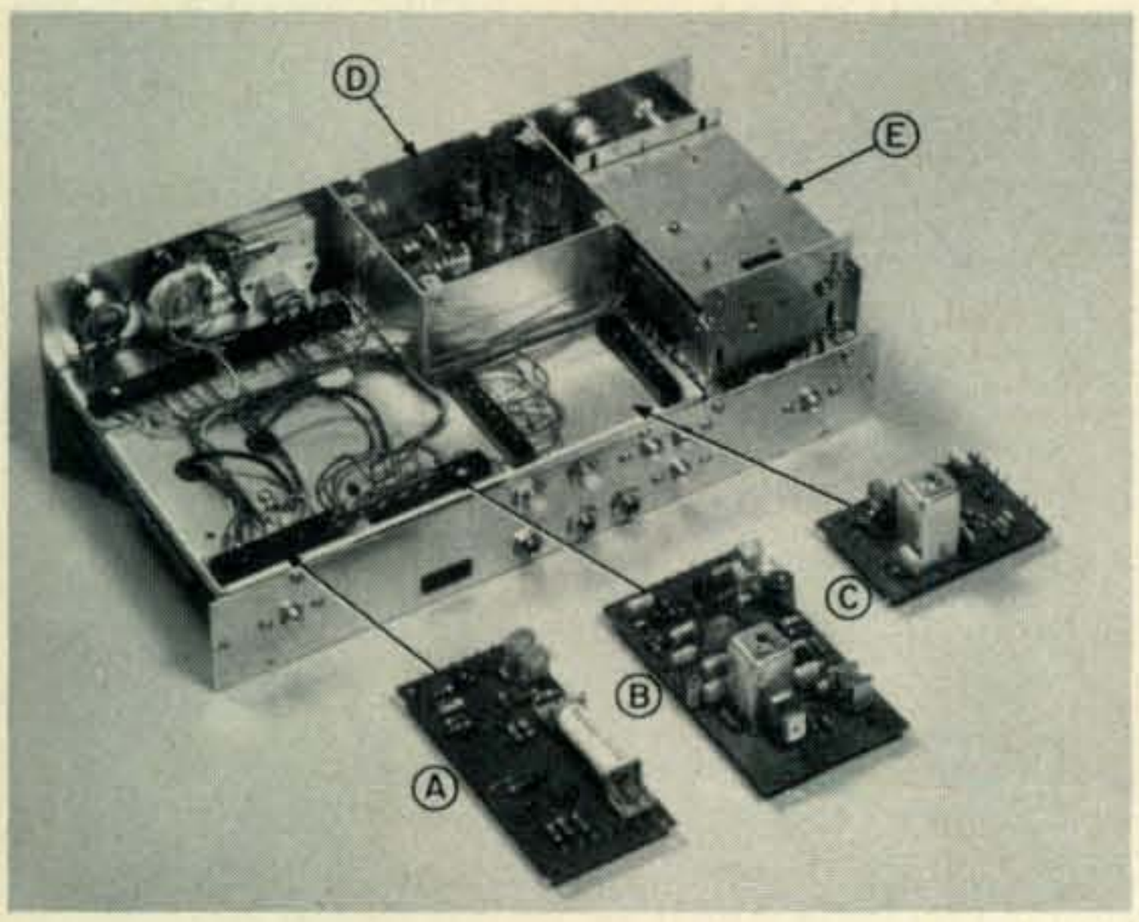


Fig. 3—Circuit of the broad band final amplifier used in the Argonaut. T_1, T_2 and T_3 are 20 t. twisted #32 bifilar wound on an Indiana General CF102 toroid. T_4 and T_5 are 15 t. twisted #28 bifilar wound on a CF108 toroid. *RFC* is 25 t. #28 on a CF102 toroid.

sparse. In general, the output transistor should be capable of a slight forward bias, necessary for linear operation, without catastrophic failure. It should also have a linear gain with respect to the final current. Tubes are usually capable of greater power output in the s.s.b. mode than in c.w. Transistors are just the opposite. It is generally possible to obtain several times as much power in c.w. than s.s.b. This is due to the lack of sufficient current in the device to handle high peak. The distortion products increase rapidly as current saturation is approached. When the transistor is overloaded in the c.w. mode this current saturation does not affect



The Argonaut s.s.b. transceiver soon to be released by Ten-Tec. (A) Control board contains antenna relay, regulated power supply, transmit-receive changeover, S-meter and receiver offset tuning circuits. (B) S.s.b. generator contains mic amplifier, balanced modulator, carrier oscillator, mode switching, and crystal filter. (C) Transmitter and receiver mixers. (D) Main v.f.o. compartment. (E) Rack drive for gang-tuning receiver and transmitter.

the performance. The schematic of the final is shown in fig. 3.

A word about the design may be of interest to those who would like to try it in some home brew equipment. Transistor input impedance usually runs between a few ohms to 10 or 15 ohms. For a broad-band design it is necessary to match this impedance to roughly 50 ohms over the bands of interest. This is accomplished with toroidal baluns T_1, T_2 and T_3. A large inductance is required for low frequency response and small distributed capacity for the high frequency response. Cores having high permeability, such as Indiana General Q1 material, should be used. The input transformers are approximately 20 turns of twisted wire on a CF102 toroid form. All transformers are bifilar wound to reduce stray capacity and insure balance. Step down transformer T_1 may or may not be necessary depending upon the transistor input impedance. The transistor output impedance is also relatively low. For amplifiers in the 5 to 10 watt class, the circuit shown should work perfectly. Transformers T_4 and T_5 are bifilar wound on the larger CF108 core. They will match the transistor to 50-75 ohm load over the bands of interest. For linear operation, the bias, a 1000 ohm resistor and a diode, should be adjusted for an idle current of 8 to 15 milliamperes.

The design parameters were pointed toward simplicity in operation. To provide features that were most desirable, but to eliminate those which might be a source of trouble.

Operation

To place in operation it is only necessary to select the mode and band, resonate a single control and select the frequency. On transmit, it is desirable to trim the resonance control for maximum reading on the built-in s.w.r. bridge. S.s.b. is actuated by a press-to-talk button on the microphone. C.w. instant break-in and side-tone are built-in. Incremental tuning is provided for reception to prevent "leap-frogging" when working other transceivers.

The Argonaut is designed to be powered by a 12 volt lantern battery or an a.c. pack. Battery life is indeterminate as the normal amateur operation is so intermittent. Preliminary tests indicate that several weeks operation of two hours a day can be expected.

[*continued on page 96*]

An IC Preamplifier for 6 Meters

BY ROBERT INDECH,* WA1MGV

Using a minimum of components the author constructs an effective 6-meter preamplifier which gives needed gain to the typical inexpensive receiver with the usual "token" 6-meter coverage. The resulting preamp is self-limiting for use in widely varying signal situations.

A COMMON difficulty in many receivers is providing enough gain on the v.h.f. bands. With this in mind, I set out to design a 6-meter preamplifier with the following characteristics: low cost, high gain, high selectivity and simplified construction.

The circuit, fig. 1 uses the RCA CA3005 integrated circuit as an r.f. amplifier in a differential amplifier configuration. Adjustable matching networks are included in the circuit. Design is straightforward. CR_1 and CR_2 are used as diode protection to bypass excessive input voltages to ground. C_1, C_2, and L_1 constitute the input circuit, whose impedance should match the antenna. C_3 and C_4 are bypass capacitors to keep r.f. out of the power supply. L_2 and C_5 constitute the 50 ohm output circuit. For easy construction, a dual power supply is used. B_1 and B_2 can be any voltage from 4 to 10 but 9 volts was chosen because batteries of this type are readily available. It is necessary to shield the input from the output to prevent self-oscillation.

Construction

The preamp is built on a 3" × 4" piece of single foil PC board with all components except C_3 and C_4, and the two coils on the top side of the board. On the foil side, a small 1" × 2¼" piece of copper clad board is soldered vertically across the narrow dimension of the main board at the mid-point to act as a shield. Button capacitors C_3 and C_4 are mounted on this shield. L_1 and L_2 mount on the main board from the foil side. Leads from components pass through holes drilled where needed on the larger board, with most interconnections being made below chassis. All grounds are made to the foil. One inch standoffs at each corner of the board facilitate mounting on the back of the receiver or wherever convenient. BNC connectors were used as input and output jacks.

As in all v.h.f. work, r.f. leads should be kept as short and as direct as possible, and actual board layout should be done with this thought in mind.

Adjustment Notes

L_1 is set for minimum inductance while L_2 is set near maximum. Using a grid dip meter, tune C_1, C_2, L_1 combination for resonance near 50.5 mc. This should correspond to about the middle of the C_1 tuning range. You will note that the tuning is very sharp and very selective. With L_2, C_5 is tuned to resonance (50.5 mc) at about the middle of its tuning range.

[*Continued on page 96*]

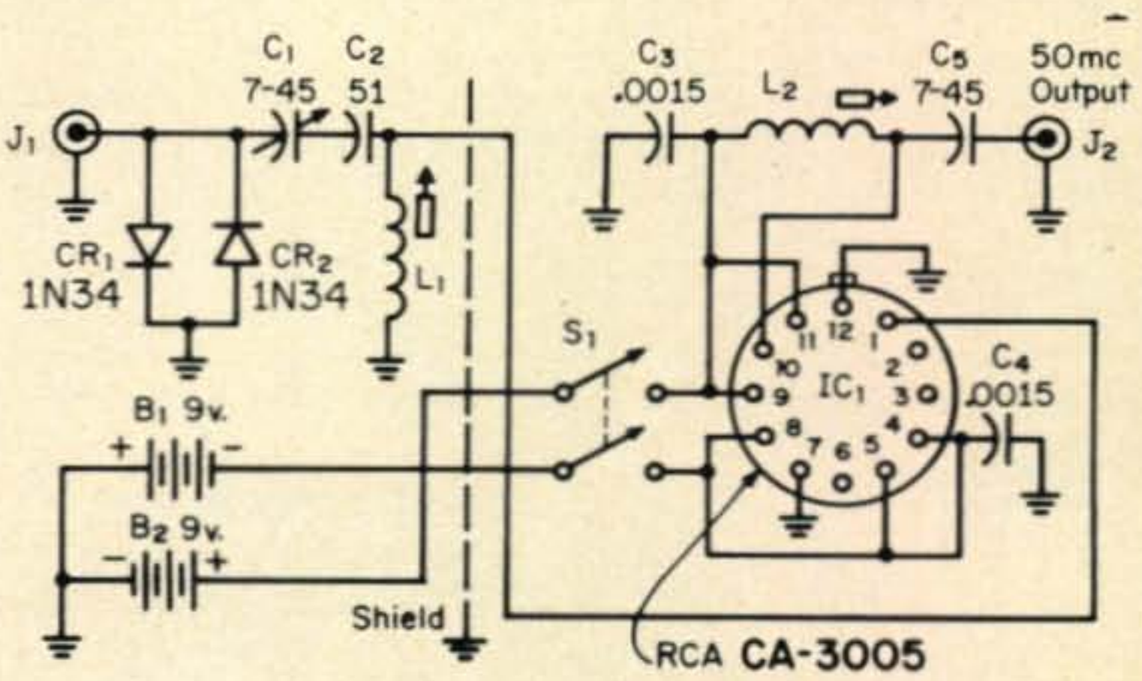


Fig. 1—Schematic diagram of the integrated circuit 6-meter preamp. Inductors L_1 and L_2 should be 0.2-0.6 μh slug tuned types, but the J. W. Miller 40A477CBI will do the job, though of a narrower inductance range.

*7 Lewis Drive, Randolph, Mass. 02386

Something To Think About

BY IRVIN G. KANODE,* WA9CKP

WHAT does the usual family do after the Silent Key notice appears in the local news? Do they lock up the shack and leave things as they were? Do they try to sell his things to the first buyer at whatever price they can get? Could they sell the gear at an auction and get anywhere near its worth? What would *your* family do?

It seems to me that each of us should make some kind of intelligent evaluation of this situation beforehand. We could prevent our family from becoming the victims of a very unfortunate situation. Most families know very little about what equipment is in the ham shack or its worth.

*158 West Indiana Ave., Nappanee, Ind. 46550

Here is a suggested plan. With an evaluation sheet, made up by yourself, the local Amateur Radio Club or some other interested organization, padded and in tablet form. Take a periodic inventory of the ham shack and make a fair assessment of the worth of each item. This should be done yearly if possible.

This paper should contain space for at least the following items as shown at fig. 1:

1. An identification number for each piece of gear.
2. What the item is, *i.e.*, receiver, transmitter, Teletype machine, etc.
3. Whether it was bought new or used.
4. The purchase price.
5. Date of purchase.
6. Amount still owed, if any.
7. Present estimated value and date.
8. Whether it is jointly owned with a friend, MARS, or other organization.

There should be space for the names of trusted amateur radio friends who would help the family appraise and sell the equipment. Place should also be provided to indicate what items might be given to some worthy organization, such as the local Amateur Radio club, Boy Scouts, etc.

Each item of any value in the shack should be given an identifiication number, preferably with a Label Maker, so there will be no confusion between items.

It isn't very pleasant to contemplate eventually being a Silent Key, but of course it is a certainty. That certainty is going to be difficult enough for family members to adapt to, so why add to their troubles. Besides, it's rather interesting, (though frequently staggering), to get an idea of the total dollar value of the shack. ■

INVENTORY OF RADIO EQUIPMENT:

Identification Number	Item	Bought New or Used	Purchase Price	Date of Purchase	Jointly Owned	Actual Cash Value-Date	Amount Owed

Items Jointly Owned: No. Joint Owner

No. Joint Owner

Appraisers: (friends who will help in the disposal of radio equipment)

Name Address Phone

Name Address Phone

Amount still owed on Equipment: To: Name Address

To: Name Address

Fig. 1—(Top) Suggested form for taking inventory of the station equipment and accessories. (Bottom) Suggested form for other valuable information about appraisers, joint ownership, and equipment not yet paid for.

Reclaiming Water Damaged Equipment

BY GLEN E. ZOOK,* K9STH

NATURAL disasters such as hurricanes produce a vast number of pieces of electronic equipment damaged by water. This equipment ranges from home entertainment equipment through two-way radio equipment to complex test equipment and electronic systems. Much of this equipment is disposed of by either the owner or, if an insurance claim is involved, by an insurance company for a small fraction of the original cost. With a little work, much of this equipment can be salvaged for use by amateurs.

Techniques

The salvage techniques used depend on the type of equipment involved and the type of construction utilized in original manufacture. In general, however, the equipment is usually of either the hand-wired or printed circuit variety. Both types can be reclaimed, but the starting techniques are somewhat different.

The first step in either case is to determine if the unit has been damaged by salt (or saline) water or by fresh water. If the unit has been in salt water it will usually be green in color. This is due to the reaction of the salt with copper producing green colored copper compounds. If the unit has been in fresh water it will usually have a coating of whitish or grayish particles. These are the result of the evaporation of the water leaving behind the various impurities dissolved in the water. These are similar to deposits in toilet tanks, etc. The salt water damage is the most difficult to correct, but it is not impossible. Fresh water damage is easier to correct, but may also prove troublesome depending on the length of time since immersion.

In the case of hand wired equipment, such as older f.m. communications equipment, the first step consists of several trips through a dishwasher. If a dishwasher is not available, then a series of sprayings with a garden hose and detergent will have to suffice. After the greatest possible amount of corrosion has been removed, a long bake in an oven at 150°F. is needed. An understanding XYL is helpful at this point. After several hours of baking the unit can be removed and examined. Troublesome rust spots can be removed with emery paper or sand paper. Any remaining deposits can be removed with a toothbrush and vinegar followed by cleaning with Formula 409 cleaner. The entire chassis should then be sprayed with a clear plastic such as clear Krylon. The unit can then be tested and any damaged parts be replaced. One thing to note is that many component leads are now made of iron rather than copper. Thus, some resistor, capacitor, and transistor components may have one or more leads rusted away, thus requiring immediate replacement.

Printed Circuits

In the case of printed circuit equipment, there are two possible routes to take, depending on the size of the equipment and how the boards are mounted. If the item is small, such as a piece of portable f.m. equipment, it is possible to hand clean only, thus eliminating the dishwasher sequence. If the unit is large it may be broken down by removing the individual circuit boards for hand cleaning. If the unit cannot be broken down, it will be necessary to start with the dishwasher-oven treatment described above. Since there are three different types of circuit board material in use, it is necessary to identify each type. The first type is usually a green colored epoxy board often referred to by the military designation G-10. Not all epoxy board is really G-10, but they can be treated the same. The next type of board is a phenolic board usually brown in color and called XXXP. The third type of printed circuit material is a pressed paper board. This board is usually very light in color.

The epoxy type of board is virtually in-

*818 Brentwood Lane, Richardson, Texas 75080

destructable. This type of board may be first cleaned by a solution of acetic acid. A commercially available source of acetic acid solution is found at the corner grocery store. It is called apple cider vinegar. The use of the vinegar solution as applied by a toothbrush and elbowgrease will neutralize and remove most of the deposits from the circuit board. Next should follow a spraying with Formula 409 and another scrubbing with a toothbrush. Then rinse in clear water and bake in an oven at 150°F. for two or three hours. After the baking brush the entire board with a dry toothbrush and spray all sides and edges with clear Krylon. Then make any repairs or parts replacements. Clean up any solder joints with a good flux remover and respray with clear Krylon. In cases where the deposits on the G-10 are very bad and are inaccessable, it is possible to soak the board in the vinegar solution for several hours without severe damage.

Other PC Board Types

In the case of Phenolic boards, the same procedure as used with G-10 can be generally used. However, care should be taken when soldering or unsoldering components, for XXXP board will lose its plating and eyelets with the application of too much heat. Also, if the board is soaked in vinegar, it should be inspected regularly to prevent damage by the solution.

In the case of pressed paper boards, be prepared for possible loss. These boards are very cheaply made and lose their plating very easily. However, they can be cleaned in the same manner as G-10. But, do not soak the board. Any serious problems with deposits will have to be eliminated with elbow grease and/or a sharp object used for scraping.

All switches and controls should be cleaned with a good contact cleaner. Bad or suspected bad controls should be replaced immediately.

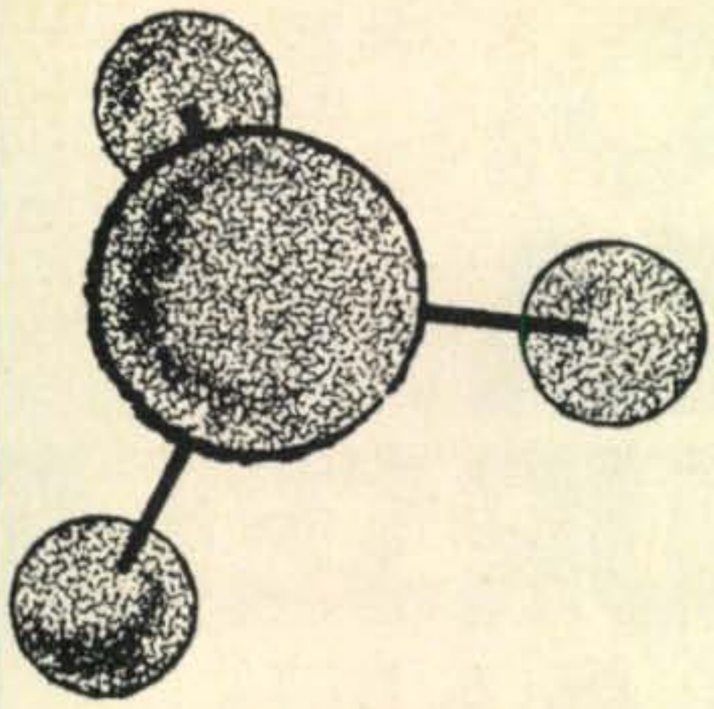
Cabinets, if made of metal can either be replaced or sanded down and repainted. Plastic cases can be made to look like new if cleaned with Formula 409 and a toothbrush followed by a coat or two of clear Krylon. Knobs and other decorative items can either be replaced or cleaned with Formula 409 followed by Krylon. R.f. connectors can be cleaned by immersion in any of the commercially available silver dip type polishes. Severe cases may require a follow-up brushing with a toothbrush, but the connectors will look like new when complete. Relays usually will have to be replaced.

The author has no personal interest in either company involved in the manufacture of Formula 409 or Krylon. These are the two products commonly available which do an excellent job in the reclaimation of water-damaged equipment. The Formula 409 removes much dirt and chemical residue while the Krylon protects from further oxidation and improves the looks of the item.

