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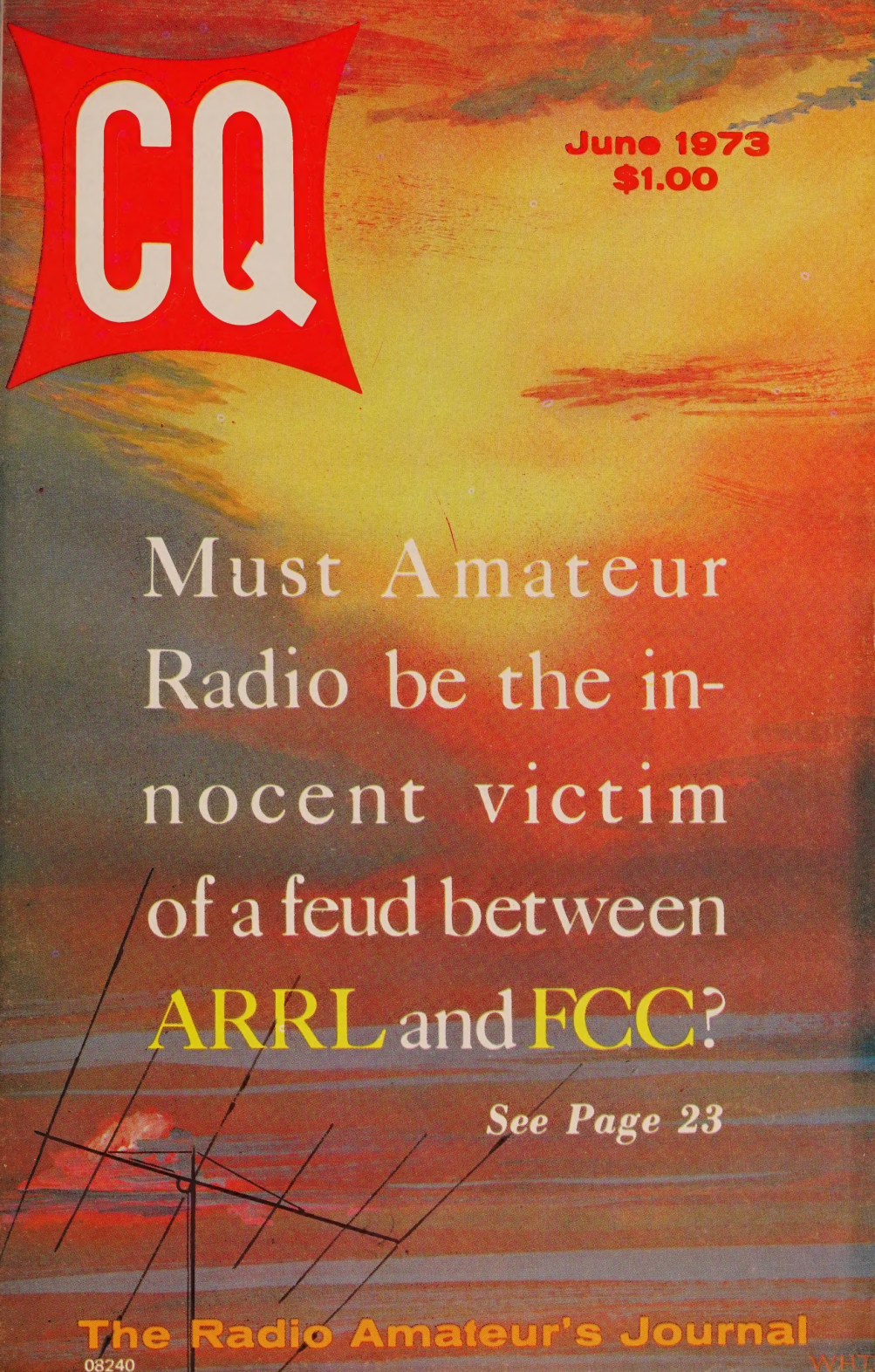
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CQ

June 1973
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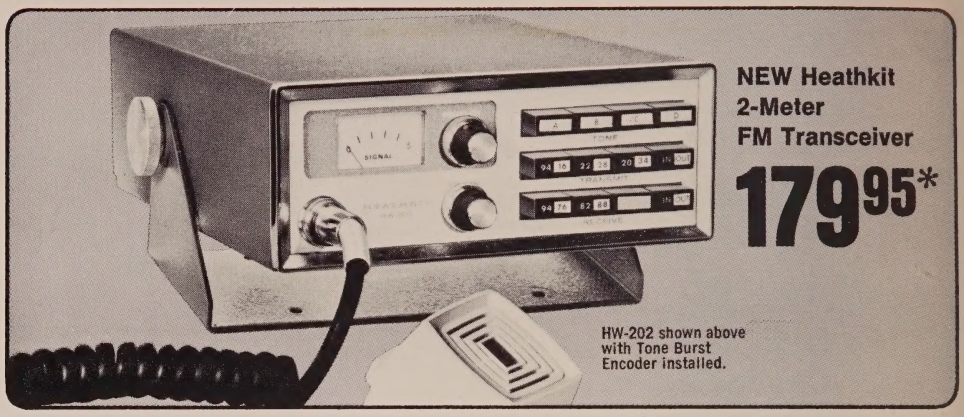
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The Radio Amateur's Journal

08240

Heathkit® 2-Meter FM gear is here!



HW-202 shown above with Tone Burst Encoder installed.

NEW Heathkit 2-Meter FM Transceiver

179.95*

***• All solid-state design • Can be completely aligned without instruments • 36-channel capability** — independent push-button selection of 6 transmit and 6 receive crystals • **10-Watts Minimum Output** — designed to operate into even an infinite VSWR without failure • **Optional Tone Burst Encoder** — mounts inside, gives front-panel selection of four pre-settable tones*

The Heathkit HW-202 compares with the best wired amateur 2M/FM rigs. Plus it has: 36-channel capability via independent selection of 6 transmit and 6 receive crystals. Solid-state circuitry with complete built-in alignment procedures using only the manual and the front-panel meter allow operation over a 1 MHz segment from 143.9 to 148.3 MHz. Removable front-panel bezel permits installation of the new Heathkit HWA-202-2 Tone Burst Encoder.

10-15 watts transmission into an infinite VSWR — indefinitely, with no failure! The HW-202 needs no automatic shut-down — it continues to generate a signal regardless of antenna condition. Transmitter deviation is fully adjustable from 0 to 7.5 kHz, with instantaneous deviation limiting. Harmonic output is greater than −45 dB from carrier. The push-to-talk ceramic microphone supplied has an audio response tailored to the HW-202.

Excellent reception — 0.5 uV or less produces 12 dB Sinad, or 15 dB quieting. Output at the built-in speaker is typically 2 watts at less than 3% total harmonic distortion. The receiver circuitry utilizes diode-protected dual-gate MOSFETS in the front end; an IC IF that completely limits with less than a 10 uV signal; dual conversion, 10.7 MHz and 455 kHz via a 4-pole monolithic 10.7 MHz crystal filter. Image response is −55 dB or better. Spurious response is −75 dB or better.

The Heathkit HW-202 comes with two crystals used in initial set-up and alignment, give you simplex operation on 146.94. Kit includes microphone, quick-connecting cable for 12-volt hook-up, heavy duty alligator clips for use with a temporary battery, antenna coax jack, gimbal bracket, and mobile mount that lets you remove the radio from the car by unscrewing two thumbscrews. The HWA-202-2 Tone Burst Encoder provides four preset-table pushbuttons for instant repeater access. Fixed station operation is as easy as adding the HWA-202-1 AC Power Supply. The HA-202 2-Meter Amplifier puts out 40 watts for 10 watts in, and externally it's a perfect mate for your HW-202.