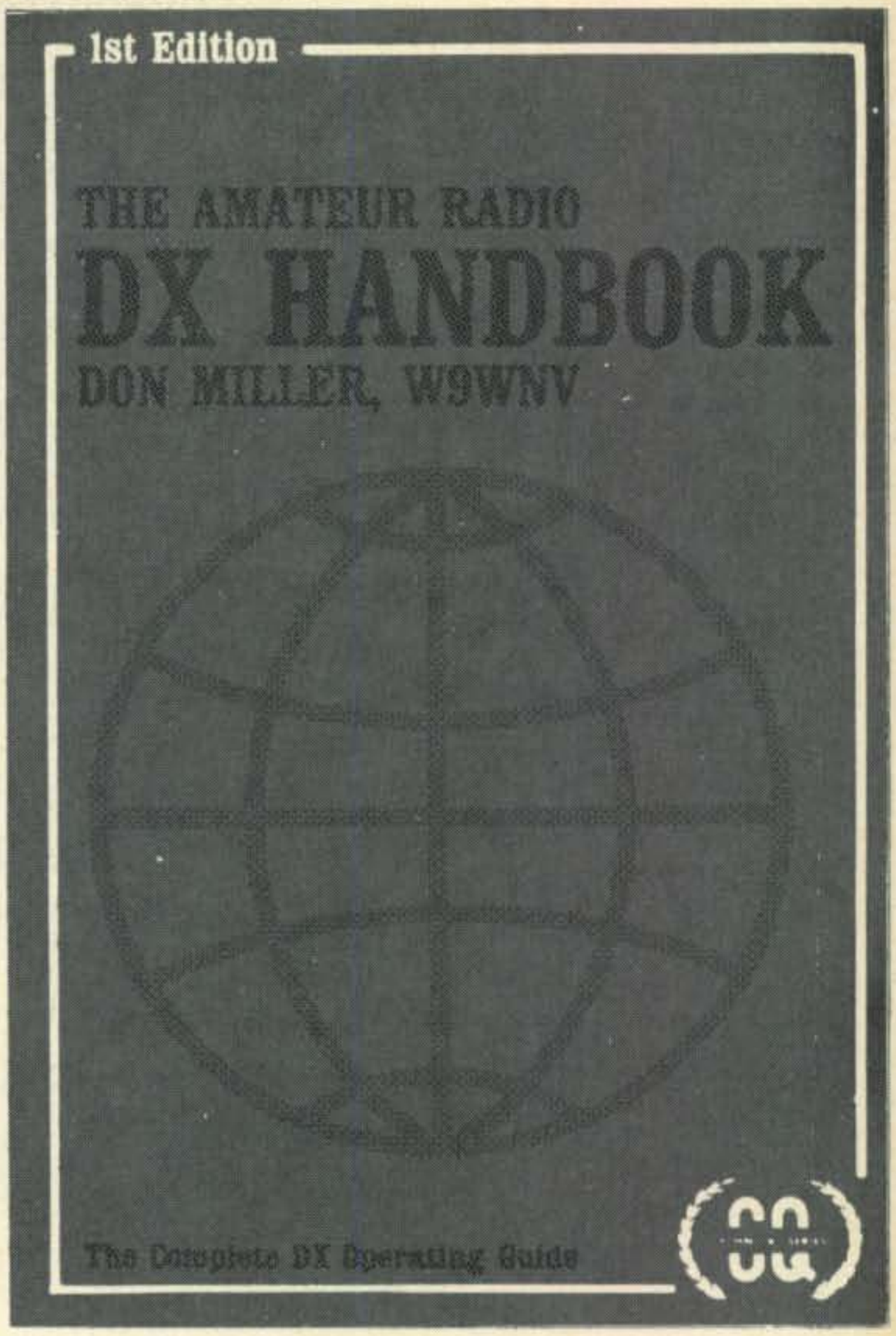
Results

A good example of the use of these techniques to salvage a unit is a particular Motorola Pageboy f.m. paging receiver which was dropped into a paper pulp vat containing among other things sulfuric acid. The unit was in the bath for approximately one hour, then was rinsed off in a bucket of water and placed in the mail. The mail transit time was over three days, thus allowing the acid to do as much damage as possible. After cleaning and spraying the unit required only the replacement of one switch and one volume control. After several days of checkout the unit was returned to commercial service where it still is, five years later! Other units deliberately damaged by salt-water during union-management difficulties have also been salvaged and returned to commercial service.

Thus, if the amateur is willing to expend a little time and effort in the reclaimation of water damaged equipment he can obtain at a very small cost equipment costing hundreds and even thousands of dollars to the original owner. Amateur f.m.'ers can obtain Motracs, Masters, and other up-to-date f.m. equipment which are only available presently at commercial prices. Experimenters can obtain expensive test equipment. Even Hi-Fi bugs can add to their collections. The thing to remember is that water-damage is serious, but it is not always permanent. ■



WHAT'S TO KNOW ?



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DX

BY JOHN A. ATTAWAY,* K4IIF

THIS column should reach you just about in time for the *CQ* Worldwide DX Phone Contest. The DX department *hopes* to be out in force, with K4IIF, W4DQD, and possibly K4DSN activating VP5JA from the Turks and Caicos Islands, while Jerry Hagen, WA6GLD, goes solo from just up the line in VP7-land. Larry, W4DQD, isn't actually a member of the DX department, but he agrees with us on most things except incentive licensing so hopefully he won't be insulted.

Speaking of WA6GLD, Jerry has been doing such a terrific job managing WPX, the *CQ* C.W. DX Award, and the *CQ* S.S.B. DX Award, that he has been promoted to Assistant DX Editor. In the future he will periodically give yours truly a rest by preparing a monthly column with an interesting west coast flavor. His first effort will be in the next issue.

De Extra

The Commemorative Prefix Problem—Does a problem exist? We at *CQ* have been highly pleased by the increasing number of new stateside prefixes to commemorate special events of local interest as they give enthusiastic prefix chasers more new ones to fight over. However, it may be a two-sided coin as the following comments from a gentleman on the WPX Honor Roll well illustrate:

"The recent rash of commemorative prefixes is driving me up the wall. Many of the stations using these exotic new calls make no advance announcement of dates and frequencies which makes it a needle in a haystack proposition to work them. Some get a fancy prefix, the only one of its kind ever heard, and then never use it at a time when people can get on the air to work them. For example, one fellow came on 21 mc during weekday afternoons when most everyone was at work, and then disappeared over the weekend. Others spend all their time ragchewing and never seem to realize how many people would like to contact a station with a unique prefix.

"Another complaint is the QSL habits of some of these stations. Although most stateside commemorative stations have special cards which they circulate widely with great pride, many of the overseas stations with new and rare prefixes do not QSL at all. I have been particularly frustrated by some of the stations who use special calls in the DX and WPX contests. Some of these have rebuffed all of my s.a.s.e's, postage stamps, IRC's and all other tools for extracting cards."

We can certainly sympathize with the writer as some of us on the staff are also enthusiastic prefix chasers. Unfortunately many holders of these new calls are not DXers, aren't familiar with pileups, and don't realize how many people are eagerly seeking QSO'S with them. They're hiding their light under a basket without intending to do so. With time and experience this condition will hopefully improve. Those who don't QSL are another and much deeper problem.

160 Meter News

FLASH—New 160 Meter Distance Record With Alaska to Antarctica QSO: On July 16, 1971, two s.s.b and c.w. QSO's were completed between KL7HEE and VP8ME at Byrd Station, Halle Bay, Antarctica. KL7HEE was running 100 watts d.c. input to a 1/2 wave inverted L at 90 feet. The frequency was 1815 kc and both stations were Q5. No data is available on the rig and antennas used by VP8ME. Hearty congratulations to two outstanding DXers for a remarkable achievement. (*Tnx W1BB*).

Another outstanding example of summer-

Sam, MP4TDM, is the only licensed station in Ras Al Khaimah which may soon be independent. He is originally from Wales and expects to be in MP-land for 16 months working in electronics for the government. *(Photo courtesy K1DRN, QSL Manager for MP4TDM).*

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

Hassan, FL8HM, skeds Charlie, K4SKI, every Saturday at 0300 GMT. A well-worded note to Charlie just might get you a QSO with French Somaliland and another rare one confirmed. *(Photo courtesy K4SKI)*

The WPX Program

SS.B. WPX

628	WA3LRJ	633	K1DRN
629	KC6RS	634	W9OKL
630	VE3EAC	635	WA5YAS
631	K8TMK	636	K4FTY
632	K2LQQ/TF		

C.W. WPX

1120 ZS5SY

Mixed WPX

296	W6ANB	298	K8QYG
297	W6FET		

WPNX

36	WNØABK	37	WN9DOF

VPX (S.S.B.)

36 DE-E14/17549

WPX Endorsements

S.S.B.: IØAMU—750, K1SHN—700, I8KDB—700, K2POA—600, DA1QP—550,W4WSF—500, W3YHR—350, DK2BM—300, and K2DNL—250.

C.W.: W2HO—850, W2GA—550, and WA3CSF—400.

Mixed: W9DWQ—1000, YU1AG—850, K8UDJ—600, WA6TAX—550, K2DNL—500, and W2MB—450.

80 Meters: K4CIA

20 Meters: W8GKM

15 Meters: W4WSF and WA2EAH

10 Meters: K8UDJ

Europe: K8UDJ

Oceania: WA6JVD

South America: IØAMU and WA6TAX

Complete rules for WPX, WPNX, and VPX may be found on pgs. 66-67 of the June 1970 issue. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to Award Manager, P.O. Box 1271, Covina, Calif. 91722, or to the DX Editor.

time DX on 160 was contacts between WA7ILC and ZL1AYG on July 11 at 1226 GMT QRN crashes were terrific, but perseverance paid off.

W1BB/1 has the 265 ft. inverted vee repaired and back in service after being QRT most of the winter season from that QTH. Stew will probably announce dates for this winter's TransAtlantic and TransPacific tests shortly, although he has considered discontinuing these tests as 160 DX is becoming a regular thing.

Amateur Radio in Argentina

We are grateful to Alberto Silva, LU2DKG, for the information in this article.

"At present there are about 17,000 amateurs in Argentina, but only 100-200 work DX, and only 15-20 of these are c.w. operators. The area in which an Argentine station is located may be determined by the first letter after the number in the prefix. When this letter is A, B, or C, the station is in the federal capital of Buenos Aires. D and E stations are in the surrounding province of Buenos Aires. For example, LU2DKG is in the province of Buenos Aires.

"The identification letters for other provinces are as follows: F—Santa Fe, G—Chaco and Formosa, H—Cordoba, I—Misiones, J—Entre Rios, K—Tucuman, L—Corrientes, M—Mendoza, N—Santiago del Estero, O—Salta, P—San Juan, Q—San Luis, R—Catamarca, S—La Rioja, T—Jujuy, U—La Pampa, V—Rio Negro, W—Chubut, X—Santa Cruz and Tierra del Fuego, Y—Neuquen, and Z—Antartida Argentina and Islas Malvinas y Atlantico Sud.

"There are 2 principal organizations which maintain QSL Bureaus. These are the Radio Club Argentina, Carlos Calvo 1424, Capital Federal, Buenos Aires, and the Federacion Argentina de Radioaficianados, Bouchard 722, Buenos Aires.

"The minimum age for Argentine amateurs is 12 years, with special permission. There are 4 classes of license, namely Novice, Intermediate, General, and Superior. The Novice is limited to 3500-3550 kc for c.w. operation and 3500-3750 kc for phone operation. He may only use up to 50 watts power and no code test is required.

"The Intermediate class license requires a 5 w.p.m. code test, and permits the use of up to 100 watts power on all c.w. and phone frequencies except 10, 15, and 20 meters. The

General Class licensee must pass a 10 w.p.m. code test and may use all bands except 15 meters. He is permitted the full amateur power of 1 kilowatt. The Superior class license requires a 15 w.p.m. code test and allows access to all amateur bands with a full kilowatt.

"There is no major amateur radio publication in Argentina. The Radio Club Argentina publishes information of interest to its members in *Revista Telegrafica Y Electronica,* a non-amateur publication. Our local club publishes an excellent bimonthly magazine entitled *Radiocomunicaciones* which any ham may obtain free of charge.

"Our regulatory body, the Secretaria de Estado de Comunicaciones, maintains a National Emergency Net. The control station is LUØASC."

News of Rare and Unusual Prefixes

WPX'ers have reported several rare prefixes active, including 3 of the Cuban CM series, plus additional special calls from within the U.S. Some of the more interesting ones are the following:

CM3—CM3GJ on 14008 kc at 2300 GMT.

CM6—CM6HT on 14009 kc at 2250 GMT.

CM7—CM7ET on 14035 kc at 1510 GMT.

DFØ—DFØAFZ reported on 14005 kc at 2300 GMT.

DM8—DM8GST is said to operate around 14030 kc but no time given.

HGØ—HGØKHV, a Hungarian "v.h.f. station, operates near 28516 kc.

HM9—HM9CN on 14290 kc at 1100 GMT.

HS7—HS7AFR is now licensed from Kanchanaburi, Thailand, and it is reported that an HS9 station will be licensed shortly.

KC2—KC2GMF operated from the Greater Monmouth County Fair in New Jersey.

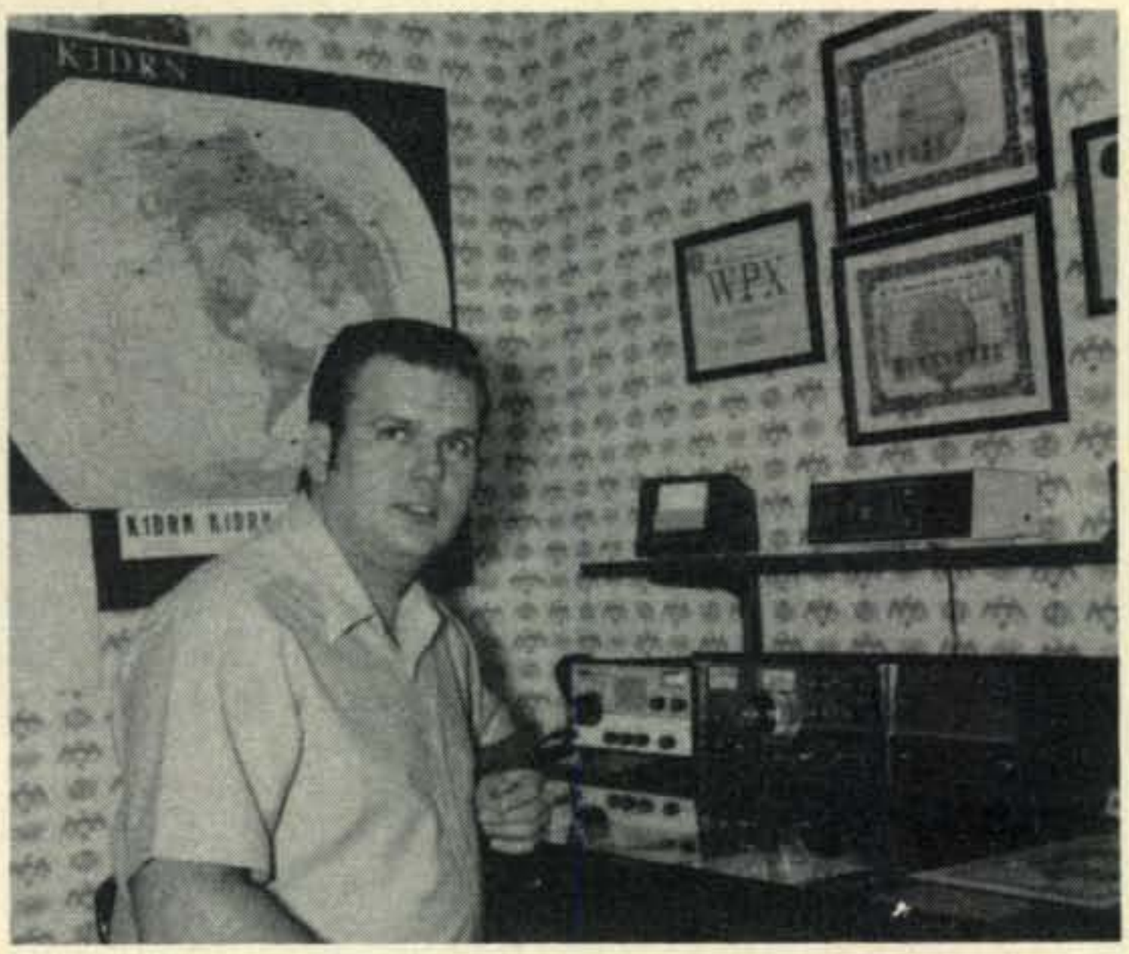
OB8—Peruvian's are using the OB series through Dec. 31, 1971 to celebrate the 150th anniversary of the independence of Peru. OB8V has been reported on 21260 kc at 2300 GMT.

PY6—PY6FI on 14013 kc at 2230 GMT.

PY8—PY8FM on 14040 kc at 2300 GMT.

VA2—VA2UN is operating from July 19-Dec. 31, 1971 to commemorate the 150th anniversary of McGill University in Montreal. It is also the 50th anniversary of the first radio station activity from the University. QSL to W2GHK.

VB1—VB1MSA from St. John's, Newfoundland commemorates the first trans-Atlantic transmission by Marconi on Dec. 12, 1901.



Vern, K1DRN, is QSL Manager for MP4TDM. His address is 265 Davis Road, Bedford, Massachusetts 01730.

CQ DX AWARD HONOR ROLL

The *CQ* DX Award Honor Roll recognizes those DXers who have submitted proof of confirmations with 275 or more countries for the mode indicated. The ARRL DXCC Country List, LESS DELETED COUNTRIES, is used as the country standard.

2XSSB

TI2HP	319	W4IC	311
W2TP	319	W6KTE	311
WA2RAU	319	W9JT	311
DL9OH	318	XE1AE	311
WA2IZS	318	W6EUF	310
W9ILW	318	VE2WY	309
K6LGF	317	VE3ACD	308
W3NKM	316	WA2EOQ	306
K6YRA	316	W6FW	302
G3FKM	315	F2MO	301
W3OJZ	315	K4HJE	301
IØAMU	314	OZ3SK	300
W4OPM	313	K1SHN	300
W6NJU	312	YS1O	300
ZS6LW	312	F9MS	299
I8KDB	311		

CW

W6ID	318	ON4QX	296
K6EC	311	WA6EPQ	294
VK3AHQ	308	W6NJU	291
W4OPM	304	K1SHN	286
W4IC	303	W6ISQ	285
DL3RK	300	W4BQY	280

2XSSB

K6EC	296	WAØKDI	282
XE2YP	294	OE2EGL	280
K4RTA	293	K8GQG	280
W6KZS	293	WAØCPX	278
KH6BB	286	ZL1AGO	278
G3RWQ	285	WA3IKK	276
HP1JC	285	WA6MWG	275
W9KRU	284	WØYDB	275

5 Aug. 71

Here is certainly one of the most distinguished groups of rare DX operators ever captured in a single photograph. Standing left to right are 7Z3AB, 9K2OL and King Hussein, JY1. Seated are ST2SA and SU1MA. This picture was taken July 19, 1971 in the shack of JY1 in Amman. The King's Drake gear and CDR control box can be seen in the background. *(Photo courtesy WB6UJO).*

WF7—WF7AIR operated July 28-Aug. 9 from the Montana State Fair. WF7WBC was located at the Caravan Club International meeting at Salem, Oregon.

WS7—WS7BCM operated during the summer. No QSL info is available.

WSØ—QSL's for WSØATA should go to KØBLT.

WU3—QSL's for WU3SNA go via W3ADO.

YUØ—YUØN was a special station operating prior to July 20, 1971. QSL to YU3EY.

4K2—4K2A was a special call used at an amateur meeting in Latvia in July. QSL via Central Radio Club, Box 88, Moscow, USSR.

Most Wanted Countries

The German Amateur Radio Club (DARC) polled its members in early summer and found that the following were the 15 countries most needed to finish working the list:

1. Clipperton
2. Minerva Reef
3. Bouvet
4. British Phoenix
5. Maria Theresa
6. China
7. Willis
8. Tonga
9. Tokelaus
10. Revilla Gigedo
11. KB6, Baker Is.
12. Spratly
13. Manihiki
14. Juan Fernandez
15. Fanning

Unfortunately, many of those most needed are in the uninhabited island or reef category and may not be activated again unless another trip is coaxed out of Gus Browning, Don Miller, or Danny Weil.

Here and There

DXOTC Net: To facilitate contacts with Italian islands, the DX Ole Timer's Club is now maintaining an information net to disseminate information on stations with rare I prefixes. The net meets Thursdays at 2030 GMT on 3665 kc for Italy and Europe, and Saturdays at 0630 and 1730 GMT on 14185 kc for stations in other parts of the world.

Rare U.S.S.R. Stations: W3HNK can help you confirm contacts with most UI8 and UM8 stations plus UJ8AC, UH8AJ, UH8BO, UH8AE, UH8BG, UH8CS, UK8MAA, UK8JAA and Mongolian stations UA9VH/JT1 and JT1AG. Send Joe a self-addressed, stamped envelope, preferably 9½ × 4 inches, for each QSL, plus a small donation toward his postage bill. Then be patient! It takes 3-4 months.

HS QSLs: The Society of Thai Amateur Radio operates a Thailand Bureau and will be happy to forward cards to HS amateurs. They have many cards on file for former HS stations and will forward them without charge to the amateurs concerned upon receipt of the following information: former HS callsign, period of operation, current home call and address. The Bureau can be contacted through P.O. Box 2008, Bangkok, Thailand.

9N1 activity—The Oct. 24-30 operation, including the first day of the contest, was by Dick Helton, W9CTY, using a KWM-2 and Hustler whip.

The WAZ Program

S.S.B. WAZ

901	KR6JX	904	WA2VEG
902	EL2AK	905	DJ4FT
903	VK3JM	906	W8YEK

C.W.—Phone WAZ

3216	K5TFG	3228	YV5AK
3217	UB5KAA	3229	YV5AE
3218	WB2JBJ	3230	JA3HFG
3219	OK1TA	3231	DLØWW
3220	I1OJ	3232	LX1CO
3221	DL4JS	3233	SP2PI
3222	W6MAR	3234	G3KHA
3223	JAØBBB	3235	SP5HS
3224	DK2FG	3236	FG7XX
3225	W5FL	3237	JA1FNA
3226	ZE6JL	3238	W9YGN
3227	DK1HP		

Phone WAZ

464 VE3AGC

Complete WAZ rules are shown on pgs. 64-66 of the June, 1970 issue. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to DX Editor, P.O. Box 205, Winter Haven, FL 33880.

ZS3CCE—This station, which operated Oct. 8-10, 1971, was a DXpedition to Cape Cross, established in 1482 as the southernmost point of Africa. Operators were ZS3KC and ZS3XQ.

QSL Information

The following wish to volunteer their services as QSL Managers for any DX stations: K4QPR, 2214 59th St., Sarasota, Fla. 33580. WB4RCV, 1179 West Ninth St., Jacksonville, Fla 32209.

AC5PN—T. Yonten, c/o Post Office, Thim Phu, Bhutan.
BV1USE—Via JH1HWN.
BV2A—To WB2UKP.
BY1AB—c/o 579B Tong Tien Men, Peking 11, Peoples Republic of China.
BY3NK—P.O. Box 32, Canton, Peoples Republic of China.
C31DY—Via PAØGMM.
C31DZ—To G5YC.
CN8BG—c/o W3HNK.
CR4BC—NOT via K4DSN.
DU1POL—Via W5QKO.
EL2BI—To W3HNK.
EL2CB—c/o W3HNK.
FMØIX—Via W7VRO.
FOØTG—To JA1DCY.
FR7AM/E—P.O. Box 178, St. Denis, Reunion Island.
GD3RZI and GD3WJN—To G3WJN.
HBØSTO—To DK3ST.
HBØXTU—c/o DL1GK.
HL9VK—Via WB6HDH.
HP1IE—To W2GHK.
HS1ABU—c/o W5ZG.
IP1MOL, IP1RB, & IP1RBJ—Via W2GHK.
JD1ACH — To JA3GZN, 1-6-3, Nanamatsu, Amagasaki, Hyogo, Japan.
JY9FB & JY9YL—c/o W3EMH.
K2YGM/VP7—P.O. Box 1175, Long Island City, N.Y. 11101.
KF4SJ—Via W2GHK.
KG6SW—To W7YWX.
MP4TDM—c/o K1DRN.
PA9QX—Via ON4QX.
PA9DHV—To G2DHV.
PJ7VL—Via W2GHK.
SMØCER—To W3HNK.
TT8AC—c/o W4SPX.
VK3UV/9—Via W7VRO.
VK9FH—To WØKHI.
VITALS (Virgin Islands Transmitting & Listening Society) — Command Communications, Box 3374, St. Thomas, V.I. 00801.
VP2EZ—c/o WA9VOL.
VP2MF—Via VE3GCO.
VP5JA—To K4DSN.
VP9KL/A—c/o 5Z4KL, Box 30214, Nairobi, Kenya.
VR2FO—Via W2FXA.
VS5CB—To WA6AHF.
VU2IA—c/o W5VA.
VU2JEZ—Via WA7MUY, 408 Walker Ave., Ashland, Oregon 97520.
WA1ARF/KS4—To WA6MWG.
XE1IIJ—c/o W2GHK.
XT2AA—Via K3RLY.
XW8DK—To WA6NFC.

Jean, F8CW, is one of the most distinguished amateurs of France. He has been active since 1919 and has held his present call since 1929. Recently retired, he spent the past 9 years with the French Atomic Energy Commission and was also Secretary of the Committee for the International Electrotechnical Commission and attended the CEI Meeting in Washington in 1970. Jean received the WAZ award. *(Photo courtesy F9MS).*

YA1OS—c/o SM5BGK.
YB3AAY—W3BRB, R.D. #4, Erie, Pa. 16509.
YJ8BL—Via W6NJU.
YUØN—To YU3EY.
ZA2RPS—Via DL7FT.
ZD5S—To KP4DKY.
ZD8CW—c/o W2MUM.
ZK1CD—Via ZL2EA.

[*Continued on page 92*]

The CQ DX Award Program

C.W. DX

59	G3WP	63	DL1MD
60	WA2AUB	64	DJ7CX
61	K6AC	65	WA8DOY
62	DJ4IT		

S.S.B. DX

141	WB9BWU	146	VE3EAC
142	W3YHR	147	DL7CX
143	W7AVS	148	DL1MD
144	WA8VFK	149	K6EC
145	KZ5FN	150	WA2AUB

CQ DX Endorsements

C.W.: K6EC—310, DL1MD—200, G3WP—150, G3WP—28 Mc., and DJ7CX—Low Band.

S.S.B.: I8KDB—310, K6EC—300, W4FUM—250, DL1MD—250, DJ7CX—250, and W4WWD—150.

Complete rules for the *CQ* DX Award Program may be found on pg. 58 of the January, 1971 issue. Application blanks and copies of the rules may be obtained by sending a self-addressed, stamped envelope to the Award Manager, P.O. Box 1271, Covina, Calif. 91722, or to the DX Editor.

Q AND A

BY WILFRED M. SCHERER,*
W2AEF

Refinishing Panel Engraving

QUESTION: I have an SP-600 and an R-390 receiver that need the front panel refinished. I cannot figure out how to go about relettering them, as the present lettering is all indented. There must be a trick to it. What is it?

ANSWER: "Engraved" lettering on panels may be refinished by rubbing engraver's wax over the indentations until they are filled with the wax. Wax will remain in the lettering after the surplus wax is wiped off the panel with a cloth. This method works fine with a smooth-surface panel, but might present some problems in removing surplus wax from a crackle-finished panel. We've also found a white-wax crayon also will do just about as good a job as the engraver's wax does.

Output Power of Equipment

In spite of our explanation of equipment power output in a previous Q & A Column, we still receive many questions which indicate that the writers have a misconception as to the power-output capabilities of various rigs.

A typical question in this respect is: "I'd like to use a Heath SB-220 Linear Amplifier with a Swan 350 Transceiver, but do not wish to reduce the output of the transceiver to drive the linear, so that without further manipulation the full 350-watt p.e.p. output of the transceiver may be used when bypassing the SB-220."

ANSWER: The first consideration here is that the Swan 350 transceiver is rated at 350 watts p.e.p. *input* which is the rating method manufacturers use for their amateur equipment. In most cases the overall efficiency is about 60% in which case the p.e.p. output of the 350 would be around 200 watts. On the average a so-called 500-watt rig will put out near 300 watts, a 1 kw job 600 watts and a 2 kw one about 1200 watts.

As for driving the SB-220 2 kw linear with the 350 transceiver, with proper amplifier loading it should be able to handle the 200-watt drive from the transceiver—at least according to our experiences with the amplifier. However, the transceiver mic gain may have to be slightly reduced below normal transceiver-alone operation in order to prevent the amplifier peak-input meter readings from exceeding the maximum legal input of 1000 watts (plate vo!tage times peak-current peaks on plate meter). For other operating comments, see our review on the SB-220 in the March 1970 issue of *CQ*.

HEP Substitute for 2N706

QUESTION: What is the Motorola HEP substitute for the Siliconex 2N706?

ANSWER: The Motorola HEP-50 may be substituted for the 2N706.

A.L.C. with 30S-1 and HT-32

QUESTION: I have a Collins 30S-1 linear which I am driving with a Hallicrafters HT-32. If more than 0.5 ma grid current flows in the linear, the grid-overload relay will shut off the plate voltage to the 4CX1000A. This drives me berserk when trying to run phone patches in addition to the possibility of destroying the control grid of the 4CX1000A. Is there any way of connecting the a.l.c. output of the 30S-1 to the HT-32 to prevent driving the 4CX1000A into the grid current region?

ANSWER: The a.l.c. voltage from the linear amplifier would have to be applied to the grid return of the HT-32's 9 mc amplifier, V_5. It looks as if the point to make this connection would be at contacts 4-S on the switch FS-1R. Just how effective this would be is not known, since we do not know the actual a.l.c. voltage that would be fed back from the 30S-1.

Another thing that might be considered is use of an a.f. compressor or clipper such as the B & W/Waters Compreamp. Similar circuitry is used in the B & W/Waters Phone Patch. By setting the mic gain just below the overdrive point when the Compreamp starts to clip and by keeping within 6 db of clipping, the p.a. will be protected from over-

[*Continued on page 92*]

*Technical Director, *CQ*.

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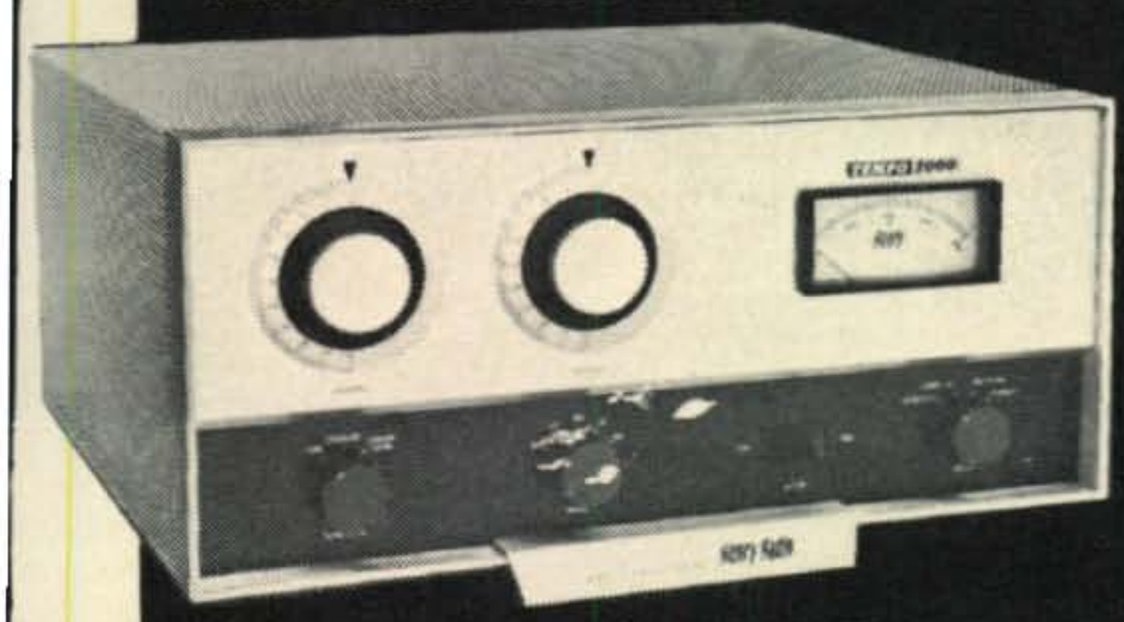

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Propagation

BY GEORGE JACOBS,* W3ASK

THE c.w. section of the 1971 *CQ* World Wide DX Contest will be held over the weekend of November 27-28. Last month's column contained special DX Propagation Charts for use during the c.w. section. If you plan to participate in the Contest be sure to check last month's column for band opening predictions, work plans and other propagation data that could be helpful in piling up contacts and points. For a day-to-day forecast of general propagation conditions expected during the month, including the contest period, see the "Last Minute Forecast" appearing at the beginning of this column.

Here are some propagation rules of thumb that should be helpful for working DX during November, especially during the c.w. contest period:

During and shortly after *sunrise,* excellent DX conditions are forecast for 20 meters, in practically all directions. Also check reception at this time from the south and west on 40, 80 and 160 meters.

From a few hours *after sunrise* until *late afternoon,* 15 meters should be the optimum band for worldwide DX, with some fairly good openings also possible on 10 meters.

During the *late afternoon* and *early evening* hours, 20 meters is expected to be the best DX band, with openings in almost all directions. Fairly good DX openings to the east and south should also be possible on 40 meters during the early evening hours.

Good openings are forecast to most areas of the world for 40 meters during the *late evening* and *early morning* hours. During these hours good openings should also be possible on 20 meters to the south and west. Some 80 and 160 meter DX openings should also be possible during the hours of darkness.

Sunspot Cycle

The sunspot cycle continues to decline at a fairly rapid rate. The Swiss Federal Observatory reports a monthly mean sunspot number of 82 for July, 1971. This results in a 12-month running smoothed sunspot number of 78, centered on January, 1971.

*11307 Clara Street, Silver Spring, Md. 20902

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for November, 1971

Days	*Rating & Forecast Quality* (4)	(3)	(2)	(1)
Above Normal: 2, 5, 16, 22, 24, 29	A	A-B		
Normal: 1, 3-4, 9-10, 13-15, 17, 19, 21, 23, 25, 27-28, 30	A A-B	A-B B	B C	B-C D
Below Normal: 6, 8, 11-12, 18, 20, 26	B-C C-D	C-D D-E	D E	E E
Disturbed: 7	C-D	D-E	E	E

HOW TO USE THESE CHARTS

The following is an explanation of the symbols shown above, and instructions for the use of the *CQ* propagation predictions:

1—Enter Propagation Charts on following pages under appropriate band and distance or geographical area columns. Read predicted times of band openings at intersection of both columns.

2—Following each predicted time of band opening is a forecast rating which indicates the relative number of days the band is expected to open during each month of the forecast period. The higher the rating, the more frequent the opening, as follows: (4) band open more than 22 days each month; (3) between 14 and 22 days; (2) between 2 and 13 days; (1) less than 7 days.

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. Note the forecast rating for later use.

3—With the forecast rating noted above, start with the numbers in parenthesis at the top of the "Last Minute Forecast" appearing above. Read down the table for a day-to-day forecast of propagation conditions in terms of Above Normal (WWV rating high than 6); Normal (WWV rating 5-6); Below Normal (WWV rating 4); Disturbed (WWV rating less than 4). The letter symbols (A-E) describe reception conditions (signal quality, noise and fading levels) expected for each day of the month and have the following meaning: (A—excellent opening with strong, steady signals; B—good opening, moderately strong signals, little fading and noise; C—fair opening, signals fluctuating between moderately strong and weak; D—poor opening, signals generally weak and considerable fading and noise; E—poor opening, or none at all.

4 — This month's short skip Charts are based upon a transmitter power of 75 watts c.w.; 150 watts s.s.b., or 800 watts d.s.b., into a dipole antenna one quarter-wave above ground on 160, 80 and 40 meters and a half-wave above ground on 20, 15 and 10 meters. For each 10 db increase above these reference levels, reception quality shown in the "Last Minute Forecast" will improve by one level; for each 10 db loss reception will become poorer by one level.

5—Local standard Time for these predictions is based on the 24-hour system.

6—The short skip Charts are valid Dec. 15. These Charts are prepared from basic propagation, data published monthly by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado.

A smoothed sunspot number of 56 is forecast for November, 1971. Last year at this time the solar level was 88. This decrease in solar activity is expected to result in somewhat fewer DX openings on the 10, 15 and 20 meter meter bands during the *CQ* World Wide DX Contest of this year as compared to last year's results.

V.H.F. Ionospheric Openings

November should be a good month for 6 meter trans-equatorial, or TE scatter openings between the USA and Latin America. The evening hours are the best time to catch TE openings, between

about 8 and 11 P.M., local standard time at the path mid-point.

Two significant meteor showers are expected during November which should make possible some meteor-scatter type openings on the v.h.f. bands. The *Taurids* shower should take place between November 4th and 6th, peaking during the early evening of the 5th, with a rate of about 15 meteors per hour. Later in the month the *Leonids* shower should take place. This shower will peak on the 17th, but its effects should be noticed from the 16th to 18th. During the peak of the *Leonds* shower about 15 meteors should enter the earth's atmosphere each hour.

Some auroral-type v.h.f. ionospheric openings are likely to occur during the month, especially when ionospheric conditions on the h.f. bands are below normal or disturbed. Check the "Last Minute Forecast" at the beginning of this column for the days that are most likely to be in these categories during November.

New Prediction Publication

The contour maps of *Ionospheric Predictions,* published monthly since the end of World War II, were discontinued with the October issue.

Published by the U.S. Department Of Commerce, first by the Central Radio Propagation Laboratory, and more recently by the Institute of Telecommunication Sciences, these monthly predictions were the basis for determing the best skywave frequencies for any h.f. transmission path, at any time of day, for average conditions for the month issued. They were familiar to everyone who has ever calculated an "MUF curve", and the propagation charts appearing in this column for the past twenty years were derived from these monthly publications.

Fear not, however, the propagation forecasters will now be out of business. The monthly predictions have been replaced by a four-volume set of prediction data of a more-or-less perpetual nature. The new publication need be purchased only once, and can be used to determine the best skywave frequency for any circuit, for any month, for any sunspot number.

Entitled *Ionospheric Predictions,* the four volumes of this new publication have the following titles:

Vol. 1—*The Estimation of Maximum Usable Frequencies from World Maps of MUF (ZERO) F2, MUF (4000) F2 and MUF (2000) E*

Vol. 2—*Maximum Usable Frequencies MUF (ZERO) F2, MUF (4000) F2, MUF (2000) E for a Period of Minimum Solar Activity, Smoothed Sunspot Number 10*

Vol. 3—*Maximum Usable Frequencies MUF (ZERO) F2, MUF (4000) F2, MUF (2000) E for a Maximum Solar Activity Period of an Average Solar Cycle, Smoothed Sunspot Number 110*

Vol. 4—*Maximum Usable Frequencies MUF (ZERO) F2, MUF (4000) F2, MUF (2000) E for a Maximum Solar Activity Period of an Above Average Solar Cycle, Smoothed Sunspot Number 160*

The new publication is now available and can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. The price of the complete four-volume set is $9.30. Individual volumes can be purchased at the following prices:
Vol. 1 (GPO Stock #0300 0318)—30 cents
Vol. 2 (GPO Stock #0300 0319)—$3.00
Vol. 3 (GPO Stock #0300 0320)—$3.00
Vol. 4 (GPO Stock #0300 0321)—$3.00

Refer to OT Telecommunications Research and Engineering Report *Ionospheric Predictions,* OT-TRER 13, and appropriate GPO stock number when ordering.

Good luck in the c.w. Contest, and please let me know how the DX Propagation forecast for the Contest turns out.

73, George, W3ASK

CQ Short-Skip Propagation Chart

November & December, 1971
Local Standard Time At Path Mid-Point
(24-Hour Time System)
Distance From Transmitter (Miles)

Band (Meters)	*50-250*	*250-750*	*750-1300*	*1300-2300*
10	*Nil*	*Nil*	08-11 (1) 11-15 (0-2) 15-17 (0-1)	08-09 (1) 09-11 (1-2) 11-15 (2-3) 15-17 (1-2) 17-19 (0-1)
15	*Nil*	09-11 (0-1) 11-15 (0-2) 15-18 (0-1)	07-08 (0-1) 08-09 (0-2) 09-11 (1-3) 11-15 (2-4) 15-16 (1-3) 16-18 (1-2) 18-19 (0-1)	07-08 (1) 08-09 (2) 09-11 (3) 11-15 (4) 15-16 (3) 16-18 (2-3) 18-19 (1-2) 19-21 (0-1)
20	10-12 (0-1) 12-14 (0-2) 14-16 (0-1)	06-07 (0-1) 07-10 (0-2) 10-12 (1-3) 12-14 (2-4) 14-16 (1-4) 16-17 (0-3) 17-19 (0-2) 19-22 (0-1)	06-07 (1) 07-09 (2-3) 09-10 (2-4) 10-12 (3-4) 12-16 (4) 16-17 (3-4) 17-19 (2-3) 19-22 (1-2) 22-00 (0-1)	06-07 (1-2) 07-09 (3) 09-15 (4-3) 15-17 (4) 17-19 (3-4) 19-21 (2-3) 21-22 (2) 22-23 (1-2) 23-00 (1) 00-06 (0-1)
40	07-08 (0-2) 08-09 (1-3) 09-17 (3-4) 17-19 (2-3) 19-21 (1) 21-00 (0-1)	06-07 (0-2) 07-08 (2-3) 08-09 (3) 09-15 (4-3) 15-17 (4) 17-19 (3-4) 19-21 (1-3) 21-00 (1-2) 00-03 (0-2) 03-06 (0-1)	06-07 (2-3) 07-08 (3) 08-09 (3-2) 09-15 (3-1) 15-17 (4-2) 17-19 (4) 19-21 (3-4) 21-03 (2-4) 03-06 (1-3)	06-08 (3-2) 08-09 (2-1) 09-15 (1-0) 15-17 (2-0) 17-19 (4-3) 19-03 (4) 03-06 (3)
80	08-21 (4) 21-01 (3-4) 01-04 (2-3) 04-07 (1-2) 07-08 (3)	08-09 (4-2) 09-16 (4-1) 16-18 (4-3) 18-01 (4) 01-04 (3-4) 04-07 (2-3) 07-08 (3)	08-09 (2-1) 09-16 (1-0) 16-18 (3-1) 18-20 (4-3) 20-04 (4) 04-06 (3-4) 06-07 (3) 07-08 (3-1)	08-09 (1-0) 09-16 (0) 16-18 (1-0) 18-20 (3-2) 20-04 (4) 04-06 (4-2) 06-07 (3-1) 07-08 (1)

160	07-09 (3-2) 09-11 (2-0) 11-17 (1-0) 17-19 (3-2) 19-07 (4)	07-09 (2-1) 09-17 (0) 17-19 (2-1) 19-04 (4) 04-07 (4-2)	07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-21 (4-2) 21-04 (4) 04-06 (2) 06-07 (2-1)	07-19 (0) 19-21 (2-1) 21-04 (4-2) 04-06 (2-1) 06-07 (1-0)

HAWAII

Openings Given In Hawaiian Standard Time†

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

ALASKA

Openings Given In GMT‡

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

†Hawaiian Standard Time is 5 hours *behind* EST; 4 hours *behind* CST; 3 hours *behind* MST; 2 hours *behind* PST and 10 hours *behind* GMT or Z Time. For example, when it is noon in Honolulu, it is 2 P.M. in Los Angeles, 3 P.M. in Denver, 4 P.M. in Chicago, 5 P.M. in N.Y.C. and 2200 GMT.

‡To convert to Local Standard Time in Alaska, *subtract* 8 hours from the GMT times shown in the Chart in the PST Zone of Alaska; *subtract* 9 hours in the Yukon Zone and 10 hours in the Alaskan Standard Time Zone. In other USA time Zones, subtract 5 hours from GMT to obtain EST, 6 hours to obtain CST, 7 hours to obtain MST and 8 hours to obtain PST. For example 18 GMT is equal to 13, or 1 P.M. in Washington, D.C.; noon in Chicago, 11 A.M. in Denver, and 10 A.M. in Los Angeles and the PST Zone of Alaska, etc.

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

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

Oct.	23-24	RSGB 7 mc C.W. Contest
Oct.	23-24	Missouri QSO Party
Oct.	**30-31**	**CQ WW DX Phone Contest**
Nov.	3-4	YL Anniv. Phone Party
Nov.	5-8	IARS/CHC/FHC/HTH Party
Nov.	6-7	Illinois QSO Party
Nov.	6-7	RSGB 7 mc Phone Contest
Nov.	6-8	Massachusetts QSO Party
Nov.	14	Czechoslovakian Contest
Nov.	12-14	QRP C.W. Contest
Nov.	13-20	QRP ARC C.W. Contest
Nov.	13-15	ARRL SS Phone Contest
Nov.	20-22	ARRL SS C.W. Contest
Nov.	**27-28**	**CQ WW DX C.W. Contest**
Dec.	4-5	Telephone Pioneers Party
Dec.	11-12	Spanish C.W. Contest
Jan.	**29-30**	**CQ WW 160 C.W. Contest**

YL Anniversary Party

Starts: 1800 GMT Wednesday, November 3
Ends: 1800 GMT Thursday, November 4

This is the phone section, the c.w. portion took place last month. Complete rules in last month's CALENDAR.

This year your logs go to: Mae Hipp, K7QGO, 5655 Yukon Drive, Sparks, Nevada 89431. Mailing deadline is November 20th.

RSGB 7 mc Contest

C.W.—Oct. 23-24 **Phone**—Nov. 6-7
Starts: 1800 GMT Saturday
Ends: 1800 GMT Sunday

Its the world working the British Isles on 7 mc in this one. (G, GC, GD, GI, GM, GW) Only single operator entries are acceptable.

Following rules are for overseas stations.

Exchange: RS/RST report plus a progressive QSO number starting with 001.

Scoring: Contacts with British Isles stations vary in point value according to the location of the DX station. If in Europe, 5 points; North America, 15 points; Africa, Asia and South America, 25 points; Oceania, 50 points.

In addition a bonus of 50 points may be claimed for the first contact with each B.I. country/number prefix. (i.e. G2, GC3, GD4 and etc. max. of 36 possible.) GB stations have no bonus value. There is no multiplier, just add QSO points and bonus points.

Awards: 1st, 2nd and 3rd place certificates to the three leading overseas stations.

There is a s.w.l. section. Only British Isles stations may be logged, scoring same as above.