Kit HW-202, 11 lbs., mailable **179.95***

Kit HWA-202-2, Tone Burst Encoder, 1 lb. . .**24.95***

Kit HWA-202-1, AC Power Supply, 7 lbs. . .**29.95***

Kit HWA-202-3, Mobile 2-Meter Antenna, 2 lbs. **17.95***

Kit HWA-202-4, Fixed Station 2-Meter Antenna, 4 lbs. **15.95***

HW-202 SPECIFICATIONS — RECEIVER — Sensitivity: 12 dB SINAD* (or 15 dB of quieting) at .5μv or less. **Squelch threshold:** 3 μv or less. **Audio output:** 2 W at less than 10% total harmonic distortion (THD). **Operating frequency stability:** Better than ±.0015%. **Image rejection:** Greater than 55 dB. **Spurious rejection:** Greater than 60 dB. **IF rejection:** Greater than 75 dB. **First IF frequency:** 10.7 MHz ±2 kHz. **Second IF frequency:** 455 kHz (adjustable). **Receiver bandwidth:** 22 kHz nominal. **De-emphasis:** −6 dB per octave from 300 to 3000 Hz nominal. **Modulation acceptance:** 7.5 kHz minimum. **Spurious output:** Below −45 dB from carrier. **Stability:** Better than ±.0015%. **Oscillator frequency:** 6 MHz, approximately. **Multiplier factor:** X 24. **Modulation:** Phase, adjustable 0-7.5 kHz, with instantaneous limiting. **Duty cycle:** 100% with ∞ VSWR. **High VSWR shutdown:** None. **GENERAL — Speaker impedance:** 4 ohms. **Operating frequency range:** 143.9 to 148.3 MHz. **Current consumption: Receiver** (squelched): Less than 200 mA. Transmitter: Less than 2.2 amperes. **Operating temperature range:** −10° to 122° F (−30° to + 50° C). **Operating voltage range:** 12.6 to 16.0 VDC (13.8 VDC nominal). **Dimensions:** 2¾" H x 8¼" W x 9⅞" D.

*SINAD=$\frac{\text{Signal + noise + distortion}}{\text{Noise + distortion}}$

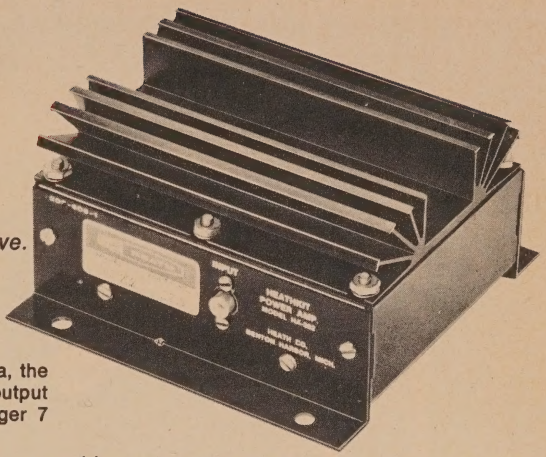
...and here!

NEW Heathkit
2-Meter Amplifier for cleaner FM copy on the fringe... 69.95*

***40 watts nominal out for 10 watts in** — requires only 12 VDC supply.*

***Fully automatic operation** — with any 2-meter exciter delivering 5-15 watts drive.*

***Solid-state design** — all components mount on single board for fast, easy assembly.*



If you're regularly working from a fringe area, the new Heathkit HA-202 can boost your mobile output to 40 watts (nominal), while pulling a meager 7 amps from your car's 12-volt battery.

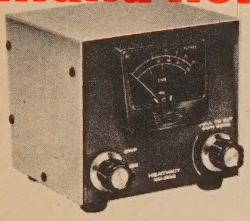
Install it anywhere...in the trunk, under the hood or dashboard. Use it with any 2-meter exciter delivering 5-15 watts drive. Features fully automatic operation. An internal relay automatically switches the antenna from transmit to receiver mode when you release the mike button.

All solid-state design features rugged, emitter-ballasted transistors, combined with a highly efficient heat sink, permitting high VSWR loads. Tuned input-output circuits offer low spurious output to cover the 1.5 MHz segment of the 2-meter band without periodic readjustment. All components mount on a single printed circuit board for easy, 4-hour assembly. Manual shows exact alignment procedures using either a VOM or VTVM. And installation is just as simple.

Kit includes transceiver connecting cable, antenna connector. Operates from any 12 VDC system — additional power supplies are not required. Add HA-202 power to your mobile 2-meter rig, and boom out of the fringe. **Kit HA-202,** 4 lbs.

HA-202 SPECIFICATIONS — Frequency range: 143-149 MHz. **Power output:** 20W @ 5 W in, 30W @ 7.5W in, 40W @ 10 W in, 50W @ 15 W in. **Power input (rf drive):** 5 to 15W. **Input/output impedance:** 50 ohms, nominal. **Input VSWR:** 1.5:1 max. **Load VSWR:** 3:1 max. **Power supply requirements:** 12 to 16 VDC, 7 amps max. **Operating temperature range:** −30° F. to +140° F. **Dimensions:** 3" H x 4¼" W x 5½" D.

...and here!



New Heathkit
VHF Wattmeter/SWR Bridge . . . 29.95*

Perfect tune-up tool for your 2-meter gear. Tests transmitter output in power ranges of 1 to 25 watts and 10 to 250 watts ±10% of full scale. 50 ohm nominal impedance permits placement in transmission line permanently with little or no loss. Built-in SWR bridge for tuning 2-meter antenna for proper match, has less than 10-watt sensitivity. **Kit HM-2102,** 4 lbs.

HM-2102 SPECIFICATIONS — Frequency range: 50 MHz to 160 MHz. **Wattmeter accuracy:** ±10% of full-scale reading.* **Power capability:** To 250 W. **SWR sensitivity:** less than 10 W. **Impedance:** 50 ohms nominal. **SWR bridge:** Continuous to 250 W. **Connectors:** UHF type SO-239. **Dimensions:** 5¼" W, 5⅛" H and 6½" D, assembled as one unit.
*Using a 50 Ω noninductive load.

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JUNE, 1973 VOL. 29, NO. 6

The Radio Amateur's Journal

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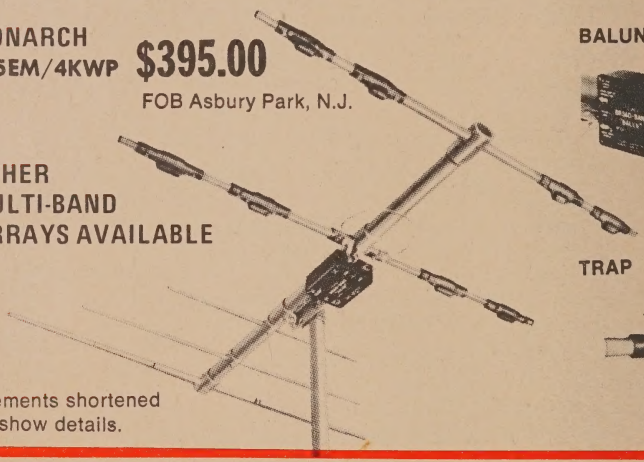
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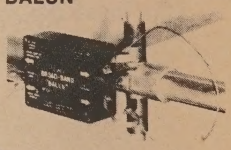
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OUR READERS SAY

Super Power

Editor, *CQ:*

About twenty years ago the first amateur radio echoes from the moon were heard at W4AO and W3LZD. Right after the first successful test Ross took the DC meter readings, and they showed an input of 920 watts.

In 1968, I assembled at W3GKP the apparatus which later produced the first moon echoes on 2.3 GHz, a two-way contact with W4HHK, "heard" reports from DJ4AU and DJ8QL, and (after moving) a transcontinental contact with W6YFK. The big klystron used in this rig (and donated by Army MARS) is rated 3½ kW input and 1 kW output. On two occasions I ran this rig at about 1.2 kW input to a dummy load to check out the antenna relays and the tube cooling. On the air it has never been run past the 1 kW mark. On a few tests I heard my own echoes from the moon with an input of about 250 watts (output estimated as 40 watts).

I am amused by the idea that anyone should think it necessary to run more than the legal limit to work terrestial "DX" (after all, it can't be more than 12,000 miles). Such operators, if any there be, don't understand amateur radio – in fact they don't understand radio! Perhaps they should try another hobby – something like shooting mosquitos with a 12-gauge shotgun.

William L. Smith, K4RJ
Franklin, North Carolina

Editor, *CQ:*

I'm sorry I missed the editorial in an earlier issue but I couldn't help but respond to Zero Bias and "Our Readers Say" in the April issue of *CQ.*

Abuse of amateur radio has long been a pet peeve of mine and super power is only one of the many excesses carried on today. Abusive language is another; but to the point *re:* super power. A few years ago, I wrote to several people asking for support in trying to get a petition together to change the rules regarding power limitations. As I did not read your earlier editorial on the subject, I can only guess that my idea was very similar to yours *i.e.* limit the size of the bottle in the final. Several of the replies that I received, when added up, said "you're nuts." One reply from a man very close to the larger body of organized amateur radio reeled off a reply that said my idea was an insult to amateur radio, that it contained no merit at all and that should it ever be presented as a proposal that he would do all in his power to defeat it. To use the modern language, I really "pulled him out of his tree!"