Mailing deadline is November 22nd to: The HF Contests Committee, c/o J. Bazley, Brooklands, Ullenhall, Solihull, Warwickshire, England.

Missouri QSO Party

Starts: 2200 GMT Saturday, October 23
Ends: 2200 GMT Sunday, October 24

This year's Party is sponsored by the St. Louis ARC. It's the 8th annual party.

Exchange: QSO nr., RS/RST and QTH. County for Mo., state or province for others.

Scoring: Mo. stations multiply QSOs by states, provinces and DX countries. Others use Mo. counties for multiplier. (max. 115).

Frequencies: C.W.—3560, 7060, 14060, 21060, 28060. Phone—3925, 7275, 14290, 21360, 28600. Avoid QRM with net operation.

Awards: Certificates to the top single operator score in each state, province and DX country; and the 3 top multi-operator stations worldwide. Additional awards if justified.

Mailing deadline November 24th to: St. Louis ARC, att: Larry Robinson, KØSGJ, 1582 San Miguel Lane, Fenton, Missouri 63026. Include a s.a.s.e. for list of winners.

IARS/CHC/FHC/HTH Party

Starts: 2300 GMT Friday, November 5
Ends: 0600 GMT Monday, November 8

This is the Fall edition of the International Amateur Radio Society QSO Party. Rules are the same as the June party, but I highly recommend you write K6BX for official sheet and forms. (Include s.a.s.e.)

Exchange: QSO nr., report, name, CHC/FHC nr., state and county or similar subdivision. Non-members send HTH instead.

Scoring: For CHCers: 1 point per QSO with other CHCers, 2 points if its a HTHer, and 1 additional point if its a YL, B/P, FHC, Novice, CHC-200, Merit or Club station. Double above points if QSO is out of own country. For HTHers: Contacts with other HTHers 1 point, with CHCers 3 points, otherwise same as above.

*14 Sherwood Road, Stamford, Conn. 06905.

The same station may be worked on different bands and modes. S.w.l.: Same scoring system as HTH.

Multiplier: Each continent, country, ITU Zone and US state. (counted only once).

Final Score: Total QSO points from all bands × the sum of the multiplier. Multi-operator stations divide score by number of operators used.

Frequencies: C.W.—3575, 3710, 7160, 14075, 21075, 21090, 21140, 28090. Phone — 3770, 3775, 3790, 3943, 3960, 7070, 7090, 7210, 7260, 7275, 14320, 14340, 21360, 21440, 28620, 28690 for US and DX as allowed.

Awards: Many hundreds available certificates and trophies, too many to list here. There are 1st, 2nd, 3rd place awards separately for CHC, FHC, SWL-CHC, Novice, HTH, VHF and blind /paralyzed. Suggest you send large s.a.s.e. (8¢ or 1 IRC) for rules and awards list.

Also available are lists showing official country, prefix and Zone map for the I.T.U., I.A.R.U., I.A.R.C. and I.A.R.S. (10¢ s.a.s.e. or 2 IRCs).

Note new title address for all requests and where to send party logs. International Amateur Radio Society, P.O. Box 385, Bonita, Calif. 92002.

Massachusetts QSO Party

Starts: 2300 GMT Saturday, November 6
Ends: 0500 GMT Monday, November 8

This is the seventh annual Mass. party sponsored by the MIT Radio Society, W1MX. The same station may be worked once per band and mode, and Mass. may work in-state stations for QSO and multiplier credit.

Exchange: QSO nor., RS/RST and QTH. County for Mass. stations, ARRL section or QTH for DX stations.

Scoring: Three points for each completed QSO. The multiplier for Mass. is the sum of Mass. counties, ARRL sections and DX countries worked. Others use Mass. counties. (max. 14).

Frequencies: C.W.—3560, 7060, 14060, 21060, 28060. Phone — 3960, 7260, 14290, 21390, 28560. Novice—3735, 7175, 21110. (Try phone on the half hour.)

Awards: Certificates to the winners in each state, province and Mass. county.

Note: All logs containing more than 50 contacts must include a check sheet of stations worked on each band.

Mailing deadline is December 1st to: MIT Radio Society, W1MX, 3 Ames Street, Cambridge, Mass. 02139. Include a s.a.s.e. for results.

Illinois QSO Party

Starts: 1600 GMT Saturday, November 6
Ends: 2200 GMT Sunday, November 7

The 9th Illinois QSO Party is again sponsored by the Radio Amateur Megacycle Society. The same station may be worked on each band and mode for QSO point credit.

Exchange: QSO nr., RS/RST and QTH. County for Illinois; state, province or country for others. (Ill. may work in-state stations).

Scoring: One point per QSO. Ill. stations multiply total by sum of states, VE provinces and countries worked. Others use Ill. counties as their multiplier. (max. of 102). In this contest USA, Canada, Hawaii and Alaska count as country multipliers. Hawaii and Alaska count again as State multipliers.

There is a bonus multiplier of 1 for each group of 8 contacts with the same county.

Frequencies: 3560, 3735, 3900, 7060, 7175, 7260, 14060, 14275, 21060, 21100, 21360, 28060, 28660.

Awards: Certificates to the top stations in each state, VE province and country, provided at least two entries are received from that region. In Illinois, single and multi-operator stations compete separately for 1st, 2nd and 3rd place winners.

A summary sheet showing the scoring and other pertinent information is requested. Include a large s.a.s.e. if results desired.

Mailing deadline is December 1st to: Radio Amateur Megacycle Society, K9CJU, 3620 N. Oleander Ave., Chicago, Ill. 60634.

Czechoslovakian Contest

Starts: 0000 GMT Sunday, November 14
Ends: 2400 GMT Sunday, November 14

Rules are the same as last year, with both phone and c.w. on all bands 1.8 thru 28 mc. (OK stations are only licensed for c.w. on 160.)

This is a world-wide type contest with contacts between stations in the same country permitted for multiplier credit, but have no QSO point value.

Categories: Single operator, both single and all band, Multi-operator, all band only.

Exchange: RS/RST report plus two figures indicating your I.T.U. Zone.

Scoring: One point per QSO, 3 points if its with a Czech. station. Multiply total by the sum of I.T.U. Zones worked on each band.

Awards: Certificate to the top scoring station in each catagory, in each country.

The "100 OK" and "S6S" awards are available for contest contacts upon a written application with your log. Two IRCs to the C.R.C. will get you a I.T.U. Zone map.

Mailing deadline for your log is December 31st to: The Central Radio Club. Post Box 69, Prague 1, Czechoslovakia.

"C.W. QRP" Contest

Starts: 2300 GMT Friday, November 12
Ends: 2300 GMT Sunday, November 14

Stations entering this contest are limited to 100 watts input, however stations worked do not have to operate under these restrictions.

The same station can be worked once per band for QSO points only. There is a limit of 5 contacts per state. (*Why?*)

Identical (almost) Twins!

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speaker optional

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AX-190 HAM RECEIVER

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We're in the Yellow Pages.

THE SX-190. 80 meters, 49 meters, 40 meters, 31 meters, 25 meters, 20 meters, 19 meters, 16 meters, 11 meters, plus two 500 kHz bands (crystals extra) between 3.5-10 MHz.

THE AX-190. 80 meters, 40 meters, 20 meters, WWV (15 MHz), 15 meters, 11 meters, 10 meters in 4 bands, plus one 500 kHz band (crystal extra) between 3.5-10 MHz.

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☐ Free Catalog
Name (print) _____
Apt. No. _____ Route or Box No. _____
Street _____
City _____ State _____ Zip ☐☐☐☐☐
*Include all Sales Taxes if applicable where you live.

Exchange: State, province or country and input power.

Scoring: One point per QSO, multiplied by sum of states, provinces and non-W/VE countries worked.

Logs: Date/time in GMT, call, QTH, band and power of station worked. Include a summary sheet with your scoring and power used.

Awards: None stipulated but I assume there will be some form of a certificate.

Logs must be received no later than January 1st, 1972 and go to: Jon Weiner, WB8HXK, 2300 Lyndway Road, Beachwood, Ohio 44122.

QRP ARC C.W. QSO Party

Starts: 1800 GMT Saturday, November 13
Ends: 2400 GMT Sunday, November 20

This is the 3rd QSO Party run by the QRP ARC International this year. Its a week long affair on c.w. only, with the emphasis on real low power, 5 watts output and less. The contest is open to all, whether or not they are club members.

Exchange: RST, state/province or country, and QRP nr. (non-members send NM & power).

Scoring: Score 3 points for contacts with club members, 2 points with non-members.

There is also a power multiplier as follows: 25 if output is 1/2 watt (500 mw) or less, 10 if 1 watt, 7 if 2 watts, 5 if 3 watts, 3 if 4 watts, 2 if 5 watts. No multiplier if power output is over 5 watts.

Final Score: Number of QSO's × QSO points × state/province/country multiplier × power multiplier. (*Why QSO's × QSO points?*)

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

Frequencies: 3540, 7040, 14065, 21040, 28040.

Awards: (1) Highest scoring station in each state, province and country. (2) Top 3 W/VE and DX stations. (3) Lowest powered station showing 3 or more genuine skip contacts.

A summary sheet with the scoring, equipment description and power used and a signed declaration that all rules were observed is required.

Mailing deadline is December 5th to: Earl R. Lawler, W5JLY, Rt. 2, Box 24-K, Burnet, Texas 78611.

ARRL Sweepstakes

Phone: Nov. 13-15 **C.W.:** Nov. 20-22
Starts: 2100 GMT Saturday
Ends: 0300 GMT Monday

There were some changes in last year's rules, more are contemplated for this year's affair.

The ARRL Contest Advisory Committee is working on shortening the exchange by dropping the time and the month/day of your birth. The exact format not available at this writing. *QST* of course will have all the details.

Contest forms (log sheets, summary sheets

[*Continued on page 91*]

THE dwards PROGRAM

BY ED HOPPER.* W2GT

USA-CA HONOR ROLL

3000		2000		1000	
WA4ULL	80	WA4ULL	136	WB4SPG	244
		K2JVX	137	WA4ULL	245
2500		**1500**		**500**	
W4JVN	112	W6CLM	169	WB4SPG	862
WA4ULL	113	WA4ULL	170		
K2JVX	114	K2JVX	171		
WA5ALB	115				

Special Honor Roll
All Counties

#61—Donald W. Schmidt, WAØJRZ 7-27-71.

THE November, "Story of The Month" is:

ICHN KC71

From all letters and comments received, a wonderful time was had by *all* at the Independent County Hunters Net Convention and a tremendous job was done by those who took care of all the arrangements and planned all the activities.

Things started moving on Wednesday, June 30, when ZL1KG, K6HZI/WB6CPE and WØYLN were installing antennas on the roof of the Prom Sheraton. Other early arrivals were VE6AYU, WB2SJQ, W4NUL and WB6EXT, so the antenna installation was completed and KCØKC went on the air on schedule.

Thursday was a day of meeting new arrivals, registrations, getting acquainted, swapping county chasing stories, counties needed and KCØKC operation.

Friday afternoon, convention business began with committee meetings on future convention sites, future plans and net procedures. All agreed that the meetings were useful and have become a necessity due to the continual growth of the annual convention. More information later on things from the various committee chairmen. Festivities continued with the ladies tour of Kansas City and the poolside party in the evening. Marv., WB2SJQ received a phone call from Win, WA2QNW announcing that he and XYL, Joyce, had adopted a new baby. The day ended with most of the group in room 3Ø3.

On Saturday, activities began at 0930 with a fine presentation by Jack, WØSJE on noise suppression. He had his station wagon in the exhibition hall for demonstration. Literature was available from various sources, including a nice write-up by Ray, VE3CBY. Several complete noise suppression kits were given as door prizes. The morning continued with some of the committees re-convening, including the ICHN business meeting and many plans were finalized.

At 1830, the cocktail party and photo session was held and then the group moved to the banquet hall for the annual ICHN Banquet.

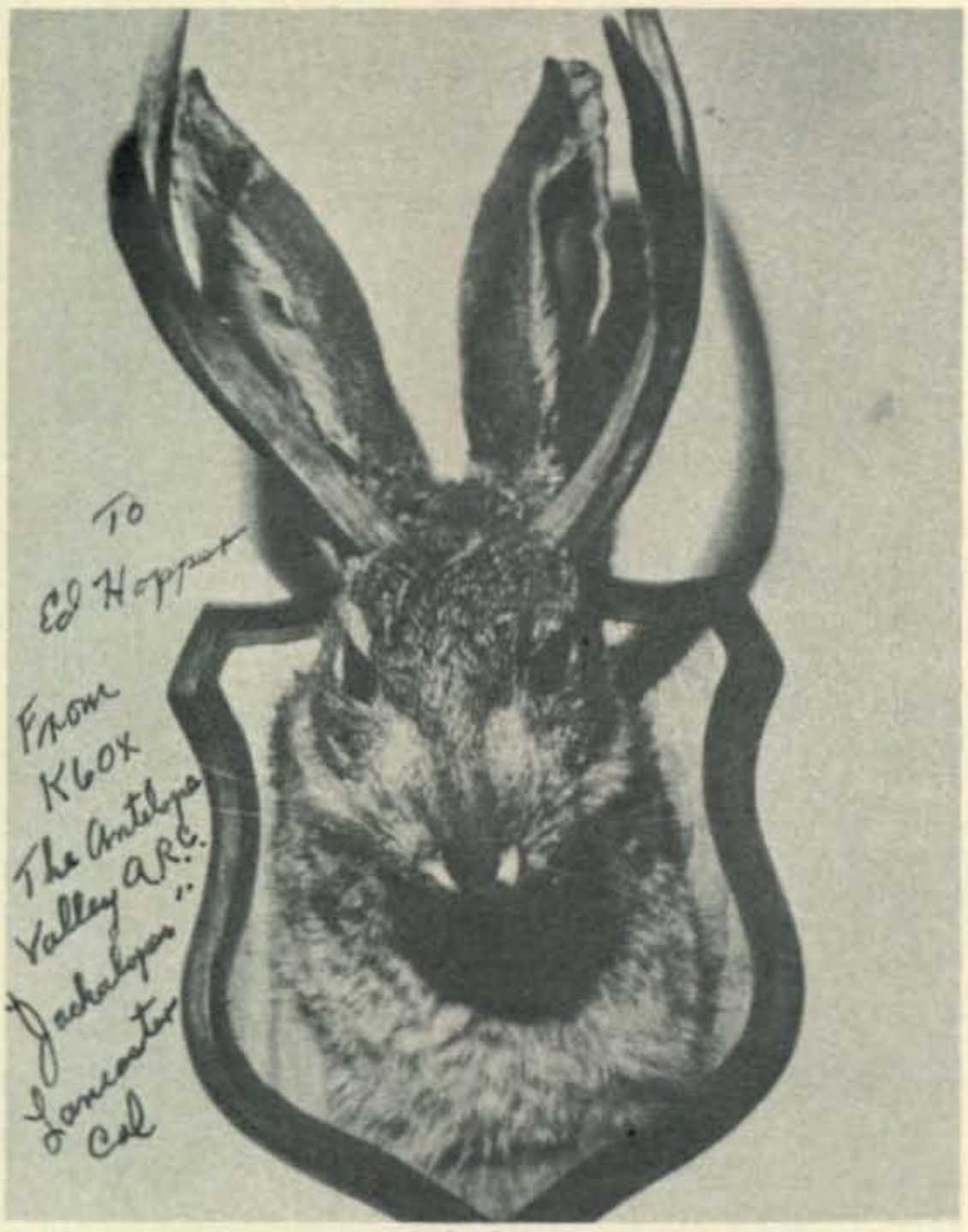
The invocation was given by Father Terry, K6HZI/WB6CPE. At the head table, Joe, W9DRL did a commendable job of MCing and began by introducing those at the table with

ICHN KC 71 Registration Desk. L. to R.—"Willie," WA7IRD; Lois, XYL of W9SOM; Cleo, WAØSHE.

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

VA2UN/VA2UN—W. M. U.

him, ZL1KG, TG9UZ, SM5EAC, WAØWOB, WØSJE and a Captain of the Kansas City Police Department. The Captain is an accomplished comedian and kept the group roaring with laughter for about 30 minutes.



Jackalope.

Presentation of trophies was next. John, W4HA received the County Hunter of the year Award, presented by Duane, K2PFC. Dick,

Admiral of The Great Lakes.

WAØSKQ presented a merit award to his QSL manager, Cleo, WAØSHE, and the annual WAØ "Should Keep Quiet" Award (quarter horse trophy) went to W8HMB. This gives Dave the honor of choosing next years winner, also the privilege of paying for it.

Several announcements were made: Mike, WAØKGD announced the operation of KQØ-NEB; Dick, WAØDCQ said he would pay for a long distance call, go as far as 300 miles to give some one the last county for 3079. Finally the drawing for the door prizes began. Geo., W1EQ walked off with the big prize, the Tempo One transceiver and Dick, WAØGZA won the Drake wattmeter (and several other prizes). Steve, WB4GGA won a 4 el. 6 meter beam and a new *ARRL Handbook* as well as some other items. Many others went home with some goodies. This completed the scheduled activities except for operation of KCØKC.

The gang at KC were very happy that their many long hours and lots of hard work were worth while and seemed to please everyone. A big help in making it a success was the fine co-operation from the Prom Sheraton Motel manager, Mr. Don Bergert.

From Sunday on, it was back to work for the KC group.

At the annual July meeting of MARAC, Cleo, WAØSHE was asked to present the Awards for Net Control and Mobile Operator of the year as voted by MARAC members. Merit awards went to K1OME as 1st runner-up for Net Control and 2nd runner-up, W9SOM. Merit awards for Mobile Operator went to W9SOM as 1st runner-up and WAØWOB as 2nd runner-up. A Plaque was presented to John, W4HA as winner for Net Control Operator of the year. A tie for Mobile Operator of the year was announced so Plaques went to Arnie, K9DCJ and Lucky, WA-5RTB. WAØSHE also presented a Plaque from W4GGU to WØKZZ and one from WA8NDL to K9DCJ for last Counties.

W4HA also had the honor of being elected a director for a 3 year term and last year's officers were re-elected.

Among those present at ICHN KC71 were: W1AQE; W1EQ; W2BLM; WB2CUI; W2EQQ; K2PFC; WB2SJQ; W3FVU; K3LXN; W3RWJ; K3VLP; WB4GGA; W4GGU; W4HA; W4IGW; K4ISE; W4IZR; W4JVN; W4KA; WA4LSU; W4NUL; WA4ULL; W4YWX; K4ZA; K4ZLE; K5DRF; W5HDK; K5KDG; W5MYA; WA-5SKI; WB6AUA; W6BEP; WB6CPE/K6HZI; WB6EXT; WB6UGV; K6JZI; W6LWM; WA-6QAU; W7CDH; W7GTK; W7HVH; WA7-IRD; W7OK; K7ZJP; K8DCR; WB8DRR; W8-HMB; W8MJG; WA8NDL; W8OA; K8RNH; WA8YPZ; W9CNG; K9CSL; K9DCJ; W9DRL; WA9EZP; WA9FBK; WA9GOH; K9GTQ; K9-HRC; K9KYF; WA9LNW; K9LUI; K9QCR; WA9SKB; W9SOM; W9ZHD; KØARS; WØAYL; KØAYO; WØBL; KØBXF; WBØCQE; WBØCQO;

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Mosley Electronics Inc.
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Henry Radio
11240 W. Olympic Blvd., Los Angeles, Calif. 90064

RCA Rotators

ARROW ELECTRONICS, INC.
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516 Pioneer 2-2290
225 Rte 46, Totowa, N.J.
201 256 8555
Farmingdale, N.Y.

WORLD RADIO---
3415 West Broadway
Council Bluffs, Iowa 51501

NEW-TRONICS CORPORATION
15800 Commerce Park Drive
Brook Park, Ohio 44142

AMRAD SUPPLY
Oakland, California. 94607
415/451-7755

SINCE 1921 telrex LABORATORIES
Communications and TV Antennas
Asbury Park, New Jersey 07712 201-775-7252

Just one thing. They all buy more pages of advertising in CQ than in any other ham magazine. In fact, more than half the companies listed above will buy more ad pages in CQ this year than in *all the other hams mags combined!*

These companies have found over the years that CQ is the best ad buy in the marketplace. And dozens of other companies are beginning to follow the leaders.

SO..

if you want to sell a product or service to your fellow hams, advertise where most of the pros advertise most consistently --

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WAØCSL; WAØDCQ; KØGST; WØGV; WAØGZA; KØIFL; WAØJRZ; WAØKGD: WAØKQQ; WØKYG; WAØLPA; WAØLRC; KØPFV; WAØPJF; WAØPJX; WAØQEI; KØQIX; WAØQWS; WØRMG; WAØSBR; WAØSHE; WØSJE; WAØSKQ; WØSLG; WAØTDQ; KØTVY; WAØVDO; WAØWDB; KØYGP; WØYJL; WAØYJQ; WØYLN; WAØZCQ; KR6LP; SM5EAC; TG9UZ; VE3CBY; VE3GCO; VE3-9301; VE6AYU; ZL-1KG and many YLs and XYLs. Thanks to Clyde, WØYLN and *MARAC Newsletter* for all this information. Sorry I could not be there and meet all the gang.

Awards Issued

Don Schmidt, WAØJRZ made All Counties, All Phone.

"Kib" Ramsey, WA4ULL, after a lull, made it 1000, 1500, 2000, 2500 and 3000.

Dave Klimaj, W4JVN was issued USA-CA-2500 Mixed and his endorsement for his USA-CA-2000 was increased to All 14 mc S.S.B. Mobiles.

Jay Siegel, K2JVX acquired USA-CA 1500; 2000; and 2500 endorsed All 14 mc 2 x S.S.B. Mobiles.

John Dyer, WA5ALB collected USA-CA-2500 and upped his USA-CA-1500 endorsement to All 14 mc 2 x S.S.B.

Bill Winnegar, W6CLM added USA-CA-1500 to his collection.

Jim Simon, WB4SPG, is now the proud owner of USA-CA-500 and USA-CA-1000.

Awards

VA2UN/VE2UN Worked McGill University Award: Of interest to Award Hunters and WPX Hunters, all call sign VA2UN has been assigned to the Amateur Radio Club of McGill University, 3480 McTavish St., Montreal 112, Quebec, Canada. This is to commemorate their 50th anniversary (began in 1921 as 1ØAU and NC2BN) and also the 150th anniversary of McGill University. They are Canada's oldest University station and club.

Expeditions to activate VA1 and VA3 are being planned. All QSLs go to W2GHK, DOTM, P.O. Box 7388, Newark, N.J. 07107. Be sure to enclose s.a.s.e. or s.a.e. and IRC.

Now to the Award: offered free to celebrate the two anniversaries (but 2 or 3 IRCs would be greatly appreciated to help run the station and award program) for a QSO with VA2UN during 1971. Apply to the address in Montreal with log data and a few IRCs. The VA call is valid until December 31, 1971.

Admiral of The Great Lakes Award: Sponsored by The Twin Sault Radio Club, W8JXA, Minneapolis Woods, Sault Ste. Marie, Michigan 49783. The award will be issued for contacts with any Amateur Radio Station operating from

[*Continued on page 90*]

SURPLUS sidelights

BY GORDON ELLIOTT WHITE *

ONE of the questions I am most often asked is "where do you find surplus, particularly the more interesting and useful equipment?"

The answer is varied, and depending where you live the pickings may be very good or very bad. Surplus and salvage, whether military, civil government, or commercial, is a very chancy thing. There is a national market of sorts only on some familiar items. The CV-89A/URA-8 RTTY demodulator appears to have a steady value of $125-$135 in good shape. AN/ARC-5 receivers range rather steadily in the $15 area, and some of the old standby WW II units continue to be available at more or less steady prices, from dealers.

But the best and latest "surplus" has to be found, dug out of scrap yards, or bought from a contract overrun, an auction of obsolete equipment, or in the cleaning-out of some manufacturer's collection of prototype and experimental equipment. There are General Services Administration sales, DSSO sales, spot bids, retail sales, HEW donations, Civil Air Patrol stocks, MARS, and a hundred other places that interesting items of electronic gear may be found.

The most readily available channels are the established surplus dealers—Fair Radio, in Ohio, Ritco and Sasco electronics in the Washington area, Columbia Electronics, J. J. Glass, and a handful of others in the Los Angeles area, B.C. and Arrow, in Chicago, Rex, and several others in New York, Meshna in Massachusetts, Bill Slep in the Tampa, Florida area, to name only a very few. Some of these dealers issue catalogs, although most find that cataloging an inventory of one-of-a-kind items is difficult. Some maintain retail stores, others are largely mail-order. They buy the surplus equipment in bulk, from the government, and cull it for items of interest to different users. For the casual experimenter they are the best source of surplus. Often, if they don't have just the item you are interested in, they can get it for you, via a well-developed network of contacts with other dealers and with wholesalers or exporters who do not generally deal with individuals.

Supplementing the established dealer are a hundred or so individuals, generally amateur or s.w.ls, who deal a little in surplus in their spare time. Most of these sources are trying to buy medium-sized government "lots," and by selling off what they do not want, pay for their hobby. Some advertise, others work by word of mouth, often within their own radio clubs or local area.

The best way to tap the surplus market, either the established dealers or the part-timers is through reading the ads in the ham literature. It is my experience that ads in the wide-circulation, not exclusively ham publications are often less reliable for finding surplus equipment of ham interest. The ad costs are fairly steep, and generally out of the reach of people selling to hams or s.w.ls.

If you are just starting to take an interest in surplus, look up dealers in the local yellow pages. There are many listed there who do not advertise nationally. With a little experience you can learn which ads are for surplus camping equipment, which for surplus electronics.

Another good local source would be any electronic manufacturer. Some will discard slightly damaged units or sell them at a fraction of their retail value. Others will scrap units that do not meet specs, or could be repaired. For example, one f.m. transceiver manufacturer has a rule that two "fixes" may be made on one solid-state unit. A third, even if it is possible to correct, sends the set to the scrap bin.

Many design labs clean out obsolete test gear and their own "breadboard" or "prototype" equipment periodically. This is a good place to get very recent material for nothing, or possibly for a swap or for very little. If you can do a favor for a design engineer, he may do you one in return.

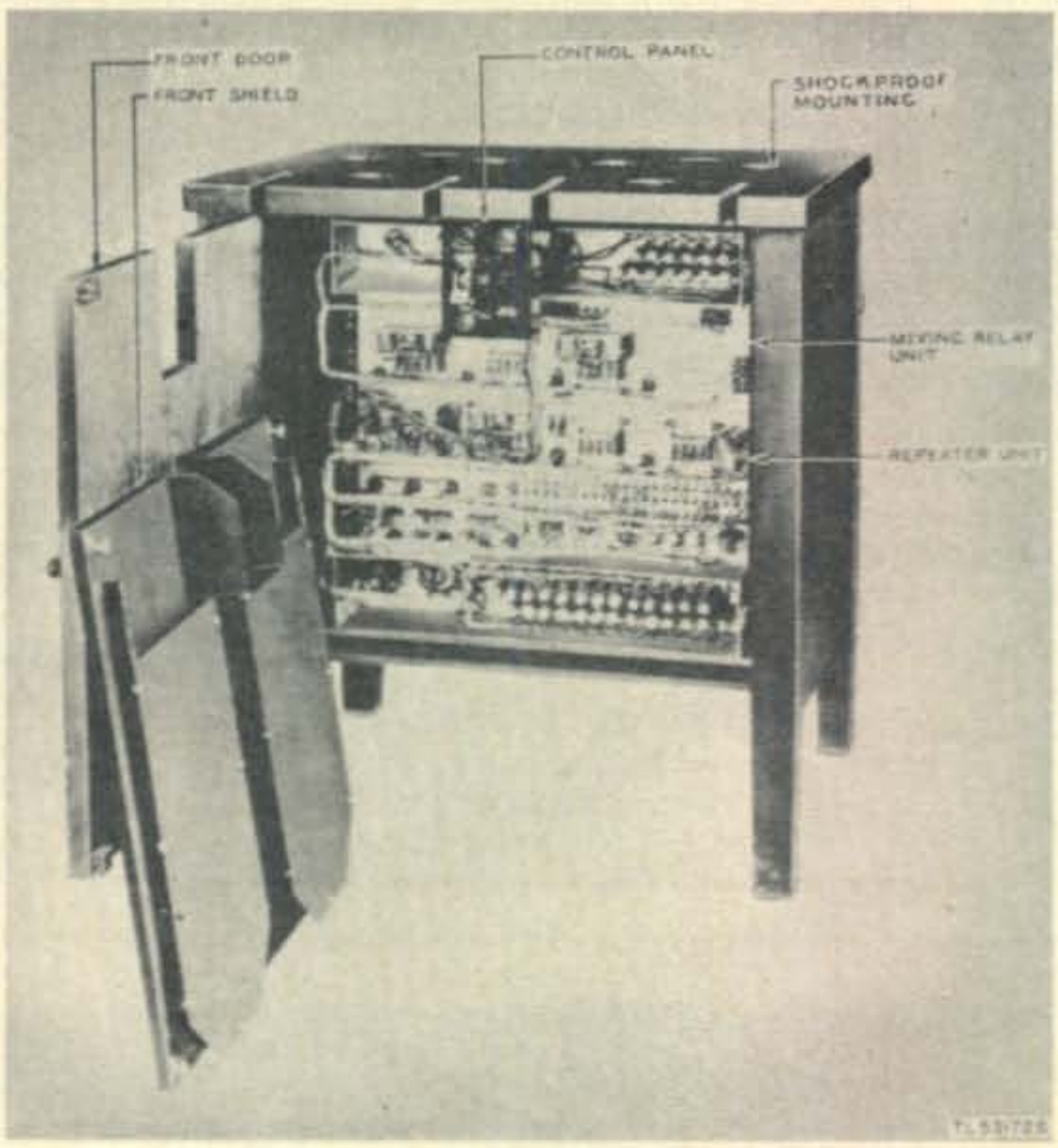


Fig. 1—World War II crypto set, known as 131B2, was a table containing a set of relays to mix the "key" tape with the clear text message tape. The special dual-head Model 14 transmitter-distributor sat on the table.

* 5716 N. King's Hgwy., Alexandria, Va. 22303.

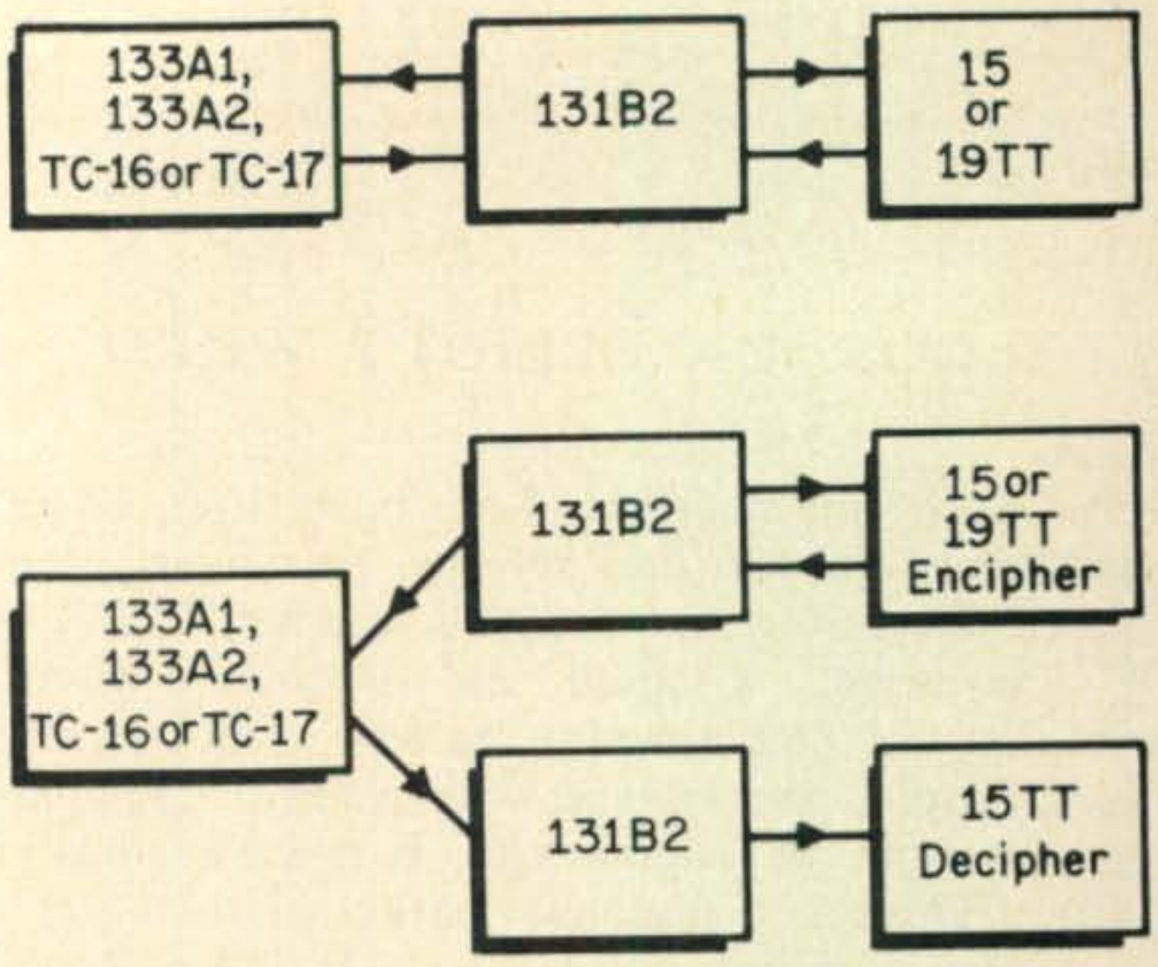


Fig. 2—Typical arrangement of the 131B2 with associated Model 15 or 19 Teletype equipment.

Now some manufacturers have a policy of destroying trade-in equipment, or new sets that do not come up to specs. This is frustrating to the surplus hound, but there are often legitimate ways around this problem. Bona-fide donations of such units for amateur use (NOT resale) or to the C.A.P., Boy Scouts, or schools, often can be arranged. Even if none of these can be worked, a close eye on the scrap can often turn up usable items that escaped destruction. Even the local scrap yard might be worth a visit from time to time, particularly in cities where there are many electronics firms.

If you are really serious about seeing what is coming out in surplus, you can get on the federal sales lists. There are two main outlets for federal excess property, the Defense Surplus Sales Offices, and the General Services Administration. To get on the DSSO list, write to DSSO, Box 1370, Battle Creek, Michigan 49016. They will send you the proper forms to fill out for the types of equipment you are interested in, and the areas of the Country you want to buy from.

Once on the list you will get catalogs of excess material, with bid forms including all terms, etc. that are self-explanatory. Keep in mind that it is important to inspect the property—don't take the government's word for the description unless you are familiar with the depots and the system—even then you can get burned. Something described as "fair" may look all right to the man who wrote the catalog, but he may not know that the set requires a complex power supply—that is not there. Expensive tubes may be missing or bad, the cables may be gone, there may be a remote tuning head missing, or a sensitive component—the oscillator out of a Collins' receiver—may be cannibalized from the unit.

Occasionally you may find something far more valuable, stuck in with a batch of junk, but inspecting the material is virtually mandatory.

Then there is the problem of getting your purchase home, once you win a bid. If the depot is not in your area the shipping may be more costly than the price of the item. Packing may be necessary—few truck lines will accept loose items not packed. This can run costs up quickly.

Another caveat: the salvage yard is never the best-policed area. You may want to inspect the material the day before the sale and remove your purchase the day afterwards to be certain you get it, and that expensive components do not disappear. Some people have been known to back in their truck and load it with their own purchases and others too. Sometimes this is through misunderstanding, sometimes plain theft. Be careful. This is, of course, a federal crime, even if the material is junk.

Civilian government salvage is handled by the GSA, and often it is easier to buy from GSA than the DSSO. Bidding is usually handled regionally, not nationally. You have to check with the nearest GSA office in a major city to get on the area bid list. Some sales are through spot

	A	B	C	D	E	F	G	H	I	J	K
A	Z	Y	X	W	V	U	T	S	R	Q	P
B	Y	X	W	V	U	T	S	R	Q	P	O
C	X	W	V	U	T	S	R	Q	P	O	N
D	W	V	U	T	S	R	Q	P	O	N	M
E	V	U	T	S	R	Q	P	O	N	M	L
F	U	T	S	R	Q	P	O	N	M	L	K
G	T	S	R	Q	P	O	N	M	L	K	J
H	S	R	Q	P	O	N	M	L	K	J	I
I	R	Q	P	O	N	M	L	K	J	I	H

Fig. 3—Partial mixing table: When the clear text character was "A" and the key character was "B" the encoded message shows a "Y," etc.

bidding, which can freeze out distant bidders. Some spot bidding must be done in person, other can be done by mail, depending upon the local system.

Even more local in scope are surplus retail sales. Many military bases sell individual items at a weekly or monthly sale—Fort George Meade, Maryland, has recently had a twice-weekly sale day, including electronics, desks, boots, chairs, etc. Fort Belvoir, Virginia, sells retail items once a month. This can only be checked by calling the salvage office at each local base and asking them.

More on Crypto

As a postscript to last month's description of a crypto unit, Fig. 1 is a World War II tape mixer, known as 131B2. This was, I believe, the first generally-used tape mixing device. It was designed in 1943, and had a special dual-headed Model 14 TD that sat on the 131B2 table. Known as the "crypto" unit, the TD was kept under a black box, out of sight. Fig. 2 shows a typical set arrangement, and Fig. 3 the mixing chart.

USA-CA [*from page 86*]

any harbor or port, on any of the Great Lakes, (Superior, Michigan, Huron, Erie, Ontario). Only one contact per harbor or port will be accepted. The basic award will be issued for 10 QSOs. Additional endorsement stars toward the Five Star Admiral Award will be issued for 5 additional QSOs per star. The fifth star will also require a QSO with a station in either Sault Ste. Marie, Michigan or Sault Ste. Marie, Ontario, Canada. Send QSLs or General Certification Lists, plus $1.00 to: A. G. L. Award Custodian, Earl Flowers, WA8HHD, Rt. #2, Box 333, Sault Ste. Marie, Michigan 49783. Applications for each star toward Five Star Admiral will require 50c fee plus s.a.s.e.

Jackalope Award: This Award is still going strong and still issued by The Antelope Valley Amateur Radio Club, Inc. of Lancaster, California and was pictured on page 83 of March 1967 *CQ*. There are over 300 amateurs in Antelope Valley (Lancaster, Palmdale, Lake Hughes, Rosamond, Edwards AFB and Mojave). Requirements are: Contact 1 member of the Antelope Valley ARC and 4 other stations in Antelope Valley. Contacts from January 1966 are valid. Send log data and $1.00 to Custodian, Russ Lietzow, WB6HCQ, 45337 7th St. East, Lancaster, California 93534. Something new has been added, in addition to the Award which will be sent in a mailing tube, the antelope foto will be sent in a separate envelope, the foto should be a great conversation piece in the shack. The "Jackalopes" have been quite active around 21355 Tuesdays and Fridays about 0300 GMT.

Notes

Many thanks to Cleo, WAØSHE for sending

in that foto from ICHN KC 71, perhaps I'll have more next month.

Since ICHN KC71, I've received several letters and phone calls regarding a QSL bureau or forwarding bureau (call it what you like) for County Hunting QSLs. Naturally this has received much more thought since the postage increases, as soon as I get some definite data on what I believe are definite plans by MARAC, I will pass along the information. YES, it is a good idea!

After reading about K6ARE's idea for mounting his Awards, Bill Winnegar, W6CLM came up with another good idea. He purchased a "Ful-Vu" economy twin wire binder with 15 pages (about $3.60), it includes a white separation page in each "Mikafilm" sleeve and you can insert two or more certificates, depending on their size. He is now on his second binder, a larger one with 25 sleeves is also available, but that is a bit large and unwieldy.

Dave Brown, WB6AUA is now at 1300 E. Algonquin Road, Apt. 3-G, Schaumburg, Illinois 60172.

Happy that ICHN KC71 was such a wonderful success, unhappy I could not be there. How was your month? 73, Ed., W2GT.

Contest Calendar [*from page 82*]

and Operating Aid 6) are available free from ARRL. Include postage, however if you want 'em sent first-class mail.

Deadline for logs is December 15th to: ARRL Communications Dept., 225 Main Street, Newington, Conn. 06111.

Editor's Notes

Not much object in re-hashing the rules and etc. about our World Wide DX Contest, they have been pretty well covered in the last two issues of *CQ*. All stations submitting a log will be listed in the final results, even "check logs" which sometimes are very useful in cross-checking other logs.

Be sure you check George Jacob's PROPAGATION COLUMN, George has indicated that the Phone week-end will be a good one. (No report on the c.w. week-end at this writing.)

From time to time I hear complaints over the air that the week-ends are crowded with contest activity. A true observation but actually no reason for complaint as a majority of these affairs stir up very little activity, and for the most part, like the state parties, operate on fixed frequencies.

However I wonder if its in the best interest of even the most rabid contesters, to have two similiar contests on the same week-end. Especially when one organization has already run two contests earlier in the year.

In most cases there is no excuse for a duplication of dates since many contests are on

established week-ends.

A little more planning would be in order, especially by responsible organizations. And if the announcements were made well in advance adjustments could be made in case of conflicts.

73 for now, Frank, W1WY

DX [*from page 73*]

ZF1WF—Via K4CDZ.
ZL4OA/A—To ZL2GX.
ZS3CCE—Via ZS Bureau.
3C1EG—To OH2NB.
3CØAN—c/o OH2NB.
4Z4IY—Via WB2WOU.
5R8AB—To G3WRN via RSGB Bureau, or direct to Colin R. McRae, 9 Portal Close, Barnham, Thetford, Norfolk, England.
5X5NA—c/o G3LQP, or to Roger Whitehead, Box 6717, Kampara, Uganda.
7P8AB—Via W2LGU.
7Q7AA—To K4CDZ.
8P6DM—c/o W7VRO.
9F3USA—Via VE3IG.
9H1CD—To W2LGU.
9M2WM—c/o WA6AHF.
9N1MM—Via W3KVQ.

73, John, K4IIF

Q & A [*from page 74*]

drive and clipping distortion will be minimized. The occasional phone-patch peaks may be clipped heavier than 6 db, but you'll still be in good shape with no added significant distortion than that which the phone circuit itself produces.

SP-600 Modifications

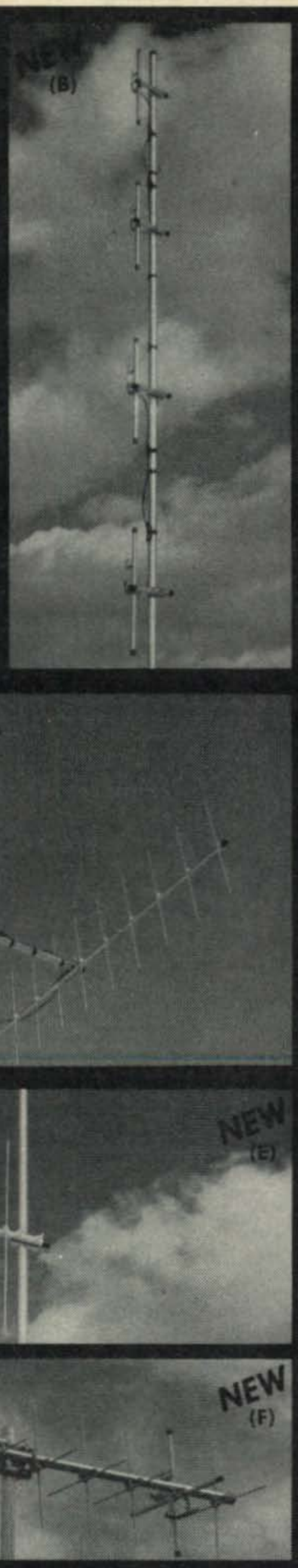
QUESTION: Have you any articles on modifications for the Hammarlund SP-600 receiver?

ANSWER: The only specific article we have on modifications for the SP-600 will be found in the March 1967 *CQ*, page 67, under the title "A Product Detector for Military Receivers." The article also includes an a.v.c. modification and installation of a mechanical filter.

Manual Appeal

We wish to thank those who offered aid in our appeal for a manual on the PRD 904 Noise Generator. Among these was W4API who himself is in quest of a manual for (or at least data on the i.f. amplifier frequency) for the Tapetone Model 345 Skysweep Receiver. He also is looking for a Tapetone TC-432-6 Converter that may be for sale.

If any one of our readers is able to supply this need, we'd appreciate it if he takes up the matter with Charles E. Spitz, W4API, 1420 S. Randolph St., Arlington, Va. 22204.



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(A) FM RINGO 3.75 db GAIN: The most popular — high performance, half-wave FM antenna. Gives peak gain, and efficiency, instant assembly and installation.