Up until several years ago, I was an avid DX chaser on 75 meters, and as judged by some, fairly proficient at it. I was invited to join two separate clubs specifically to operate their 75 meter positions during the contests. I visited both and came away sick at heart because I saw and confirmed for myself what I had and others had long suspected. Amplifiers that had multi-multi kilowatt bottles in the finals powered from transformers that it would take several strong persons to move. I saw mic gain controls full clock-wise, the covers on the exciters open so that a twelve inch table type fan could move air into the cabinet to cool it. Needless to say, I joined neither, operated neither and left both as quickly as I could because just being there made me feel guilty. The most disturbing thing is that the operators thought they were "competing" and actually were enjoying themselves. This is competition? This is a sense of fair play? This is ham radio? I say emphatically – NO! What possible competition can exist between a bicycle and a motorcycle in a race of speed? I have seen the same thing in individual ham stations all across the U.S. In all fairness, I should say that my observations were made about four years ago and possibly those same stations are under new direction and control now.

Let me hasten to say that I would give benefit-of-doubt to 99% of the individual hams and clubs across the country. The 1% however, does exist and always will unless dealt with severely. The 99% will operate as per the regulations even if you limit them to a 6L6 in the final. The 1% will not. It appears to me that the only way to reduce the 1% is for the FCC to remove their licenses and prosecute if and when they find them operating without license.

Rules and regulations are guidelines set out for reasonable people to follow just as locks are to keep out honest people. There is no lock that will keep out the dishonest if they desire to get in.

Amateur radio for the most part does its own house cleaning very well. It cannot pull the habitual offender in line because he is not a true ham and has no regard for the status of amateur radio. His only interest is his own pleasure at the expense of others. Publishing his name and call will only serve to feed his ego. If you question that statement, simply listen to any of the bands and when you find one who is in the process of interfering with others just listen. If the group being interfered with acknowledges his presence, he will hang around all evening. Ignore him and he goes away.

CQ has apparently taken the position of eliminating from consideration for recognition anyone suspected of using illegal means during any of the activities sponsored by *CQ.* That's great and I applaud you! However, if you really have the courage of your convictions, report your findings to ARRL and FCC and ask both for support in removing from our ranks those that would tear down amateur radio however slowly.

If the powers that be feel that a specific plate dissipation in the bottles of the finals is desireable, then fine. I'll dismantle my 4-1000 rig and put in whatever the regs say. Sure, it might make it harder to get across the pond on 75 meters, but so what? Much more satisfaction can be achieved by using finesse than by brute force. Communications is an art, and to blow my own whistle a bit, some of my most satisfying moments have come when I scooped some big gun on 75 meters chasing DX.

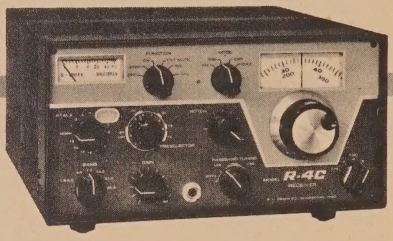
Because someone is bound to start yelling about his "rights" should you actively pursue your efforts, let me say in advance – "HOGWASH." The rights a person has are those accepted by his society as best for the society in general and set out as rules

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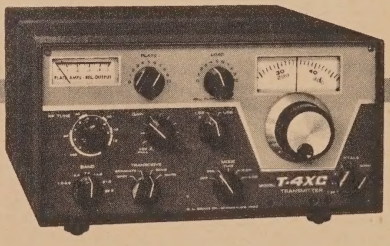


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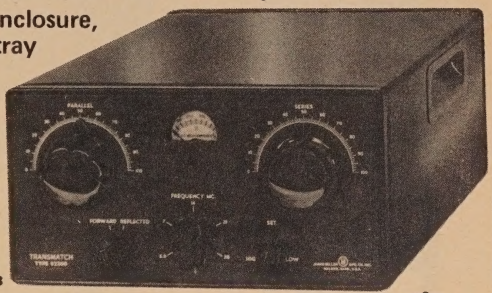
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and regulations for the society to follow. Rules and regulations are the guideposts by which man each day governs his actions. The greater majority of hams do not condone illegality in any form. Therefore, no right is lost if action against illegality occurs.

As pointed out earlier, I have a very healthy respect and admiration for amateur radio and hams is general. Both are responsible to a great degree in enabling me to provide for my family the necessities of life.

Let's rid ourselves as much as is possible of the segment of ham radio that can contribute nothing and if allowed to continue can only be a great factor in reducing it to a class of service for which there can only be contempt.

Dean Craft, W4IHK
Springfield, Virginia

The Social Receiver

Editor, *CQ:*

The correspondence on "The Social Receiver" (April, *CQ*) was every bit as interesting as the original article of the January issue.

We are greatly indebted to J.H. Griscom, Jr., W3GGV, for reminding us so poignantly of the stage K6RRC politely omitted from his receiver: the self-biased, narrow-minded discriminator.

Milton Nodacker, WN7TFE/8
East Cleveland, Ohio

Dial-A-Prop

Editor, *CQ:*

Couldn't resist subscribing with the Dial-A-Prop deal you support. Just back active again and this service is wonderful. You probably know the phone number is wrong on page 72, April — should be area code 516.

Leslie M. DeVoe, W9LQ
Indianapolis, Indiana

Editor, *CQ:*

All I can say is thank you for your Dial-A-Prop service.

I think it is one of the best ideas that your magazine has had, even though the propo may not be so good lately. I really like the full details on which bands to use.

Thanks to *CQ* Magazine and George, W3ASK.

Jack Burton, WB2CJS
Forest Hills, New York

RTTY on 20 Meters

Editor, *CQ:*

The type of biased, narrow minded thinking exhibited by John Rogers in March, 1973 *CQ* is the very thing which has the most potential for harming the growth of amateur radio, which he apparently fears is happening. Since ham radio began, gentleman's agreements on subdivision of bands for use with various modes have worked quite well. This includes occurrences when s.s.b. was introduced, used of SSTV, division of 2 meters, etc., and most important to this discussion, the use of RTTY. Although the agreements have worked well on the whole, there are always those who feel they are being robbed and start yelling. If Mr. Rogers can't find space in the lower 80 kHz of 20m. to operate c.w., he certainly isn't looking very hard. As an



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avid fan of c.w. since I have been a Novice and of s.s.b. on becoming a General, and having recently started on RTTY, I can assure Mr. Rogers that there is room for everybody when we cooperate, and for that matter, there is room for more hams. 20 meter c.w. is one of the most QRM free subbands around, probably only surpassed by 10m.

I hope I never become so biased as to claim that a group of people using a mode I'm unfamiliar with should not even be called amateurs. This is the type of misunderstanding that is at the root of so many problems today, and certainly is not an attitude suitable for enjoyment of our great hobby.

Any mode of transmission sounds like chattering gibberish unless one has the equipment to detect it properly, and as for interference, RTTY can be QRMed by c.w. just as easily as vice versa. RTTYers and c.w. men threaten the future of either mode on 20m. There is room for a lot on our bands, including alot of understanding.

Bruce Frahm, WAØTAS
Manhattan, Kansas

Editor, *CQ:*

Reading Mr. Rogers' letter concerning RTTY on 20 meters in the March 1973 issue left me disgusted.

RTTY is as much a part of ham radio as c.w. or s.s.b. Over 100 countries and all states are represented on RTTY, which indicates world-wide interest. RTTY requires both electronic and mechanical knowledge, therefore, broadening one's horizons.

As for removing RTTY from the c.w. portion of 20 meters, most active RTTY'ers would be very pleased to see c.w. banned from 14075 to 14100 kHz.

RTTY is growing everyday as more and more commercial equipment is introduced. At the major conventions you do not find seminars on c.w. or is there a magazine called "C.W." RTTY has both to offer.

My only suggestion to Mr. Rogers is that if he cannot copy c.w. through RTTY, that he move below 14075 kHz.

Glenn R. Kurzenknabe, K3SWZ
New Cumberland, Pennsylvania

C.W. The Second Time Around

Editor, *CQ:*

The article in the March issue by Al D'Onofrio, W2PRO, "C.W. The Second Time Around," was excellent. However, Al omitted one piece of advice to c.w. novitiates which I feel is of paramount importance.

If you don't own one, buy or borrow a recorder and tape yourself.

Have you not heard a person say after his first exposure to this devilish machine, "I didn't know that I sounded like that!"

A long time ago, I made my living as a c.w. operator, but didn't touch a key for 22 years until about 18 months ago when I decided to return to the ranks of amateur radio.

Like Al's bicycle-riding analogy, the basic skill was still there in my case, but the technique was mighty rusty. Using a battered recorder and copying my own fist was the best idea I had in 1971.