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(B) 4 POLE: A four dipole array with mounting booms and coax harness 52 ohm feed up to 9 db gain.

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AM-147	**$26.95**

(D) 11 ELEMENT YAGIS 13.2 db GAIN: The standard of comparison in VHF communications, now cut for 2 meter FM and vertical polarization.

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A449-11	440-450 mhz	**13.95**

(D) POWER PACK 16 db GAIN: A 22 element, high performance, vertically polarized FM array, complete with all hardware, mounting boom, harness and 2 antennas.

A147-22	146-148 mhz	**$49.50**

(E) 4 ELEMENT YAGI 9 db GAIN: A special side mount 4 element FM yagi can be fixed or rotated–good gain and directivity.

A144-4	146-148 mhz	**$ 9.95**

(F) FM TWIST 12.4 db GAIN: A Cush Craft exclusive — it's two antennas in one. Horizontal elements cut at 144.5 mhz, vertical elements cut at 147 mhz, two feed lines.

A147-20T	145 mhz and 147 mhz	**$39.50**

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NANUET, N.Y. 10954 195 West Route 59, Half Mile East of Thruway Exit 14
FARMINGDALE, L.I., N.Y. 11735 900 Route 110, One Mile South of Republic Aviation
MINEOLA, N.Y. 11501 525 Jericho Turnpike, One Half Block East of Herricks Road
TOTOWA, N.J. 07511 225 Route 46, 201-256-8555
NORWALK, CONN. 06850 18 Isaac Street, Shopping Pl., 203-838-4877

Erratum

The reference made in the first paragraph for the September Q & A Column should have been designated as the *August* 1968 Column, *not* November. Also, in the particular reference the formula length in feet = $492f_{mc}$ should have been printed as $L_{ft} = 492/f_{mc}$ or as shown in last month's Column.

—W2AEF

CQ Reviews Dycomm [*from page 49*]

below 10 mc and above 225 mc required higher inputs of up to 250 mv at 2 mc and at 260 mc.

Because of its high output potential, use of the PSU-13 with a receiver necessitates a reduction of the receiver r.f. gain to prevent receiver overload with cross-over birdies. Also, since the scaler requires an average input of 100 mv (100,000 μv), it cannot thus be used for on-the-air signals. Receiver operation with the scaler is therefore limited to bench tests of equipment as also would be the case with normal frequency counter use.

Coupling to the scaler input may be made directly, by means of a pickup antenna or with a small coupling loop at the end of a short coax cable. In any case, care must be taken not to exceed the maximum input-voltage tolerance, otherwise certain components of the unit may be damaged. There is no level-input adjustment or indicator, so where doubt exists as to the r.f. voltage, such should be checked with an appropriate r.f. voltmeter.

If you have a counter or just a suitable receiver, use of the PSU-13 Scaler will be found most handy for checking the frequency of v.h.f. gear. We wish that we had had such a device in bygone years to simplify v.h.f. calibration of g.d.o.'s and other equipment.

The Dycomm Model PSU-13 VHF Scaler is priced at $89.95. It is a product of Dynamic Communications, Inc., P.O. Box 10116, Riviera Beach, Florida 33404. *—W2AEF*

1934 Transmitter [*from page 21*]

(or the home-made 1932-style communications receiver to be described in a future article) you are ready to knock 'em dead with 50 watts on 160, 80 or 40 meters.

Each year the Antique Wireless Association (W2AN) has an Old Time Transmitter Contest. Any operator using old time gear (25 years old, or older) may join and compete. Dates and details of this contest, to be run this fall, will be announced later. Better get going on that old-time rig right now! ■

NEW

SECRET WEAPON FOR CONTEST'ERS

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EK-402 THE ULTIMATE CW KEYER

FEATURES:

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C. DE W6HVN K

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6M IC Preamp. [*from page 63*]

Results

Signal gain is about 25 db with the 9 volt dual supply. With my receiver, the Lafayette HA-800, the preamplifier is self-limiting. That is, it will not overload, but give 100 μv output (S-9) irrelevant of the changing amplitude of the input signal. This feature is especially desirable when tracking mobiles. ■

CQ Reviews: Standard [*from page 36*]

by. This goes for all brands, not just Standard.

Standard has a good reputation in honoring its warranties. With the better quality control and workmanship indicated by the later production models, the need for warranty work should decrease.

The Standard SR-C826M can be seen at many local amateur dealers. It comes with crystals for four channel combinations, installation hardware, microphone, line filter, and manual for $339.95. Information is available on this Japanese import from Standard Communications Corp., P.O. Box 325, Wilmington, California 90744.

—*K9STH/5*

Argonaut [*from page 62*]

Performance

To mix a metaphor, the proof of the pudding is the on-the-air operation. As may be expected, the performance or QSOs-per-call increases with frequency. When 10 is open, one almost forgets he is using low power. On 15 and 20 it performs well enough to work all continents on phone and c.w. using a TH6DX antenna 50′ high.

As a mobile rig, it surprised us. On 20 meters, K4DCD worked KG6AYL on s.s.b. A little later he worked VK5FM on c.w. Both QSOs were solid and with respectable reports. No installation was necessary, the Argonaut just plugs into a cigar lighter and antenna.

It takes a little more skill and patience to work 40 and 80 meters. With low power, one should pick an uncrowded section of the band, call *good* signals which indicate skip is favorable.

We are hopeful that the Argonaut will expand the horizons of amateur radio. ■

Motorola 80D on 220 mc [*from page 54*]

a satisfactory value. The multiple coils are easily modified. L_6 has one turn shorted, on

A Thoughtful Gift

YOU probably have several very near and dear friends who are Hams, for whom expensive and elaborate Christmas gifts this year are out of the question.

IF SO, you're not alone! Thousands of Christmas shoppers face the problem of what to get these friends . . . while holding expenses within their budgets.

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the cold end, and the padding capacitor C_8 was removed. The plate voltage on V_{102} was raised by connecting a 100 ohm 1/2-watt resistor between terminals 1 and 2 on L_6. The coupling capacitor C_{115} was discarded and a 2 mmf ceramic capacitor was used to couple the output from terminal 3 on L_6 to the grid of the added 6AK5. L_7, now in the plate circuit of the added 6AK5, was modified by shorting two turns on the cold end. C_9 was changed to 5 mmf and C_{10} was changed to 15 mmf.

The r.f. amplifier grid coil L_1 was modified by shorting one turn on the *hot* end, and by installing a 1-turn antenna coil, made from #22 solid insulated hook-up wire, on the cold end. Capacitors C_1 and C_2 were removed. The coupling capacitor C_{101} was changed from 24 mmf to 15 mmf.

The r.f. amplified plate coil L_2 was modified by shorting one turn on the cold end. Padding capacitor C_3 was removed. The middle coil between the r.f. amplifier and the 1st mixer, L_3, was modified by shorting one turn on the cold end. The padding capacitor C_4 was changed from 12 mmf to 5 mmf. The grid coil of the 1st mixer, L_4, was modified by shorting one turn on the cold end. Its padding capacitor C_5 was changed from 6 mmf to 0.5 mmf.

The 6AK5 amplifier stage for the 7th multiple adds only three resistors and three capacitors, besides the tube and its socket. A tube shield was used, by the way. This stage is quite stable even though it runs straight through. Actual plate and screen voltage is in the order of 125 volts. Interestingly, an increase in voltage here did not increase the injection. The increase in plate voltage on V_{102}, by adding the 100 ohm resistor between terminals 1 and 2 on L_6, did increase the injection, however.

Performance

The measured sensitivity of the modified "G" receiver was 0.5-0.6 microvolts for 20 db quieting. 0.1 microvolts could be heard; 0.3 microvolts is a very usable signal. Referenced to 0.3 microvolts, the image ratio measured 62 db. TV Channel 11 was without a trace with the receiver connected to a 225 mc ground plane antenna.

Omnidirectional antennas, including a "gain" antenna, for 220-225 mc f.m. will be covered in the next part of this 3-part series. Watch for it next month. ■

FM Detector [*from page 23*]

connect the circuit to either an f.m. signal generator set to the proper i.f. frequency to be used, or to the actual secondary of the last i.f. transformer in the receiver to be used. Set the f.m. generator, or tune an f.m. signal so that about ¼ volt of signal is applied to the input. Adjust the slug in the inductor for maximum audio output at pin 1 of the chip. This adjustment is not at all critical and is quite smooth. The circuit is now fully aligned. You may wish to touch up the tuning of the last i.f. transformer in the set for best result while switching between a.m. and f.m. but it is not absolutely necessary.

The N5111A will limit fully with only 0.5 to 1 millivolts of signal at the input of the chip, and will produce about ½ volt of audio at full limiting. A.m. signals are suppressed about 40-50 db and distortion should not exceed 1.5%. The acceptable input bandwidth of the chip is stated by the manufacturer to be 50 mc, but I would stay below 15 mc for best results. Best of all, the N5111A is only a bit under $2.00 at Signetics Distributors. In short, if you want a simple, easy-to-adjust f.m. detector, this is the way to go. ■

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This fabulous top-performing monitor radio regularly sells for $119.95. But House of Power has acquired a fine lot of PF-1s, brand new in factory-sealed cartons with full manufacturer's warranty, and we're passing the savings on to our customers.

You save a full $40 by ordering your PF-1, while they last, at just $79.95. Why pay more when the Cobra PF-1 gives you top quality at this incredibly low price? Just look at these features:

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It's amazing! The new Cobra PF-1 monitors government AM and FM VHF channels and lots more. Does it better than any other radio. All at a price you can afford.

Unlike other monitors, you receive all frequencies on both high and low bands as easy as tuning a radio. And in addition to manual tuning, push button crystal control is available at a preselected frequency of your choice on each band — a feature usually offered only in the most expensive radios. Crystals available from all electronics distributors.

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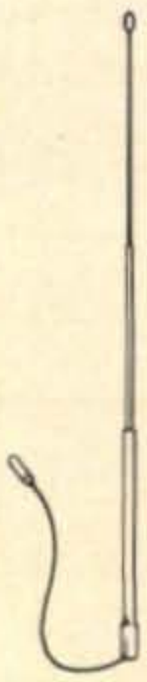
And here's an added bargain. A beautiful Cobra telescoping whip antenna that regularly sells for **$8.95** yours for just **$4.95** with your PF-1 monitor. This antenna is designed to mount directly on the PF-1 antenna terminal.



F.M. [*from page 26*]

Tidbit: This column is a good place to publicize local and regional FM activities.

Tip: When installing mobile antennae (especially gain types) use a good in-line wattmeter and prune to size. The charts don't work too well when the antenna is installed anywhere besides the center of the roof. For example with three of a national brand of gain antenna on this columnist's commercial frequency and installed in similar places on three different vehicles, one was one inch shorter than the cutting chart, one was right on the chart, and the third was three inches longer than the chart. That length and position on the car sure makes a difference.

Tidbit: 7C5 and 7V7 tubes are alive, well, and hiding in South America.

Tip: Many prominent businessmen are quite active in public service projects and are thus aware of the value of such actions. A little selling job can often persuade these people to let you use the roof of their multi-story buildings for a rent and utility free repeater site. Just sell them on the value of emergency communications. Watch the local news and society news pages of the newspaper for possible candidates.

Tidbit: The Antenna Specialists ASPS-177 is a half-wave gain antenna, not ⅝ wave as many amateurs believe. Take a good look at their catalogue. A ⅝ wave antenna is about 48" long at 147 mc and a ½ wave antenna is about 39" long at the same frequency.

Tip: Replace all that old surplus and commercial contaminating coax as soon as possible. If you are now using RG8/U go to the non-contaminating RG213/U. Don't even consider the small diameter RG58/U, RG59/U and similar cables for runs over 15 feet or so on v.h.f. and u.h.f. You will be surprised at how much better you transmit and receive.

Tidbit: The loading coil at the bottom of 2 meter gain antennae is not a loading coil at all. It is a matching network to get coax to work with the antenna.

Tip: Try RG83/U for a quarter-wave matching section between stacked 50 ohm feed antennae. By feeding each beam with one wavelength of RG213/U, feeding into a "T" connector, and bringing the RG83/U out to the 50 ohm line to the shack, one can get a pretty good match with a minimum of trouble. RG83/U is about 40 ohms impedance.

Tidbit: If you like to see some more "Tips and Tidbits" in future columns, let me know.

Finale

Next Month marks the end of the first year of the F.M. COLUMN in *CQ*. Watch for some good information. Then, with the first anniversary column in January, watch for a lot more. Terrible cliches, but you get what I mean. Until then happy f.m'ing. ■

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Direct all Correspondence & Copy to: **CQ Ham Shop, 14 Vanderventer Ave., Port Washington, L. I., New York. 11050.**

EXCITING LISTENING: Police — Fire — Emergency Calls on your broadcast radio, $19.95 up. Also receivers, scanners, dual/band, crystals. Salch Company, Woodsboro, 3, Texas. 78393.

TOUCH TONE PADS: 12 tone-$35; 16 tone-$45; Wired and ready swap? WA6EHD, 8165 Alton Dr., Lemon Grove, Calif. 92045.

SWAP: I have ham gear and test equipment to trade for old radios, good or damaged iron or tin toys, lead casting molds or old marbles. McKenzie, 1200 W. Euclid, Indianola, Iowa. 50125.

COLLINS 75A4, SN No. 5115, with three filters and manual. Exceptional condition. $450. Frank Antal, K1ZCD, Box 404, West Springfield, Mass. 01089.

NEW HAM MAGAZINE: Interested in public service, humanitarian action and international friendship? Sample issue free. World-radio, 2509 Donner Way, Sacramento, Calif. 95818. WB6AUH.

SELL: Collins 75A4 No. 1075, KWS-1 No. 649; 32V3 Globe King 500B; Champ. 300, 755A VFO Globe Scout Delux, Hallicrafters SX101A, HT37, Galaxy V, AC 35 supply, EICO 753, 752, SASE brings details, prices. WB0AHR, 2245 Lamplight Crt., Grand Junction, Colo. 81501.

TRAVEL-PAK QSL KIT — Send Call and 10 cents; receive your Call sample kit in return. Samco, Box 203, Wynantskill, New York. 12198.

SELL: Apache TX-1 mind cond. only. 18 hrs. old. $125.00. Bay Area only. W6PZX, So. S. Francisco, Calif. 589-1369.

WORLD RADIO has guaranteed used gear —terms trial. Late KWM2, $649.95; TR3, $349.95; TR4-$399.95; SB34, $249.95; 99ER, $99.95; GSB6, $159.95; 32S3, $399.95; 6N2, $79.95; RangerII, $129.95; R390, $499.95; R530, filters, speaker, $499.95; HQ110C, $139.95. Free "blue-book" for more. 3415 West Broadway, Council Bluffs, Iowa. 51501.

CASH AND VERY GOOD 51J4 with mech fltrs, and SSB for very good R390A. So. Cal. P. C. Ellis, 18162 Dewberry, Irvine, Cal. 92664. 714-833-2274.

BRASSPOUNDERS: The Society of Wireless Pioneers, P. O. Box 530, Santa Rosa, Calif. 95404, is keeping a list of all those who have earned their living as CW radio operators. Send your information for listing.

HOOSIER ELECTRONICS: Your ham headquarters in the heart of the Midwest where only the finest amateur equipment is sold. Authorized dealers for Drake, Hy-Gain, Regency, Ten-Tec, Galaxy, and Shure. All equipment new and fully guaranteed. Write today for our low quote and try our personal friendly Hoosier service. Hoosier Electronics, Dept. E, R.R. 25, Box 403, Terre Haute, Ind. 47802.

HE45B, Heath twoer, Lampkin 105B, Motorola 3 freq T43, sale or Trade. WA5CMC. Wichita Falls, Texas. 76301.

URGENTLY NEED: Manual for AN/SRT-15 Navy transmitter, Please send price in your first letter. WA4FCC, John E. Carr, Route 2, Rockmart, Ga. 30153.

SAROC CONVENTION Grand Prize complete station consisting of Hy-Gain/Galaxy/Tri-Ex equipment value approximately $2,000.00. So get your SAROC advance registration in early.

2-METER FM IC-20, solid state of the art, fully xtaled, w/mike, m-mount, & other accessories. $220. Bob Brunkow, 15112 S.E. 44th, Bellevue, Wa. 98004.

COLLINS 30L1. MUST SELL. In Navy. Excellent condition. New tubes. ASKing $350.00. Tom Adams, Box 161, Savage, Maryland. 20863.

WANT: Good, operable Heath IB-101 and IB-102 counter/scaler. Will trade Good Collins 51J4 recvr w/spinner dial, 3 filters Speaker and Manual. Have GE R.F. Bridge Model 316A best offer. LA Area only. W6NTO, 4827 Moresby Dr., Torrance, Calif. 90505.

EARPHONES FOR SALE: Lightweight, scarce 300 z type T H 3 Telephonics Corporation make. Units wired in pairs with molded short cord. No headband. $1.00 a pair, plus postage. Douglas, 2254 Pepper Drive, Concord, Calif. 94520.

QSLS. SECOND TO NONE. Same day service. Samples 25 cents. Ray, K7HLR, Box 331, Clearfield, Utah. 84015.

FOR SALE: Hallicrafters SX42, $75.00; Collins 32V3 Transmitter $150.00 firm. W6JF, P. O. Box 186, Dana Point, Calif. 92629.

HELP: Rebuilding HRO-50T need parts, schematic, information or junk HRO. WA2FFZ, 186 West Avenue, Pitman, N. J. 08071.

WWV Tone to Logic Decoder. Includes two PC boards, construction data, educational project. $2. K6BHF, 1630 Bowling Lane, San Jose, Ca. 95118.

FOR SALE: Galaxy V with AC & Factory recond. pwr supplies. Fender mount Hi-Gain antenna, radiators for 20, 40, and 80 meters. $395. W9SA, George G. Postels, 6503 Pheasant Ln., Middleton, Wisconsin. 53562.

COPYING CW13, 20, 25 wpm difficult for you? Why? For your briefly written answer and two dollars, the copyrighted 1971 booklet of forty-seven pages designed to overcome your difficulties will be postpaid to you. Call letters and zip code necessary. Without statement, $2.95. Effective Preparation, P. O. Box 10125, St. Petersburg, Florida. 33733.

WANTED: Collins 200 and 500 cycle plug-in filters Nos. X-455K Q-200 and F-455 FA-05. Howard Cervantes, 34 Johnson Rd., Binghamton, New York. 13905. (607) 724-5785.

SELL: Hammarlund HX-50 Xmtr. Excellent condx.. Manual. Best offer over $140. Galaxy III Xcvr. AC, DC, P.S., Remote VFO, Mobile mike, mtg. bracket, Cables, Mast and 75 Resonator. Fine Condx. wid manual. Best offer over $290. Larry Kellough, WB9AZQ, 1418 Dubois, Vincennes, Ind. 47591.

SELL: Valiant-Fac. Wired. Also, Morrow Falcon Rec. with P.S. & Spkr. Best offer. W6DJZ, 3748 Floresta Way, Los Angeles, Ca. 90043.

SELL: National NCL2000, NC-183 Waters 3001 Coupler, 334 Dummy Load Millen No. 90651 Grid Dipper, Gonset Comm. II, 2Mtr. VFO, G-77 and G-66B with 12V supply. SASE brings details, prices. W0NBF, 2246 Lamplight Crt., Grand Junction, Colo. 81501.

SAROC convention has more going for the ladies than any other convention we know of, so LADIES bring the OM to SAROC and enjoy yourself, SAROC Jan. 6-9, 72, Las Vegas, Nevada.

LINEARS-HOMEBREW PRO JOBS. Pair 813's 1500 WPEP without PS, $60. Three 6LF6's, 800 WPEP with PS, $70. 1500 Watt HV supply, $20. Knight KG-250 Stereo Amplifier, $40. DC-30KC 50 WRMS Opamp with PS, $35. Free photos. Mort Caldwell, W8IFN, 455 W. Va. Ave., Morgantown, W. Va. 26505.

FREE INFORMATION 990 successful businesses, Elizabeth Phillips, 728 North Citrus, Vista, California. 92083.

HELP! Anyone who can lend, give or sell me a manual for a Heathkit Apache (TX-1), WB2AIO, Dennis Bookmiller, 309 Roycroft Blvd., Snyder, New York. 14226.

MAGAZINES: Send list of Ham (only) issues needed, money (10 cents each), and postage costs to Lockheed Amateur Radio Club, 2814 Empire Avenue, Burbank, Calif. 91504. Your issues (and any refund due) will be sent promptly.

B & K DELUXE 1076 TV ANALYZER, LN w/all cables, pattern slides test B & W & color; also IF output to use w/transverter for 432& Ham TV. Miniature TV Slide station, cost $330, for $175. W4API, Box 4095, Arlington, Va. 22204.

QSL PHOTO STAMPS: Glossy free samples. B & C ENTERPRISES, P. O. Box 49C, Luray, Va. 22835.

"1971 TESTS-ANSWERS" for FCC First and Second Class License -plus- "Self-Study Ability Test." Proven! $9.95. Satisfaction guaranteed. Command, Box 26348-H, San Francisco, California. 94126.

RADIO ADVENTURE! Thrill to the amateur radio adventures of Tommy Rockford, K6ATX, in SOS AT MIDNIGHT, CQ GHOST SHIP, DX — BRINGS DANGER — all time favorite novels by Walker Tompkins in colorful new editions. Order individually at $2.45 plus 25 cents postage and handling, or all three for only $7.00 postpaid. Utah and California residents add sales tax. Send check or Money Order to Peregrine Publishers, Inc., Box 30565, Santa Barbara, California. 93105.

FOR SALE: Raytrack Horizon 6 Linear Mint used 3 hours, $495. Also Amphenol Millivolt Commander FETVM. Good, complete. $75. Andrew Mueller, WB9GAC, Germantown, Wis. 53022.

PASS FCC Extra, Advanced, General Exams Easily with Simplified, Economical Books and Code Records. Free Catalog. Ameco Publishing, 314C Hillside Avenue, Williston Park, N. Y. 11596.

2M FM6 channel portable transistorized transceiver. New — in factory carton, $155. D. Anderson, (213) 478-6738.

FOR SALE: Pick up only. Hammarlund HQ-110, 80 thru 6 mtr dual conversion rcvr, $85; Heath DX-100B Xmtr, 80 thru 11 mtrs, AM/CW, 180 WTS. As is, $45. 3904 San Juan Street, Tampa, Fla. AC(813) 837-4155.

GERMAN DL-QTC Magazines; TDQ 2 mtr transmitter. K. Paquee, 53 Jerome Ave., Trumbull, Ct.. 06611.

SIXTH ANNUAL HAM AUCTION and Flea Market sponsored by Penn Wireless Radio Club will be held on October 24, 1971 at Fairless Hills Community Center, Fairless Hills, Pa. Open from 10 AM till---? Auction from 2PM till 5PM. Table space, $1.00. A2-mtr FM Repeater Demonstration will be held. Talk in Freq on 50.4 MHZ and 146.34 FM. Held indoors rain or shine. For further information, write K3JQH, 30 Horshoe Lane, Levittown, Pa. 19055.

What convention provides cocktail parties, breakfast with champagne, outstanding prizes, technical sessions and meetings? Answer — SAROC, January 6-9, 1972, Las Vegas, Nevada.

WANTED: Modulation transformer for model 3117 Pwr. Supply. Used for G77 Xmtr. or Complete supply. Jeff Nelson, 9614 N.E. 3rd St., Vancouver, Wn. 98664.

WANTED: Paragon DA-2 Det. 2 stage amp., Coils for DeForest D-10, Atwater-Kent parts of all kinds, Grebe rheostats, Other old radios and Msc. parts. Joe Horvath, W6GPB, 522 Third St., San Rafael, Cal. 94901.

FOR SALE: Collins Mechanical Filter 3Kc for 75A4 —new— $17.00 postpaid. W2ASI, 15 Kensington Oval, New Rochelle, N. Y. 10805. (914) NE3-7077.

ONE-DAY SHIPMENT on Regency, Swan, and Drake 2-meter rig and crystals. Crystals $3.95 each, all popular frequencies and some "off-channels" in stock. Ed Juge Electronics, Inc., 3850 South Freeway, Fort Worth, Texas. 76110. Phone (817) 926-5221.

Recording Oscilloscope Camera, 35mm motor-driven, Cossor Instr. Co., Will fit Tektronix, etc. $65. Viking tape deck, 2 preamps. $100. W9TKR, 505 South Elmwood, Waukegan, Ill. 60085.

5RK DELTA TRI-BANDER, proven DX Antenna, 2 element, 10-15-20 delta loop, 30 lbs., brochure SASE, $95, Order ISLAND ELECTRONICS, 4103 Ave. S, Galveston, Texas. 77550.

SIX METER CLEGG THOR, Mint, 60 watts, VFO-$125. Also, Lafayette HA-460, mint— $85. K2-RPZ, Box 412, Rocky Point, New York. 11778.

ATTENTION: The Independent Contest Operators of Indiana request all stations working W9FB/9 during the ARRL Field Day to QSL to K9KLR, P. O. Box 1816, Gary, Indiana. 46409.

ALL NEW, NO JUNK 200V 6A RCA TRIACS 80 cents; trans $1 will buy one—2N2016 type 3—2N 1483 type 6—2N3261 type 12—2N1300 type 4 — 2N4861 type JFCT, 20-2N404 type 4— Dialca Pilot lights hardware with power type. Some surplus. Douglas Craton, 5625 Balfrey Dr., W. Palm Bch., Fla. 33406.

28 KSR Console cabinet, LESU, and RO Base. Sell or trade complete or separately. D. C. Harrington, K0SHK, 1620 Gardena Ave., Fridley, Mn. 55432.

EX-NOVICE Disillusioned. Unused SB101 HP23A $325. Art Ford, 9 Havemeyer Ln., Commack, New York. 11725.

TRADE: RT-176/PRC-10 Six Meter FM Transceiver for 2 meter transceiver. All letters answered. L. Turner, W7BKQ, 2213 Sunland Ave., Las Vegas, Nevada. 89106.

New XFMs 700CT 160MA/6.3-5A/5V@3A — $12 — 465VCT .90MA/5V@2A/6.3V@5.5A/6.3V@2.8A $7.00 —850VCT@ 200AM 6.3@3A/ 5.0V @ 3A/ 6.3V @ 2.8A — $15. WB4PTK, Rt. 1, Box 244, Troutville, Va. 24175.

JOIN QRP ARC Int.: Send SASE for info. Corresponding Secretary, Earl R. Lawler, W5JLY, Rt. 2, Box 24K, Burnet, Tx. 78611.

SAROC Seventh Anniversary January 6-9, 1972. Advance Registration $9.00 per person entitles registrant to SAROC Special room rate $12.00 per night plus room tax, single or double occupancy, effective January 4 thru 12, 1972; tickets for admission to technical seminars, HAM RADIO MAGAZINE and SAROC Happy Hour Thursday, SWAN ELECTRONICS AND SAROC Social Hour Friday HY-GAIN/GALAXY ELECTRONICS and SAROC Champagne Party Saturday, Buffet Hunt Breakfast, Sunday. Ladies who registerwill receive transportation for shopping tour, luncheon and Crazy Hat Program at the New Union Plaza Hotel downtown Las Vegas, Saturday. Advance Registration, with Flamingo Hotel mid-night show two drinks, $14.50. Advance Registration, with Flamingo Hotel Dinner Show (entrees Brisket of Beef or Turkey) no drinks, $17.50. Tax and Gratuity included except for room. Frontier Airlines SAROC group flight package planned from Chicago, St. Louis, Omaha, Denver, send for details Fifth National FM Conference, ARRL, WCARS-7255, WPSS-3952, MARS, meetings and technical sessions scheduled. Accommodations request to Flamingo Hotel, Las Vegas, Nevada before 15th December. Advance Registration to SAROC, Southern Nevada ARC, Inc., Box 73, Boulder City, Nevada, 89005, before 31st December.

WANTED: RME 20 Preselector or later model. Private collection. W5PM, RFD Number 1, Box 399, Covington, La. 70433.

NOVICES: Need help for general ticket? Complete recorded audio-visual theory instruction. Easy, no electronic background necessary. Write for free information. Amateur License, Box 6015, Norfolk, Virginia. 23508.

FOR SALE: Old CQ and QST magazines 25 cents each. Send SASE for list W0BK, 1022 N. Rockhill Road., St. Louis, Missouri. 63119.

ELEXCO: We carry a complete line of Amateur Equipment. Hallicrafters, Galaxy, Hy-Gain, National, Varitronics, Regency, Ten-Tec, Kirk, Cushcraft, Hustler, Tristao, and many more. Before you buy ortrade, write us for our low prices and high trades. Bankamericard, Master-Charge, and financing. ELEXCO, Suite B, 608 Papworth, Metairie, La. 70005.

REGENCY HR-2, $229; Hi-band or low-band monitor $139; Hi/Lo Band $169. Large stock of crystals, WE SHIP THE DAY YOUR ORDER REACHES US! Ed Juge Electronics, Inc., 3850 South Freeway, Fort Worth, Texas. 76110. Phone (817) 926-5221.

HEATHKITS wired, 15% of cost. Price References, on request. SASE— P. O. Box 6144, Linglestown— Penna. 17112.

HAM-M SP600 $200. RBA 15KC to 600KC $50. CV253/ALR 38 to 1000 MC $70. 50W 6 mtr AM Xmtr. $25. J. G. Murray, W2OAP, 40-33 61st St., Woodside, New York. 11377.

SELL: Westinghouse 2 meter FM Base Station, 2 channels, 65 watts output, 0.5 microvolt sensitivity. $75 firm, no shipping. K9WEH, 201 E. Marion, Prospect Hts., Il. 60070.

BINOCULAR MICROSCOPE, in good condition, please describe fully, price or what trade interest in Radio Camera or Coins? Vern Sherman, W8MX, R 2, Manton, Michigan. 49663.

WANTED VLF RECVR 15 Khz to 500Khz. A. J. Mony, Rte. 2, Box 241, Douglasville, Ga. 30134.

WANT: Early receivers like Atwater-Kent and early receiving & transmitter vacuum tubes. W9LGH, 610 Monroe Ave., River Forest, Ill. 60305.

FOR SALE: Johnson Viking AM Mobile with vfo multi elmac pmr-7 rcvr. Best offer. M. Parker, WB-6GBR, 4723 Rockbluff Dr., Rolling Hills, Ca. 90274.

FOR SALE OR TRADE: Ham magazines, books, eqpt. SASE. W3MSN, 5108 Boulder Dr., Oxon Hill, Md. 20021.

WANTED: Heath SB-640 External LMO or other VFO for Heath HW-18-3 Xcvr. WB9DWG, Box 314, Whitewater, Wisconsin. 53190.

WORKED SOUTH AMERICA CERTIFICATE: Work all 13 countries. Send list and $1. HC1TH, 4050 Drummond, Houston, Tx. 77025.

WANTED: HEATH MP-10 converter, IT-28 Cap Checker, HD-10 Keyer and HS-24 Speaker. WB6-AWC, 7825 Scotts Valley Rd., Lakeport, Ca. 95453.

AMECO Code Records: 104-33 and 106-33. Perfect. First $6.00. E. Jeltrup, 27A Lincoln Pl., Ossining, New York. 10562.

DeForest Eight Control 2 inch Scope. Gd. Cond. HB Cabinet PP UPS Area $20. W9DI, 22 S. Clay St., Hinsdale, Illinois. 60521.

BC-342 rcvr. 1.5-18 mHz. W/manual and matching LS-3 spkr. AC pwr. SILBERT, Wh. Sul. Springs, N. Y. 12787.

HALLICRAFTERS SR400 $560 Ten Tec PM3A No. 45 Heath HG10B $20 all ppd. WB2IQF, 181 Oak Ridge, Summit, N. J. 07901.

FOR SALE: 10 meter 3 element yagi with rotator and rotor cable $20 complete — you pay shipping or pick up. Waters 6 pos axial coax selector switch, $2. WB5BAM, Rt. 1, Box 225C, Breckenridge, Tx. 76024.

NEED: Gonset G-66/w/manual and power supply if possible state price es cndx. Nollet, 3626 2nd Ave. E., Hibbing, Minn. 55746.

AC adn cal book, $95. Panadpter unit 2" size, very clean $30. K6KZT, 4434 Josie Ave., Lakewood— California. 90713.

WANTED: Ameco PCL-P Nuvistor rcvr preamp. State price, condx. Also take unwanted ham gear. A. Carr, 37 Woodsview Ave., Grimsby, Ont., Canada.

MINT HW 16, $85; Globe Scout 40a AM/CW $40, V44 VFO $15; AR2 Rcvr, $10; WN6CFD, 589 So. M, Livermore, Calif. 94550. 415-447-4669.

NCX-500, good, sell for $310 incl. AC-500 supply. Deliver within 50 miles, Kalkstein, P. A., Andover, Mass. 01810. 617-475-2572.

SELL: Swan Cygnet 270B with DC converter. $375 and I pay shipping. Jerry Richardson, K5-IKL, RFD 1, Box 250, Deming, N. M. 88030.

SELL: Drake 2-C, 5 novice xtals, key. $200. Mike Kusz, WA2RGL, 215 Almont, Buffalo, N. Y. 14224.

WANTED: Used surplus gear. Back issues of Radio Mags. James Wood, 463 Torner Rd., Baltimore, Md. 21221.

WANT: 2 Mtr Mobile FM. RG170-Coax. Trade Eqpt, magazines, books, or cash. W3MSN, 5108 Boulder Dr., Oxonhill, Md. 20021.

FOR SALE OR TRADE, Test Power Supply, Electronic Measurements, 0-100V @ 150 ma. 2 meters, current limiting, externally programmable. Fred Inniss, K6QBF, 1508 Dapple Ave., Camarillo, Ca. 93010. $35.00.

WANTED: Ranger II with manual, also crystals Ferguson, W1HSL, Box 17, Pomfret, Conn. 06258.

ANTENNAS: Hy-Gain 153BA 15 mtr beam and Hustler 4BTV 4 band vertical. $30 and $20 or best offer. WA6JAN, 1908 Vascones Dr., Hacienda, Hts., Calif. 91745.

WANTED: Collins Receiver and Transmitter & Power supply in good condition. Give serial number and tell how old. Ralph Dorough, 117 Pecan St., Terrell, Texas. 75160.

SELL: Drake TR3 — AC3, very good, $375. 18-AVQ, $30, good. Ray Clark, 126 Slosson Ave., Staten Island, New York. 10314.

IN NEED of an ALL BAND VERTICAL ANTENNA in good condition and reasonably priced. 80, 40, 20, 15, 11, 10 meters. B. W. Thomas, WN5-EDV, 2420 Dutton Ave., Waco, Texas. 76706.

WANTED: Melehan Valiant Mechanical Full automatic key. (W6RQZ) 415-526-7345. 94702.

WANTED: Drake R4B/T4XB/MS4/AC4. WB2LYB, 516-333-4930. Barry Kutner, 741 The Plain Rd., Westbury, New York. 11590.

WANTED: Telrex Tri-Band Beam, Robot SSTV, RCA811A Tubes. Mike Ludkiewicz, 143 Richmond Road, Ludlow, Mass. 01056.

HT-37 SSB Xmtr. HT-41 Linear Amplifier. Both original owner, with instruction manuals and boxes. Make reasonable offer, Gerry, WB2FJX, 158-14 85th Street, Howard Beach, L. I., N. Y. 11414. (212) 641-4573.

WANTED: Schematic for Clapp-Eastham Receiver, Type H.R., 175-825 meters. K1KPS, 12 Hubbard Park, Cambridge, Ma. 02138.

WANTED: 10V 10A fil Trans for Display Use. Trade Xfmrs, Meters, What do you need? W3ZM, 216 Winchester Ct., Annapolis, Md. 21401.

SELL: Brand new 4CX1000A. $100.00; BRAND NEW Heath HD Meter Model IM58. $60.00. USED Precision Sweep Generator Model E-400. $50.00. USED TS/186 C/UP Freq. Meter $35.00. W5TEP, O'Neill, 1225 West Bridge St., New Braunfels, Texas. 78130.

WANTED: Sideband Filter (Blackhawk Engineering Co., Model 404-90) from a defunct Heath Marauder xmtr. Will consider purchase of entire defunct xmtr for parts if priced right. C. R. Putnam, W5QWH, 2700 N. 7th, McAllen, Tex. 78501.

BARGAINS: Weston No. 301 Panel meters, many ranges. $2.00 each, pair of unused 4X150A tubes with cooling fan and diodes. $11.00. Add shipping. Samkofsky, 201 Eastern Parkway, Brooklyn, New York. 11238.

WANTED: Amplifier parts, Vacuum Variables, Rotary Inductors. What have you to sell? Hoffman, 2949 Fish Hatchery Road, Madison, Wisc. 53713.

FOR SALE: COLLINS NOISE BLANKER 136B-1 for KWM-1 $35.00. 1500Hz Filter for 75S-3B, $35.00. Both new. Never used. WB2QKG, S. Slonim 2727 Ocean Pkwy., Brooklyn, N. Y. 11235.

DX-60, HO-10 Monitoy, and Lab. 0-10 scopes $50 each. Sweep Square, and R.F. Gen. Manuals. Bob, 1003 Electra St., Longview, Texas. 75601.

OLD RADIO PROGRAMS: Trade list for exchange. H. B. Cox, 552 Plumas Ave., Oroville, Ca. 95965.

SWAP: Like new C.E.I. Slide Rule and Course for factory-built Speech Compressor. WA4KCN, 4921 Edenshire Ave., Memphis, Tenn. 38117.

WANT TO BUY: Linear Drive with 100 watts, HB or commercial. Tell me what you have and price prepaid. Best offer by the 1st of October. Sam O. Horton, 401 Teel Rd., Beckley, W. Va. 25801.

FOR SALE: Hallicrafters SX110, $80.00 and Swan 175 Sideband Transceiver, $50.00. WN1MYZ, Kevin Quinlan, 18 Sonrel St., Woburn, Mass. 01801.

40MTR QUAD, NEW, $325; 32S-3, 516FZ, $550; EICO 753, $85.00; New BN-86, $12; LA-1 Arrestor, $10; 5-38-E, $25; Fan $10. K1VTM/1, 23 Sunrise, Saybrook, Ct. 06475.

WANT: ARRL Handbooks 1953, 1962, 1964, QST BINDERS & Pre 1930 Radio Mags. L. Mueller, 12700 Elliott Av. SP287, El Monte, Ca. 91732, 213-442-0015.

WANTED: Gonset Comm. III Case (White) and rear panel. Must be excellent. Jim Gysan, 53 Lothrop St., Beverly, Mass. 01915.

WANTED: 2 Mtr Converter for NC300 (30 MC out) in good condition. State cash price. W1HDB, R. B. Monteith, North Lane 2, W. Granville, Mass. 01034.

NEED: Jennings Variable Vacuum Condenser with drive. UCS 10-300 pf in perfect condition. Can pay $25. Cash. W4AIS, 300 Thornwood Dr., Taylors, S. C. 29687.

WANTED: AN/ART13 Gov't Surplus Radio Transmitter operation manual. Advise price. F. Richards, 805 Main St., Hingham, Mass. 02043.

INSTRUCTOGRAPH, Manual and 10 tapes. Excellent condition. $40 postpaid. Bob Craig, 8 Hollis Pl., Huntington Station, N. Y. 11746.

NATIONAL HRO-50, 7 coils, speaker, calibrator $110. HRO-60, 5 coils, speaker, calibrator $200—SBE-33 latest series like new $130. George Misic, 37370 Windy Hill, Solon, Ohio. 44139. (216) 248-7099.

WANTED TO BUY: Anything in marked railroad silverware, dishes, etc. Goodman, 5826 S. Western Ave., Chicago, Illinois. 60636.

SELL: Heath TX-1 transmitter, 10-80 meters, Exc. cond. Manual inc. Ideal for Novie. $85.00 or best offer. J. Manion, 1208 W. Fairview Ave., Dayton, Ohio. 45406.

SWAP OR SELL: For trxcvr. Stoddard fld. stgh. rcvr. AN-prm IA Gerhardt, WN8GLZ, 545 Main St., Dundee, Michigan. 48131.

WANTED: Swan 250 good cond. Trade: Hy-Gain 400 Roto-Brake Brand new in factory carton. Richardson, 1109 Dakota S.E., Albu., N. M. 87108.

COLLINS 455 KC Mechanical Filters USB and LSB, $15 each. New 9mc. Xtal Filters USB and LSB, $10 each. L. Fischer, K0RVN, Rt. 4, Box 217, Waseca, Minn. 56093.

WANTED: Manuals for Viking Pacemaker and Eico 315 RF Sig. Gen. Borrow to copy or buy. R. S. Lear, 2955 Appling Dr., Chamblee, Ga. 30341.

SALE: Pair RCA CW-5B, 960 Mc. Crystal controlled receivers, rack mounting, manual. P. L. Lemon, 3154 Stony Point Rd., Santa Rosa, Ca. 95401. (707) 542-1488.

FOR SALE: Swan Station, 500CX, VOX, 117XC, Mark II Linear — mint, perfect. $895.00. Cash or trade. WA2RJV, 301 Blacksmith Rd., Camphill, Penna. 17011.

85' Galv. Vesto Tower two Prop Pitch Rotators, 35 ft. mast relay switch. HX30 T/R switch, 450 mc conv. 6M conv. Joe Engressia, 9050 SW 117 Ave., Miami, Fla. 33156. Phone 305-274-0760.

WANTED: Skeds for 5 band WAS. PEI for WAVE. CW only. R. Pender, K5MHG16, 419 Westbourne Dr., L. A., Calif. 90048.

WANTED: Johnson Thunderbolt VHF 6&2 mtr. Amplifier or equivalent. Sell Johnson Viking Invader 2000. Mint. $525.00. William Ackerman, c/o 22338 Foxcroft Woodhaven, Mich. 48143.

LAFAYETTE 99-2508 SWR Bridge and R.F. Power Meter, $10. J. Wasiewicz, W2DQC, 229 Sarles Ln., Pleasantville, N. Y. 10570..

SALE—TRADE. 120 FT crystals 5675 thru 8675, 25 kc jumps, case. B&W 75 ohm model 426 LP filter. H. F. Morse, 13A Tanglewood Estates, Keene, N. H. 03431.

SALE: Knight T-150A transmitter, pair 6146's up to 150 watts input, covers 6 thru 80, XTAL/VFO CW/AM. Ideal for novice and new generals. $48. W2BP, 101 Collins, Pleasantville, N. J. 08232.

COLLINS MECH. FILTERS, $10.00 EACH. (Various Center freqs and band widths). K6KAQ, 2936 Winlock Rd., Torrance, Calif. 90505. (213) 534-4204.

COLLINS KWM-2 W/NB and Waters Q Mult. $700; 62S1 $550; 312B5 $250; 30L1 $350; SP600 JX-17 $285; 609-662-6575, Bouvier, 2609 Finlaw Avenue, Pennsauken, N. J. 08109.

COMPLETE STATION. SB101, 400cy filter/HP-23/GG813's NB Linear/Hy Gain Quad/TA36/Ham-M/30 ft tower plus extras. $595 firm. Sry, no shipping. Milo, Boz, Rt. 2, Salem, Ohio. 44460.

SWAP my HW-101 in excellent condx for T4XB in any condition. K6HTM, 875 Lindo Ln., Chico, Calif. 95926.

NEED: 675Kc xtal for SB Slicer IF. John Carroll, W9KIQ, Box 439, Ranier, Ore. 97048.

WANTED: Desk top cabinet for SP-600. WA0ILV, Frank Miller, Clarkson, Nebr. 68629.

SALE: Johnson Ranger I Transmitter good condx, 50 dollars Sam Carroll, 907 S.E. 48th St., Olympia, Wash. 98501. (206) 491-0333.

FOR SALE: Collins VFO's: 70E-15, 70H-12, 70K-1, 70E-23, 70E-24, 70J-3. 75S3-C, $550. 32S3, 516F2, $650. KWM-1, 516F1, $325. Collins: F455FA-05, F455FA-08, F455FA-15, $45 each. Harvey-Wells, TBS-50-A, ACPS, $45. SX-115, $250. 30S-1 (as is) new tube, $600. James W. Craig, 29 Sherburne Avenue, Portsmouth, N. H. 03801. (603) 436-9062.

FOR SALE: HW-17 with mobile mount, HW-17-1 Mobile Supply & Mosley Diplomat Antenna. $95 plus shipping. Fred Inniss, K6QBF, 1508 Dapple Ave., Camarillo, Ca. 93010.

28KSR Console Cabinet, LESU, and RO Base. Sell or trade complete or separately. D. C. Harrington, K0SHK, 1620 Gardena Ave., Fridley, Mn. 55432.

WANTED: HW-16 any condition (state) and lightweight tower. Also, ham-band crystals. J. M. Hoffer, W1DL, 24 Cherry Road, Framingham, Mass. 01701. (617) 872-5084.