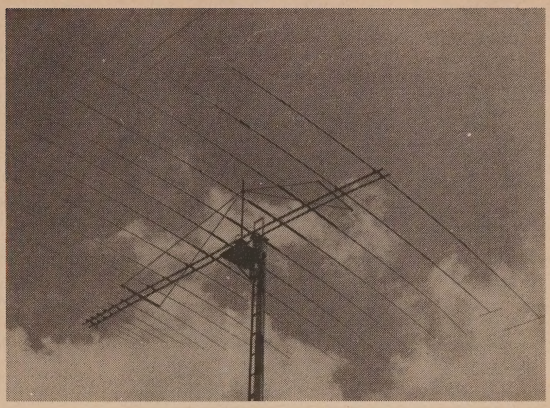
Try it! I'd love to see the faces of some operators (?) after their first go-round with the unforgiving tape recorder. We'd hear fewer NNMAs on the bands.

Edwin D. Kennedy, W3GPI
College Park, Maryland

[*Continued on page 80*]

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Announcements

W1 Ham-of-the-Year Award for 1973

The Federation of Eastern Massachusetts Amateur Radio Associations are now requesting nominations for the "Ham of the Year" award for 1973. Only amateurs in the 1st call district are eligible and the amateur selected will be the top "good neighbor" among hams, the one who has performed an outstanding public service.

Anyone may nominate an amateur for the honor. Nominating letters should include the candidate's name, address, call and a complete description of the service performed. Send letters to: Chairman, FEMARA Awards Committee, 28 Forest Ave., Swampscott, MA 01907.

FARL Scholarships

The Foundation for Amateur Radio, Inc., announces its intent to award three scholarships for the academic year 1973-74. All amateurs, wherever resident in the U.S. and holding an FCC license of at least General class, can compete for one or more of the awards if they are now enrolled or have been accepted for enrollment in a full-time course of studies beyond high school.

Application forms can be requested from the Chairman, Scholarship Committee, 8101 Hampden Lane, Bethesda, MD 20014. Area preference is the same as the Gore Scholarship.

Jacksonville, Illinois

The Jacksonville, Illinois Hamfest will be held on July 8 at the Morgan County Fairgrounds. Tickets $1.50 or 4 for $5. For info: WB9CEB, Box 571, Jacksonville, IL 62650.

Frankfort, Illinois

The Six Meter Club of Chicago Inc. will hold their 16th Annual Picnic and Hamfest on Sunday, August 5th, at the Frankfort Picnic Grove, 1 mile north of U.S. 30 on U.S. 45, Frankfort, IL. Food and drinks, swap and shop provided. Advance registration $1.50, $2.00 at gate. For info: Val Hellwig, K9ZWV, 3420 South 60th Court, Cicero, IL 60650

Minneapolis, Minnesota

The 1973 I.S.S.B. Convention will be held at Radisson South, Minneapolis, MN from June 15-21 inclusive. For info: Dr. Fred C. Holzapfel, WØUUE, 5001 Olson Highway, Minneapolis, MN 55422.

Chadron, Nebraska

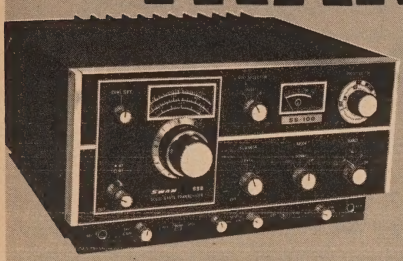
The Pine Ridge Amateur Radio Club of Chadron, Nebraska will hold their annual hamfest at Chadron Nebraska State Park, 9 miles south of Chadron, Nebraska on Sunday, June 3. All amateurs and families welcome, covered dish dinner, soft drinks and coffee furnished. No charge. For info: Terry Cogdill, WAØBHT, Pine Ridge Amateur Radio Club, Box 56, Pine Ridge, So. Dak. 5770.

Akron, Ohio

The Goodyear Amateur Radio Club will hold its 6th Annual Hamfest Picnic on June 17th from 10 a.m. to 6 p.m. at Goodyear Wingfoot Lake Park,

[*Continued on page 80*]

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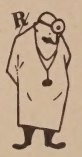
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Q AND A

BY CHARLES J. SCHAUERS, W6QLV*



Q&A continues to receive requests for manuals and schematics (especially for older equipment) which we simply do not have. Our answer to those who seek these is that they should use a Ham Shop ad in *CQ* and offer a reasonable amount for the manual of schematic they need.

This columnist has loaned out manuals (many of them!) which were never returned and now there are few replacements to be found.

When you write Q&A do *not* enclose manuals or schematics in your envelopes which you desire returned.

If you have a troubleshooting question *do* enclose a *copy* of a schematic if you can—this will help us help you.

We do not and cannot maintain a file on readers' correspondence. We treat all letters confidentially. We assure you that we cannot answer *all* questions that are asked for we realize that we do not know it all and never will. Please keep your letters and cards short.

Antenna Matching

"I recently bought a popular make of antenna matching unit and it works well with a coaxial feed. However, at my present location the only kind of antenna I can use is a long wire. Any way to modify my Drake MN-4? Can you suggest a matcher for a long wire antenna? I have two rigs (one at another location) so can still use the MN-4."

The MN-4 matches impedances up to about 250 ohms or so except on 20, 15 and 10 meters where it goes somewhat higher—

Q & A is a free technical assistance program offered by CQ to its readers. We ask your cooperation to enable us to assist as many amateurs each month as possible. Always include a self-addressed stamped envelope with your question. Only one question per letter, please. Before writing to ask where a published article appeared, try to find it yourself by consulting the annual indexes of the various amateur magazines. Mail questions to: CQ Q & A, 14 Vanderventer Ave., Port Washington, N.Y. 11050.



Create a vast improvement in your two meter performance! Get the advantage of 6 db gain transmitting—6 db gain receiving. Both are yours in the Hustler Model G6-144, the antenna designed to establish who is who on two meters.

be "who's who" on two meters with the HUSTLER 6db gain colinear

MODEL G6-144 . . . $42.95

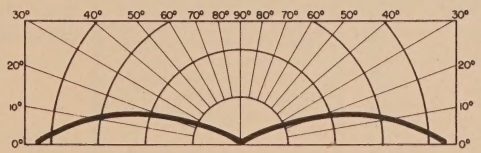
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- 6 db gain over 1/4 wave ground plane
- Omnidirectional radiation pattern
- 50 ohm feed impedance
- Field adjustable
- SWR at resonance — typically 1.1:1
- 6 MHz bandwidth for 1.5:1 or better SWR
- Power rating—250 watts FM

MECHANICAL:

- Radiator: 133"x 1" — 7/8"-3/8" OD high strength aluminum tubing
- Radials: Four—21" x 3/16" dia. aluminum rod
- SO-239 coax connector
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- Shipping Weight: 4.54 lbs.

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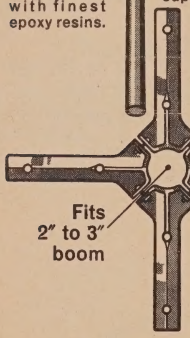


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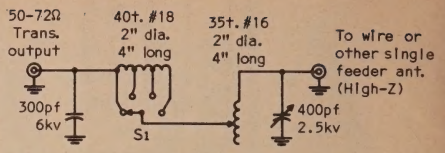


Fig. 1—An antenna tuner as mentioned in the text. S_1 is a ceramic switch. The variable inductor can be of the surplus type.

about 500 ohms on 10. Long wire antennas will run up to 1000 ohms or over. The MN-4 was *not* designed for high Z antennas. No modification data is available currently. However, I presume you wish to come into a matcher with your transmitter at around 50 ohms to a long wire antenna. Fig. 1 will work. To use the little unit I suggest you use a good v.s.w.r. meter along with it and then tuning is made easy.

Lip Carbon Mike For HI Z Operation

"I have a war surplus MI/A carbon mike, 75 ohms impedance which fits over the mouth. I should like it to be used with my transceiver which has a hi Z input for the mike. How do I do this?"

See fig. 2. Use an Argonne transformer Number AR-146, $2.98, obtainable from Lafayette Radio Electronics. This is 50 ohms to 100K ohms and will do the job. Start off with *low* mike gain and advance the mike gain control until you are modulating the rig properly. If your voice is too "high pitched" try a capacitor .002 mf across the secondary.

Power Fall Off

"I have a transceiver made in Japan. The input and output are not linear across any band. Full rated power is developed on the low end of each band and falls off to half power, especially on 20 and 40 meters. This is in the c.w. mode key down into a dummy load. My HT-37, using the same load shows linear in and out. What do I look for?"