SELL. TA-33 Triband beam, $70. Alliance C225 Rotor. $15. Will ship. WA7EMM, 79 Newcomer, Richland, WA. 99352.

WANTED: RM455 Adapter for MM-2 Also MM-2 Instruction Manual to buy or copy. Sever, 8464 Cleveland NW, North Canton, Ohio. 44720.

WANTED: In working condition. A 610 panel for a B & K Tube Tester. Must be reasonable. W5 HSO, 6 Damon, Belen, N. M. 87002.

WANTED: 4-65A transmitting tubes, prefer new, would consider used. Advise price first correspondence. WA5 JWJ, 5304 Wooten Dr., Fort Worth, Texas. 76133.

DIVERSITY RTTY Converter, CVA-1 by Technical Material Corp. (See July 71 CQ, p. 84). Excellent cond. $125. W9 TKR, 505 South Elmwood, Waukegan, Illinois. 60085.

SELL: SBE-33 with DC P/S and Turner 90D-3 Mike $150. UCS-300, $20; Polaroid 110B with Filter, Exposure meter, wink light and case, $50. Allied DX-120 S/S Star Patrol Gen. Cov. Rcvr. $48. Trammell, 1507 White Oak Ct., Martinsville, Virginia. 24112.

MINT: Heath "Scanalyzer" SB-620 $90 P.P., Heath 5mc scope ID-17 $55 P.P., Collins F455N20 Mech. Filter. 2.0 kc wide with sharper skirts than amateur filters, $20 P.P. K7 CPW, 2115 Wolfe Place W., Seattle, Wash. 98199.

FOUR 4X125's in Collins Style Case. Pair 4-1000A's in rack. SASE for info. D. N. Roden, Jr., WA4-NPL, P. O. Box 684, Scottsboro, Al. 35768.

FOR SALE: Earphones F.O.B. 5 sets Brandes Superior; 1 Trimm lightweight; 1 W.E. 509W; 2 W. E. Lightweight; any money above $5.00 set; 4 Cannon Chiefs, $4 each. Douglas 2254 Pepper Dr., Concord, California. 94520.

MAGAZINES: Old issues of CQ/QST/73/Ham Radio Magazines available at 10 cents each, plus postage. Send list to Lockheed Ham Club, 2814 Empire, Burbank, Calif. 91504. Issues and any refund sent promptly.

HT-44 w/Pwr Supply (200 w. p.ep) Excellent condx. $150. W1 MDO, Robert Entwistle, 12 Friendly Road, Norwalk, Conn. 06851.

12VDC to 120VAC Lafayette 50 watt power inverter in kit form. $10 or trade for ? G. D. Denman, Rt. 3, Box 164, Grapeland, Tex. 75844. Also other things to trade.

FOR SALE: CE200V with KH61J160M coils. $395. E. Erickson, 13 Robert Circle, So. Amboy, N. J. 08879. Tel. 201-721-0755.

REGENCY IMPERIAL, Range Gain 2 & Browning Eaglette CB Gear for sale. KG-635 Scope, mint. WB8 EEJ, 125 Gardner St., Caro, Mi. 48723.

WANT: T4XB and AC4 for $350, R4B for $250. Dr. W. Karl, W2EGX, 24 Mill St., Cooperstown, New York. 13326.

SELL: Cheap ART 13 transmitter, ask for price and details. W. C. Holder, W4AAZ, 1000 West Alden Avenue, Valdosta, Ga. 31601.

MECHANICAL FILTERS: 455 Khz. 300 Hz, $22.95. 2.1 Khz $18.95. J. A. Fredricks, 314 So. 13th Avenue, Yakima, Washington. 98902.

SWAN 350-C Transceiver, 550W SSB/CW/AM with sidetone, calibrator, and 117-XC power supply. Excellent condition, must sell. $275 F.O.B. Denver, Jordan, 7185 South Birch Way, Littleton, Colo.

SELL: Beautiful H.B. Linear Ampli. Pair of 811-A's. With Rotron Muffin Fan. Rotary Inductor. Solid State Supply, self-contained. $45.00 F.O.B. WA8-QBJ, Clinton, Ohio. 44216.

SELL: SBE-33. Want DC spply for NCX-3 and mobile antenna. D. Hoffman, 2949 Fish Hatchery Road, Madison, Wisconsin. 53713.

CANADIANS: Complete amateur equipment repairs, fully-equipped lic'd technician, kits wired-serviced. Bob Fransen, VE6TW, 227 Cottonwood, Sherwood Park, Alberta.

FOR SALE: HENRY 2K3 Linear, 24 hrs. use, can't tell from new. Settle estate. W7FBU, 2809 E. Mercer, Phoenix, Az. 85028. 602-992-8113. $525 F.O.B.

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WANTED: Johnson Ranger will pay cash. Harper Richards, W2IV, Argyle, N. Y. 12809.

BUY OR SWAP FOR SIGNAL-ONE, KWM2, Drake, Heath, or Yaesu. W0BNF, Box 105, Kearney, Nebraska. 68847.

SELL: Complete 6 meter Gonset station— Communicator III, 6/2 VFO, 225 watt Amplifier, All accessories including antennas, best offer. K2YAL, Box 500, Oceanside, N. Y. 11572.

SIX METER TRANSCEIVER WANTED. Gud quality for fair price. WA3LKV, 22 W. Ridge, Lansford, Pa. 18232.

SALE: TA-33 Beam by Mosley $65.00. Reg. Cherrill, W3HQO/G3XNV, 3590 Grant Ave., Phila., Penna. 19114.

SELL: ACME TELEPHOTO TRANSCEIVER Model FNP-15. $50.00 cash and carry. N. C. Moseley, Beechwood, Dr., Tarboro, N. C. 27886.

SELL: 75A4, Ser. 1503, 1 filter $325. Auto mate 5/50 Keyer w/vibro paddle, $40. K4DVT, 3761 18th Ave. No. St. Petersburg, Fla. 33713.

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LINEAR BUILDERS: 30 AMP Filament chokes for GG Linear Amplifiers. Perfect for pair 4-400A's— 3-500Z's, 813's or single 4-1000A, 3-1000Z, etc. Brand new. $5.00 ea. Postpaid. V. R. Murrell, K4-HHA, 712C Rich Road, Newport, Tenn. 37821.

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WANTED: I. F. Plugin unit, complete, for Collins R391/URR. K1GVA, 61 Warwick, Portland, Maine. 04102.

FOR SALE: Sencore FE-14, Field effect volt-meter (mint) $50.00. AMECO CB6 6mtr conv., $20.00. PV50 6mtr pre-amp, $10.00; all F.O.B. Wendel, 160-20 Grand Central Pkwy., Jamaica, N. Y. 11432.

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FOR SALE: Toschiba 6T-115P- 5" reel to reel recorder. $55.00. Also Mayfair 1844 — 5" R-R, $30.00. Robert Haase, 417 Old Jesup Rd., Brunswick, Ga. 31520.

RTTY INFORMATION for the Amateur interested in RTTY. F. DeMotte, P. O. Box 6047, Daytona Beach, Florida. 32022.

WANTED: Donations of Amateur Magazines for College Radio Club. NEED RSGB Bulletin, etc. Postage refunded. W4DQD, Trustee, Box 2067, Statesboro, Ga. 30458.

FOR SALE: Knight T-150 xmtr 80-6 meters xtal or VFO with manual. Ten-Tec PM1 xcvr, deluxe model with 15 meters and acc. Sell either $55.00. Both $100.00 or trade for what have you. Want SB200 or similar linear. Phone: 304-253-7698, W8HVB, 401 Teel Rd., Beckley, W. Va. 25801.

WANTED: Telectron Models No. RA-1 or AM-1 Sig. Generator. Used to test garage door operator radio controls. Will swap test equipment or buy, working or not. R. Wendel, WB2YYX, 160-20 Grand Central Parkway, Jamaica, N. Y. 11432.

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WANTED: Schematic for Collins 516E-1 D.C. power supply to make copy of. Will return immediately. John, WB4QID, 1450 Galloway Rd., Lakeland, Florida. 33801.

WANTED: Automatic Clock-Timer, Part No. K-38874-1 for HQ-100. W4VCY, 838 Darlington Rd., Tarpon Spgs., Fla. 33589.

CERTIFICATE HUNTERS! Cosmophone owners, ex-owners or those contacting 3 or more cosmophones send details K6VOI, Bob Carlson, 1309 E. Elgenia, W. Covina, Ca. 91790.

HEATH HW-32A (20m) and HP-13A DC Power supply. $175 includes cal., mike, spkr, mobile mount, manual. Lefkowitz, 379 Florida Ave., Herndon, Va. 22070.

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SELL: Drake TR-4 with AC-4/MS4 $450; R4B, $310; R4A $270; TA-33 Sr $70; SB-200 $190. All excellent condx. FOB. Rev. Bittner, 814 4th St. S, Virginia, Mn.

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SELL: SB300 w CW Fil, Spkr, $175; SB400 w mike, $225; SB620 $70; IP27 $60; KG635 scope $70; WRL VFO, $15; Radio Shack VTVM, $15; Accurate Gen No. 153, $20. W4SGE, Rt. 1, Box 49A, Rixeyville, Va. 22737.

FOR SALE: Magneto desk style telephone like new, $25.00. Sell or trade final pair 4-125's less high voltage supply — band switching. Would like Johnson Ranger I. Carl E. Jacobson, W9SQM, Cochrane, Wi. 54622.

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MINT HT44 and PS-150-120 with manual, $200 or trade on FTDX 560, SB101 or similar xcvr. B. D. Pollock, Box 215, Ironia, N. J. 07845.

SELL G.E. ST4A Sweep Gen. ST5A marker gen. ST2A scope Component system. To highest bidder or will trade WB3HWO, Bx 91F.S.B., Lancaster, Ohio. 43130.

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NEED MANUAL or Schematic of Northern Radio Company type 105, Model 4A frequency shift keyer. George Kapsokavadis, 23 Kolokotroni St., Corfu, Greece.

TRADE: Mint standard "806" 2 mtr FM, 11 sets DF Crystals for a Swan TV2-B. Clegg 22'er. Best offer. W1YYB, 5310 Lothrop St., Beverly, Mass. 01915.

TR4 RV4 AC4 $495; Poly 62B $150; Swan 400 405 406 $295; Heath unused SB101 Both filters HP23A mike $350; BC221 w/book $50. Art Ford, 9 Havemeyer Ln., Commack, N. Y. 11725.

WANTED: Heathkit 5 inch scope, either model Io-10 or Io-12, with manual. Must be in perfect condition. Trade Ham gear for or buy. Stamped envelope please. K0JHW, 7061 Idlewild Ave., Jennings, Mo. 63136.

K2GQO moved to 400 Cobblestone Drive, Spring Hill, Florida. 33512 and now operates as K4FYD. Would like to hear from my old friends and sked on 15 or 20.

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SELL/TRADE: Excellent Swan 250, 6 meter transceiver, with 117XC supply. Want Collins 75A-3 or 75A-4 receiver. WA2FJV, 301 Blacksmith Rd., Camphill, Pa. 17011.

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WANTED: Bird Wattmeter, SB301, Vanguard 2M converter. WB5AFY, 4108 Bismarck, Vernon, Tex. 76384.

WANTED: SWR Bridge for use up to 432 MHz. State condition and price. WA1MPB, Earl H. Duda, 24 Hillcrest Ave., West Haven, Conn. 06516.

WANTED: Drake 2B and 2BQ. Must be clean. Paul Kraemer, 2529 Knapp St., Ames, Iowa. 50010.

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RTTY TU by TMC. Galaxy G-500 DC PWR. Topaz DC PWR. Recording O'Scope camera. Viking pro tape deck, preamps. W9TKR, 505 South Elmwood Waukegan, Ill. 60085.

VFO HEATH VF-1, $10. You ship. R.F.V., 101-23 Iefferts Blvd., Richmond Hill, N. Y. 11419.

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HT-37 SSB Xmtr, $145. HT-41 Linear Amplifier, $150. Both original owner with box & instructions. Gerry, WB2FJX, 212-641-4573. 158-14 85th St., Howard Beach, N. Y. 11414.

WANTED: Hammarlund HC-10 I.F. Unit. Jim Hadlock, K7JRE, 3701 S.W. Morgan St., Seattle, Wa. 98126.

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CMCT 60, 12 volt, 60 watt, 148—174 MHz transistorized power supply, fully narrow band with accessories ..... **$208.**

RCA ovens new, 12 v. & 6/12 volt. ..... **$3.**
Mikes for Super Carfones. Made in Japan for RCA, reconditioned, **$3.00**; new, **$4.00.**
Decoders, Segode 2805 with call heads. ..... **$18.**

GREGORY ELECTRONICS

GREGORY ELECTRONICS CORP.

The FM Used Equipment People

249 Route 46, Dept. CQ, Saddle Brook, N. J. 07662
Phone (201) 489-9000

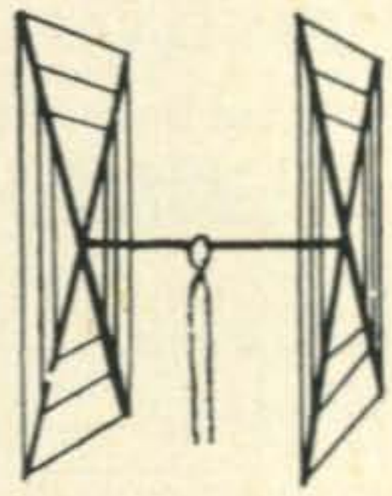
Dept. CQ

AN INDESTRUCTIBLE ANTENNA OF INFINITE GAIN, FOR FREE ?

No, not yet, but we are working on it. Right now, the nearest we have come to the ultimate in strength, performance and low price are the antennas listed below. Every one is thoroughly researched as to design; constructed of the finest components; fully tested on the air for maximum performance; repeatedly assembled to arrive at the fool-proof instructions; truthfully advertised; and sold at fantastically low prices.

QUADS

Worked 42 countries in two weeks with my Gotham Quad and only 75 watts...



W3 CUBICAL QUAD ANTENNAS — these two element beams have a full wavelength driven element and a reflector; the gain is equal to that of a three element beam and the directivity appears to us to be exceptional! ALL METAL (except the insulators) — absolutely no bamboo. Complete with boom, aluminum alloy spreaders; sturdy, universal-type beam mount; uses single 52 ohm coaxial feed; no stubs or matching devices needed; full instruction for the simple one-man assembly and installation are included; this is a fool-proof beam that always works with exceptional results. The cubical quad is the antenna used by the DX champs, and it will do a wonderful job for you!

10/15/20 CUBICAL QUAD SPECIFICATIONS

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

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

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

Radiator Terminals: Cinch-Jones two-terminal fittings

Feedline (not furnished); 52 ohm coaxial cable

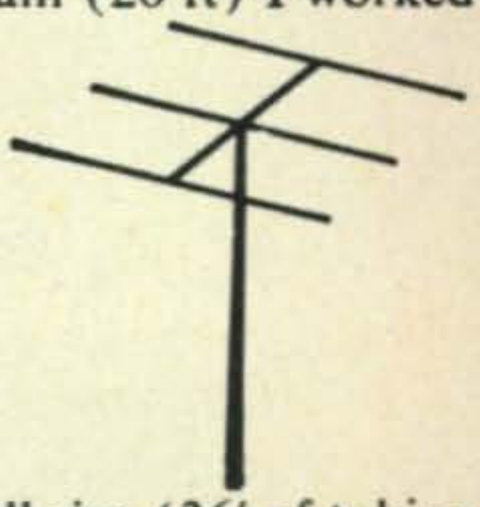
Now check these startling prices—note that they are *much lower* than even the bamboo-type:

10-15-20 CUBICAL QUAD	$37.00
10-15 CUBICAL QUAD	32.00
15-20 CUBICAL QUAD	34.00
TWENTY METER CUBICAL QUAD	27.00
FIFTEEN METER CUBICAL QUAD	26.00
TEN METER CUBICAL QUAD	25.00

(all use single coax feedline)

BEAMS

The first morning I put up my 3 element Gotham beam (20 ft) I worked YO4CT, ON5LW, SP9-ADQ, and 4U1ITU THAT ANTENNA WORKS! WN4DYN Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history!



Each beam is brand new; full size (36' of tubing for *each* 20 meter element, for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; ⅞" and 1" alumnium alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.

2 EL 20	$21	4 EL 10	20
3 EL 20	27	7 EL 10	34*
4 EL 20	34*	4 EL 6	20
2 EL 15	17	8 EL 6	30*
3 EL 15	21	12 EL 2	27*
4 EL 15	27*		
5 EL 15	30*		

***20' Boom**

ALL-BAND VERTICALS

"All band vertical!" asked one skeptic. "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty, using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: VE3FAZ, T12FGS, W5KYJ, W1WOZ, W2-ODH, WA3DJT, WB2FCB, W2YHH, VE3-FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YS1-MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3-KT. Moral: It's the antenna that counts!
FLASH! Switched to 15 c.w. and worked KZ5-IKN, KZ5OWN, HC1LC, PY5ASN, FG7XT, XE2I, KP4AQL, SM5BGK, G2AOB, YV5-CLK. OZ4H. and over a thousand other stations!

V40 vertical for 40, 20, 15, 10, 6 meters	$14.95
V80 vertical for 80, 75, 40, 20, 15, 10, 6 meters	$16.95
V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters	$18.95

"HOW TO ORDER: Send money order (bank, store, or United States) in full. We ship immediately by best way, charges collect. DEALERS WRITE."

GOTHAM
1805 Purdy, Dept. CQ, Miami Beach, Fla. 33139

n a time when transceivers are a dime a dozen,

ours costs an arm and a leg.

he signal/one CX7A will set you ack $2,195 — but set you way ahead amateur radio operation.

That's because the CX7A has just bout every feature you can think of. cluding the most sensitive receiver ade, the most "talk-powered" 00 watts of power you ever heard, and uch more. Like an extra receiver, n RF clipper, a built-in power supply nd an electronic keyer.

Suddenly, $2,195 sounds more like bargain than a bundle. Because ou're getting, in effect, a room full gear in one compact desk-top unit. unit that features the industry's ghest quality control standards, the finest components obtainable, the most features, the best performance . . . we could go on.

Better yet, you go on over to your signal/one dealer and see the rig for yourself. Or write us for a detailed brochure. Once you see the CX7A, you'll be willing to give up an arm and a leg for it. Or at least $2,195.

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Our fans take No.1 for granted.

Take power tubes, for example.

RCA amateur tube fans expect maximum performance year after year. And they get it. So do our professional customers. As a matter of fact, designers of amateur, commercial and military electronic equipment have rated RCA first in power tube brand preference studies year after year.*

So take a tip from the professionals. When you need power tubes, insist on No. 1—RCA. We have the widest choice. And the best. We suggest you obtain a copy of the **1971** Guide to RCA Industrial Tubes, TPG 200F.

The man to see is your RCA Industrial Tube Distributor. He's No. 1, too.

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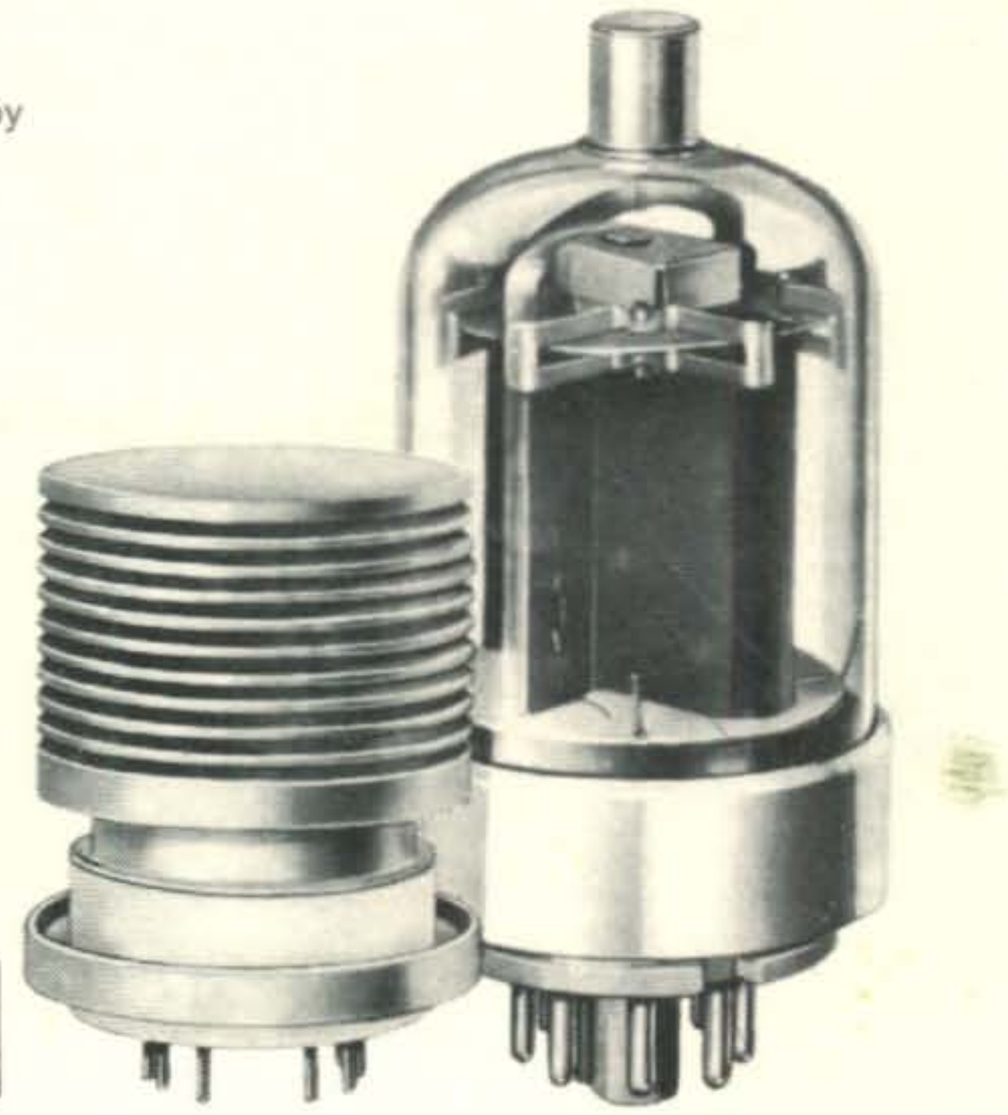
*Brand preference studies conducted by leading Electronic Publications.



RCA