[*Continued on page 82*]

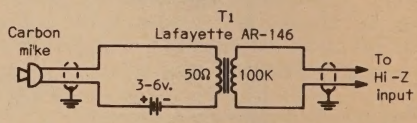
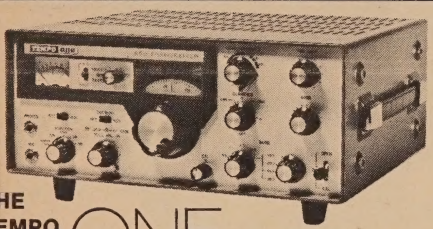


Fig. 2—An impedance matching device for matching low to high impedance microphones. A 100 k pot may be connected across the secondary of "T" for better gain control or in series for higher Z inputs.

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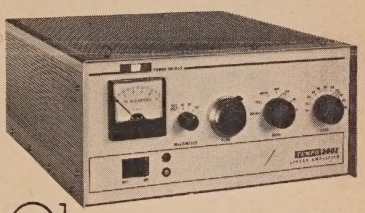


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FREQUENCY STABILITY: Less than 100 cycles after warm-up, and less than 100 cycles for plus or minus 10% line voltage change.
MODES OF OPERATION: SSB upper and lower sideband, CW and AM.
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ANTENNA IMPEDANCE: 50-75 ohms
CARRIER SUPPRESSION: −40 dB or better
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RECEIVER SENSITIVITY: ½ μv input S/N 10 dB
AGC: Fast attack slow decay for SSB and CW.
SELECTIVITY: 2.3 khz. (−6 dB), 4 khz. (−60 dB)
IMAGE REJECTION: More than 50 dB.
AUDIO OUTPUT: 1 watt at 10% distortion.
AUDIO OUTPUT IMPEDANCE: 8 ohms and 600 ohms
POWER SUPPLY: Separate AC or DC required. See AC "ONE" and DC1-A.
TUBES AND SEMICONDUCTORS: 16 tubes, 15 diodes, 7 transistors

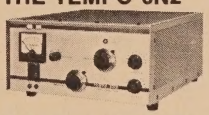
TEMPO "ONE" TRANSCEIVER	$349.00
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THE TEMPO 2001 LINEAR AMPLIFIER

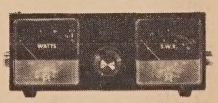
Small but powerful, reliable but inexpensive, this amplifier is another top value from Henry Radio. Using two 8874 grounded grid triodes from Eimac, the Tempo 2001 offers a full 2 KW PEP input for SSB operation in an unbelievably compact package (total volume is .8 cu. ft.). The 2001 has a built-in solid state power supply, a built-in antenna relay, and built-in quality to match much more expensive amplifiers. This equipment is totally compatible with the Tempo One as well as most other amateur transceivers. Completely wired and ready for operation, the 2001 includes an internal blower, a relative RF power indicator, and full amateur band coverage from 80-10 meters. PRICE: $545.00

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Dual meters continuously monitor output power and SWR during transmission. Offers two power scales of 0-200 and 0-2000 watts plus operation from 1.9 to 150 MHz. Tempo offers this combination in-line SWR bridge and wattmeter at a surprisingly low $29.95.

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- Mounting versatility—table top or standard 19-inch rack.
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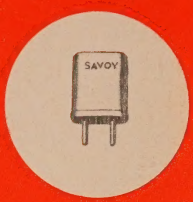
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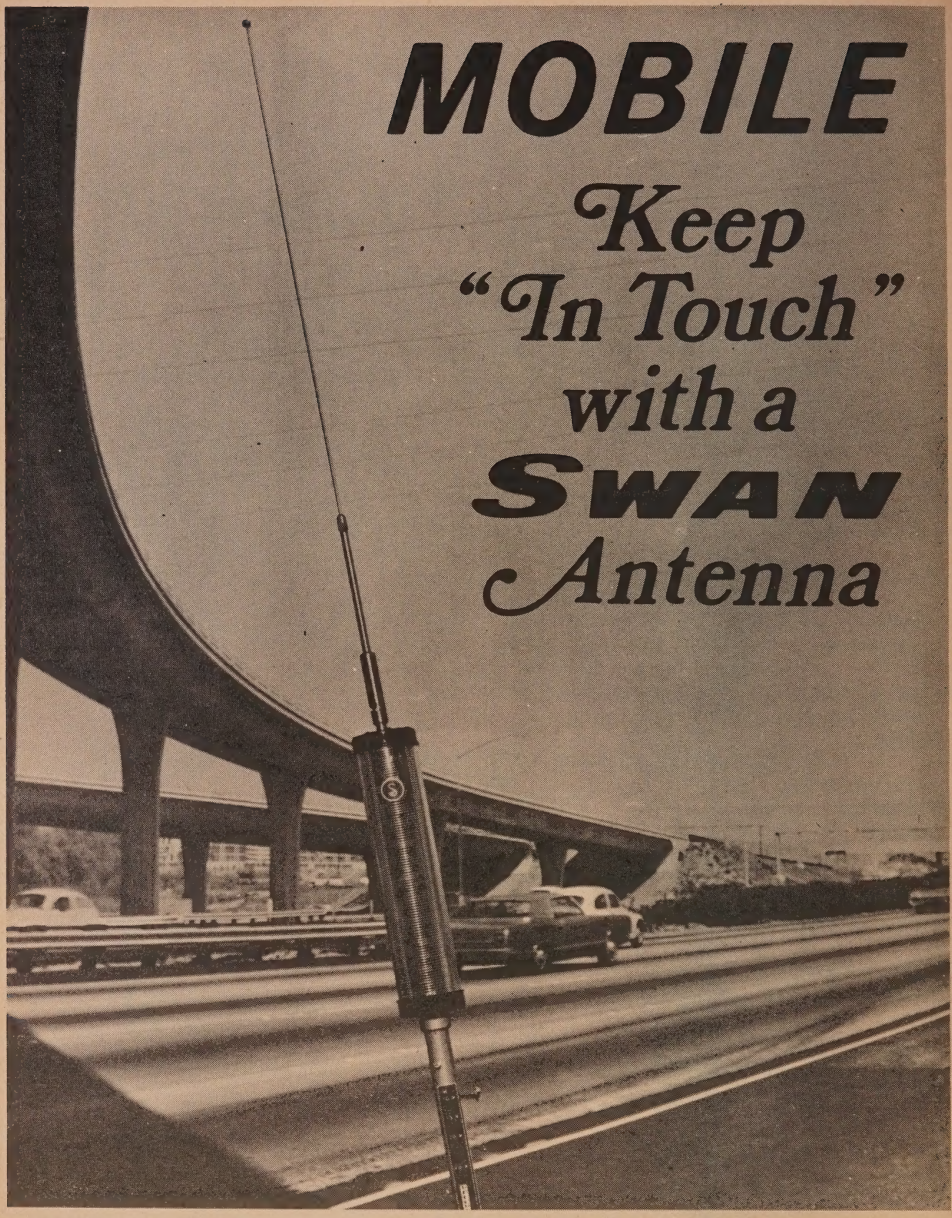
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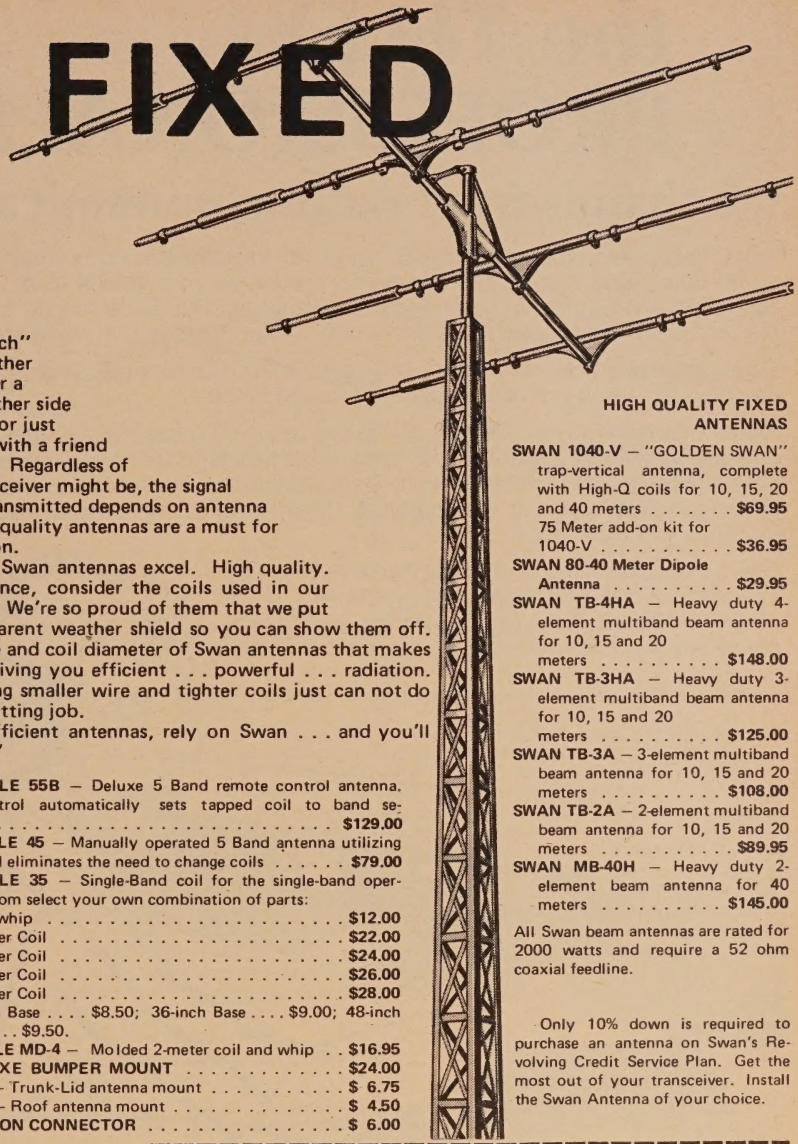


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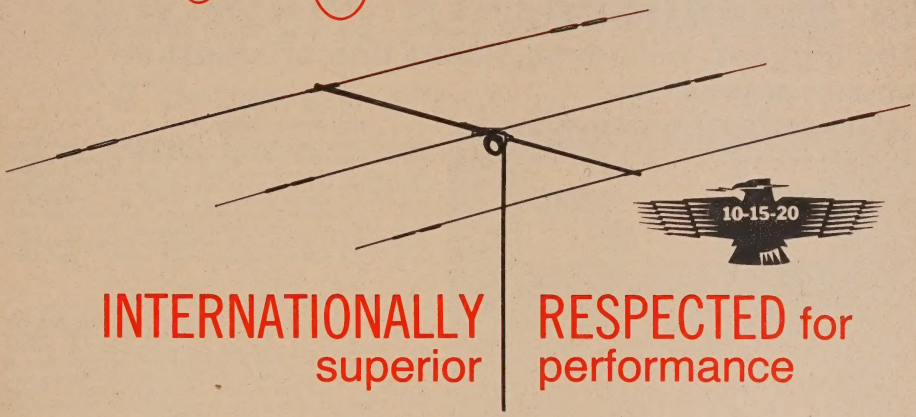
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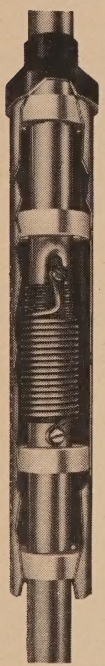
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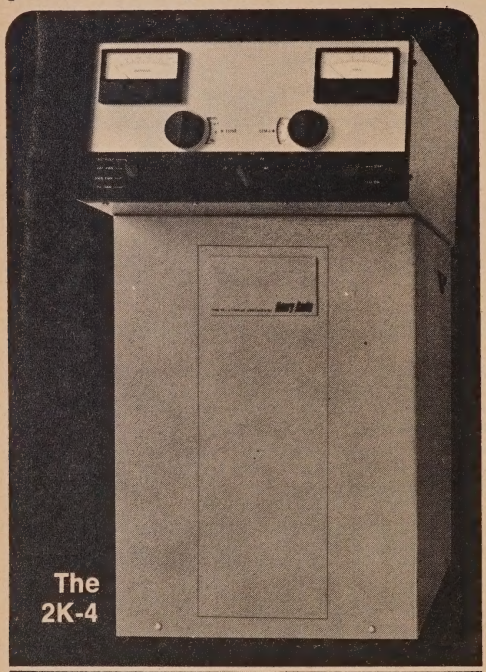
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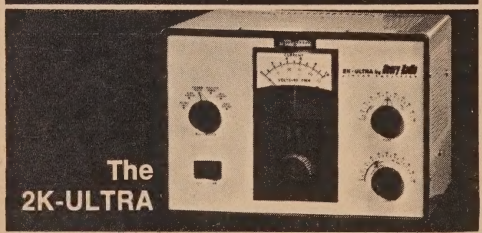


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A Guest Editorial:

Everything You've Wanted to Know About the FCC But Were Afraid to Ask

A penetrating look at the ARRL and its relations with the FCC

BURIED in a short article in the August, 1934 issue of QST *was a notice that on June 9, 1934 Congress passed the Communication Act of 1934 which, effective July 1, of that year, replaced the Federal Radio Commission with the newly created Federal Communications Commission. The new Commission would be composed of seven members appointed by the President and subject to confirmation by the Senate of the United States. One Commissioner would be appointed or reappointed each year, for a term of seven years.*

The Commission is assisted in the performance of its responsibilities which cover vital communication matters within the United States and its territories, by a staff, one part of which is the Safety and Special Radio Services Bureau. A major division of this Bureau is the Amateur and Citizens Radio Division.

This Division of the FCC has recently come under fire from the American Radio Relay League, particularly with respect to certain rule-makings and the so-called paternalistic policy of "Washington knows best," as expressed by the ARRL's Directors' Resolution and companion QST *editorial (see* QST, *March, 1973).*

To the distant observer, the workings of the FCC may seem obscure, intricate and remote, but a good understanding of the rule-making process, particularly as it applies to the Amateur Service is essential for all radio amateurs. The following observations, it is hoped, will bring some light to this process and place the recent QST *material in the proper context.*

WHAT is the rule making process within the FCC? Is it a legal, just and viable action with built-in safeguards as most amateurs hope? Or is it merely a drumhead court-martial decision arbitrarily reached by a bunch of uninformed bureaucrats, unresponsive to the view of the general public?

Who, indeed, is to say what amateur radio will be?

Whose task is it to establish guidelines as to the future of amateur radio?

Difficult questions to answer, but ones that probably will determine the future of amateur radio.

The ARRL Resolution

This article is prompted by the ARRL Directors' Resolution and *QST* editorial of March, 1973, both of which are inadequate, inelegant and ineffective means of expression vis-a-vis the FCC and have done more harm than good to the Amateur Radio Service. Such a resolution has no force of law, commits no one to anything, and only stirs up strong passions among the Archie Bunker set. A review, then, of the FCC rule making process seems to be a good idea in order to clear the air and to permit more effective avenues of communication to be opened be-

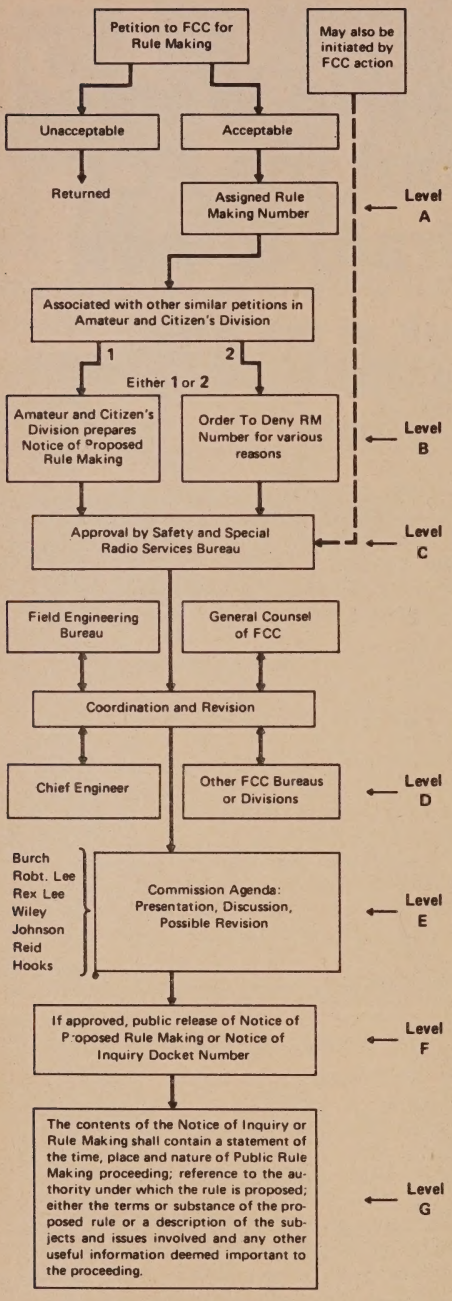


Fig. 1—Initiation of an informal Rule Making by the FCC.

tween *radio amateurs* and the Federal Communications Commission whose duty is to regulate them.

The Administrative Procedure Act

All administrative actions taken by the FCC and *other* governmental bodies are prescribed by the *Administrative Procedure Act* of June 11, 1946, and are summed up in the "Attorney General's Manual"[1]. This 139-page volume interprets the Act and provides guidelines for orderly administration of the rules and regulations established by Federal Agencies including the FCC. In addition, the Manual outlines the relationship between these agencies and the public in the matter of rule making. Section 4 (b) of the Act, as discussed in the Manual, states, *"in every case of proposed informal rule making subject to the notice requirements of section 4 (a) the agency shall afford interested persons an opportunity to participate in the rule making through submission of written data, views or arguments with or without opportunity to present the same orally in any matter"*. The Manual further states that the objective of this participation is "to assure informed administrative action and adequate protection to private interests."

Clearly, then, an authorized and orderly channel of communication is set up and available for public participation in FCC rule making. Let us examine how this channel functions and see if it is used effectively.

Step 1: Initiation of Informal Rule Making

The FCC *must* follow procedures defined in the Administrative Procedure Act in all rule making proceedings. The initiative steps of this procedure are outlined in fig. 1, Step 1.

Any interested party or parties may petition[2] to *amend existing rules* or *propose new ones;* or a proposal for amendment or a new rule may be initiated by the Commission's own action. If a petition is in order, procedurally and substantially, it is assigned a *Rule Making Number* (RM number) and is grouped or associated with other similar petitions bearing on the same general subject, if any (level A). If the petition is not in order, that is, not in conformity with the general requirements for the petition, it is returned to the sender.

[1] Attorney General's Manual on the Administrative Procedure Act, prepared by the United States Department of Justice, Tom C. Clark, Attorney General.

[2] Petition requires original and 14 copies

If the petition is found in order, it and all other relative matters are taken into account and preparation for a *Notice of Proposed Rule Making* or *Notice of Inquiry* is initiated by the Amateur and Citizens Radio Division. Such proposed rule makings go through several drafts and are discussed extensively within that Division. *It must be kept in mind that rules are not formulated for a few segments of the Amateur Radio Service, or for the benefit of a few, but must apply equally to all.* All available information contained in the petition and elsewhere, including the knowledge and experience of the people working on the material are taken into account.

[Perhaps at this point it is a good idea to explain the difference between a Notice of Proposed Rule Making (NPRM) and a Notice of Inquiry (NOI). In the former, after suitable discussion of the petitions and other information bearing on the subjects, Service Rules (Amateur radio *is* a Service) proposed for incorporation into Part 97 of the Rules and Regulations are attached as an Appendix to the NPRM. Those specific rules constitute the major difference between a NPRM and a NOI. In the latter, the discussion generally leads up to specific questions of policy and procedures related to the subject, and solicits information and answers from interested parties on those questions and issues raised throughout the NOI, whether in specific form or not.]

So far the NPRM or NOI under discussion is entirely within the Amateur and Citizens Radio Division (level B of fig. 1). Once the Division is satisfied with it, it then passes to the Chief of the Safety and Special Radio Services Bureau (S&SRS Bureau, level C, fig. 1) for approval or revision. The NPRM or NOI then follows a process of coordination and revision with the Chief Engineer of the FCC, Field Engineering Bureau, Office of the General Counsel (if required) or any other Bureau or Division of the Commission (level D, fig. 1). During this process, any contributions from the viewpoints of those other Bureaus and Divisions are taken into account. Assuming everything is agreed, the NPRM or NOI draft is then submitted to the office of the Secretary of the FCC for inclusion on the agenda of one of the meetings of the full Commission where it is presented orally if requested, and discussed (level E, fig. 1). Such meetings of the Commission are not open to the public.

After suitable discussion, the Chairman of the Commission (Mr. Dean Burch) will call for a vote among the seven Commissioners who either vote for, against, abstain, concur in part, dissent in part, etc. If the outcome of the vote is in favor, the NPRM or NOI then becomes an official act of the Commission, is assigned a *Docket Number* and is released to the public for comment (level G, fig. 1). Note the information in the box of level G which sets forth the conditions of the NPRM or NOI, the time allowed for comments, reply comments, etc.[3] *This is the first chance the Amateur Radio Service has to comment on the proposed actions of the FCC.*

It must be kept in mind that rules are not formulated for a few segments of the Amateur Radio Service . . . but must apply equally to all.

What happens next largely depends on the substantive matters discussed in the comments received by the FCC, the reasons advanced for various positions, comprehensiveness of the material submitted taking into account characteristics of signals and procedures utilized by amateurs, etc.

Step II: Issuance of Report and Order

After expiration of the filing period for comments, the FCC Division involved (in the case of amateur radio, this is the Amateur and Citizens Radio Division) studies the received comments and reply comments and, in accord with the Administrative Procedure Act, *must* write a *Report and Order* (R&O) summarizing the petition(s) and the proposed answers to them. Again, this process goes through extensive discussion and several drafts before the Division forwards it to the Bureau Chief (fig. 2, levels H through K). After the Report and Order is formalized, but before it is submitted for Commission approval, it is coordinated internally within the

[3] Time allowed for comment is fixed by the FCC and may be extended.

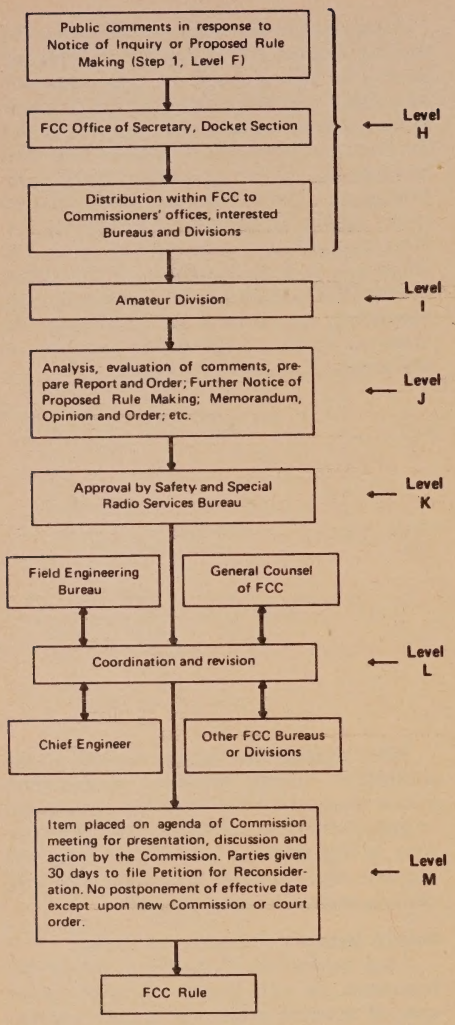


Fig. 2—Conclusion of Rule Making by the FCC.

FCC with the Chief Engineer, the Field Engineering Bureau, the FCC General Counsel and other interested Bureaus or Divisions to insure that the proposed action is legally proper, technically feasible and acceptable to the other Divisions (level L, fig. 2). The Chiefs of the various Divisions and Bureaus must personally sign the Report and Order before it is given to the Office of the Secretary of the Commission for inclusion on the agenda of the commission. Once it is placed on the agenda of some meeting of the Commissioners, it is ready for their consideration, possible revision and vote.

When the Report and Order is up for discussion at a regularly scheduled meeting, it is presented to the Commissioners by the Amateur and Citizens Radio Division in whatever detail the Commissioners request. After discussion of the matter, the Chairman calls for a vote of the seven Commissioners, as explained previously at Step 1, level E. If the outcome of the vote is in favor, the Report and Order is released to the public for comment. After the public release, there is a 30 day period within which a *petition for reconsideration* may be submitted by anyone who disagrees with the Report and Order (Step 2, fig. 2, level M). The petitions are filed at the Office of the Secretary of the FCC and at the expiration of the time period are forwarded to the appropriate Offices, Bureaus and Divisions of the FCC. In the case of radio amateur matters, the material is forwarded to the Amateur and Citizens Radio Division of the Safety and Special Radio Services Bureau, where they are considered, analyzed and evaluated as to whether the Report and Order should be modified.

If the petitions for reconsideration are convincing, are based on good reasoning and facts, apply equally to the Service as a whole and take into account the administrative procedures of the Commission as they apply to the Report and Order, there is a good chance that pertinent provisions of the Report and Order may be changed. If such factual information and data is not present in the petitions, the Commission staff will in all likelihood consider that the originally submitted Report and Order should stand. Under these conditions, the R&O will be discussed in a written memorandum to the Commission stating the reasons why it should not be revised (or should be revised, as the case may be). The *preceeding step thus constitutes the second chance the Amateur Radio Service has to comment on the actions of the FCC.* A 30 day period, prescribed by law, is allowed for petitions to be received by the FCC. The period cannot be extended.

Finally, the proposed Memorandum, Opinion and Order (the reply to the petitions for reconsideration) is once again placed on the agenda of a Commission meeting, presented and discussed as previously described, voted on and the results made known by a public release.

Unless there are errors of procedure involved in the process described which are brought to the Commission's attention, this is the conclusion of an *informal* rule making proceeding. Practically all proceedings involving Amateur Radio Service are conducted by means of the informal process, in writing, as contrasted to a formal proceeding which involves appearance of witnesses, submission of evidentiary testimony under oath, and pleadings of the adversary attorneys before an Administrative Law Judge (formerly called Hearing Examiners) of the Federal Communications Commission.

If, after all these steps (including two opportunities for public comment) have taken place, and persons are still dissatisfied about the results of the rule making procedure, they may—as a last resort—bring suit against the Federal Communications Commission on procedural or other grounds in a Federal Court. The plaintiffs would have to prove that the FCC acted improperly in the rule making, a charge that might take time, effort and considerable funds to mount effectively.

* * * * *

This, then, outlines the rule making process of the FCC. The March, 1973 *QST* editorial took issue with the results of this process, particularly with regard to Docket 18803 (Repeaters), Docket 19162 (phone band expansion) and Docket 19245 (so-called "Eye-bank" Docket). The editorial raises the question in the minds of some observers if the ARRL did in fact take advantage of the built-in provisions for public comment inherent in the FCC rule making process, and if it did, what were the consequences of their actions?

With regard to Docket 18803 (Repeaters), subsequent to submission of comments on the initial Notice which were fully taken into account, the ARRL filed a petition with the FCC for reconsideration of the Report and Order, but only requested a postponement of the effective date of the rules. *They did not file a petition for any substantive changes in the rules themselves,* which they seem to complain so bitterly about. The FCC denied their request for delay of the effective date of the rules.

With regard to Docket 19162 (phone band expansion), the ARRL submitted comments which were largely granted; 75 meter phone was expanded to 3775 kHz and 40 meter phone was expanded to 7150 kHz. No expansion was asked by ARRL nor granted for 14, 21, and 28 mHz. The ARRL petitioned for reconsideration of the Report and Order and requested additional phone sub-allocation on 75 meters for Conditional and General Class licensees on the basis that the majority of participating members in their traffic nets were in those license categories, and that the ARRL did not feel that additional frequency space was sufficient incentive for them to upgrade their licenses. *The FCC denied the ARRL petition on several grounds: lack of justification of the position (the petition consisted of "little more than a list of traffic nets"); it did not include "quantative or qualitative information"; and it did not meet the principles of the incentive licensing policy that the ARRL supported and the FCC adopted in 1968.*

The FCC called attention to Section 97.1 of the Rules and Regulations which includes a statement of the "basis and purpose" of the Amateur Radio Service. It says, in part: "The rules and regulations... are designed to provide an amateur radio service having a fundamental purpose as expressed in the following principles(s)—Encouragement and improvement of the amateur radio service through rules which provide for *advancing skills* in both the communication and technical phases of the art."

The so-called "Eye-Bank" Docket (Docket 19245) was an attempt to clarify various matters relating to Section 97.39 of the Rules which concerned eligibility to hold an Amateur license and the use of an amateur station, particularly a club station associated with an ineligible entity such as a school, corporation, etc. For the first time, "third party traffic" was defined by the FCC. The ARRL position in this Docket was that an amateur station should be entitled to handle any kind of message so long as the operator did not get paid either directly or indirectly for his services. This position was based upon a 1928 decision of the Federal Radio Commission. The ARRL filed comments on the FCC Notice in this regard.

The FCC, on the other hand, felt that it was its prerogative and obligation to specify the types of traffic which could be handled by all the various services, including the Amateur Service, and the decision was made that *commercial* communications could not be handled by amateur stations. *While the*

ARRL disagreed with this position, it filed no petition for reconsideration of the decision.

* * * * *

Thus, in the case of three vital Dockets pertaining to amateur radio, the ARRL filed a petition for reconsideration of a Report and Order only in one case (Docket 19162, phone band expansion) which was rejected for lack of justification. The ARRL filed no petitions for reconsideration for the other two cases; Docket 18803 (Repeaters) and Docket 19245 ("Eye-Bank").

In view of the Directors' Resolution and editorial outburst against the FCC in the March QST, then, it seems proper to pose the question: did the ARRL "do its homework" in regard to these three pieces of rule making legislation? Based upon the record, the answer to this question is NO, as in two instances the ARRL did not take advantage of the built-in protective processes in the rule making procedure of the FCC and was ineffective in the third instance.

While the ARRL disagreed . . . it filed no petition for reconsideration of the decision.

In view of the lack of positive action of the ARRL, the Resolution of the Board of Directors and the accompanying editorial seem untimely and uncalled-for.

The March *QST* editorial, thus, contains omissions of fact and incorrect conclusions which do an injustice to all radio amateurs and the FCC. Obviously, the editorial raised the blood pressure of many *QST* readers (see letters to the editor in the April issue of *QST*). Perhaps this is exactly what the editorial and Resolution were supposed to do: arouse radio amateur enthusiasm at the heroic, "watch dog" tactics of the League and at the same time act as a smoke screen to hide inaction, and to disguise the fact that the ARRL did not take advantage of the opportunities to raise an effective protest against portions of the controversial rules and regulations that it opposed. In this regard, the ARRL let its members down badly.

A Close Look at the Various Dockets

Docket 18803 (In the Matter of Amendment of Part 97 of the Commission's Rules concerning the licensing and operation of Repeater stations in the Amateur Service). The Report and Order adopted August 29, 1972 is printed in full in the October, 1972 issue of *QST*, pages 102-111. The November, 1972 *QST* editorial (speaking of the Docket) said, "Our early input, from members and League Officials alike, indicates a broad support of the general principles enunciated in the new rules, and when there is disagreement —even substantial disagreement—it is with specifics." In the December issue of *QST*, a list of 15 petitions for reconsideration of various aspects of the Docket were printed. The petitions were filed by various Clubs and Repeater groups in the United States. An ARRL petition for partial stay until February 19, 1973 was granted, permitting the compliance period for existing repeaters to be extended until June 30, 1973 (*QST*, March, 1973, page 81).

In the October, 1972 issue of *QST* (page 100), the ARRL stated that Docket 18803 represented a "liberalization of restrictions," and noted that the FCC "seems to have abandoned many of the unpopular features of its Notice of Proposed Rulemaking."

Specifically, the Report and Order incorporated in large measure the comments of ARRL. Several areas of rule modifications are as follows:

(a) The licensee of a repeater may designate other licensed amateurs to also be the control operator.

(b) Frequency privileges of the Technician Class operators were expanded to include 145-148 mHz.

(c) The NPRM would have limited repeaters to no linking. The R & O permitted two repeaters to be linked in tandem to serve the "intra-community" area encompassed by two such repeaters.

(d) In the area of radio remote control, the NPRM would have permitted only direct (one hop) radio control of a repeater. The R & O permits any number of radio links for control purposes, the only criteria being whether it will work properly.

(e) Logging requirements for repeaters were vastly simplified as were those for amateur mobile operation.

(f) To enable more efficient repeater operation with a minimum of interference, the

concept of antenna height and radiated power was introduced, and a table of ERP *vs.* HAAT adopted for each v.h.f./u.h.f. band.

(g) Band sub-allocations for repeater operation (non-exclusive) were made for the bands 50 mHz-450 mHz and above 1213 mHz.

(h) Identification of all stations (not only repeaters) was clarified.

(i) Notification of portable operation is not required for durations of less than 15 days.

In view of the editorial position of the ARRL and its omission of a petition for substantive change, it is difficult to see that they have any grounds for objecting to the Docket as it now stands.

Docket 19162 (In the Matter of Amendment of Part 97 of the Commission's Rules to provide for expansion of the telephony segments of the high frequency amateur bands). The original NPRM was released in the spring of 1971 and while the full Notice was never printed in *QST*, a summary of the proposal is given in July, 1971 *QST*, page 85. The ARRL reply to the NPRM is given in August, 1971 *QST*, pages 78-82. The full Report and Order is given in November, 1972 *QST*, pages 78-81. The ARRL Petition of Partial Reconsideration is summarized in December, 1972 *QST*, pages 81-84 and the FCC Memorandum, Opinion and Order denying the ARRL Petition is printed in the March 1973 issue of *QST*, pages 83-86.

Specifically, the Report and Order incorporated frequency expansion of the phone bands requested by the ARRL but not to the particular license class they desired. 40 meter phone was expanded down to 7150 kHz. The ultimate impact of any such phone expansion is at the expense of some other emission, usually c.w. The ARRL petitioned for reconsideration of the R & O asking for more 75 meter phone allocations for Conditional and General Class licensees. Their basis for the request was that many of their nets are operated by those classes of licensees who do not consider that increased frequency privileges warrant their up-grading their licenses. The principle justification for their request was a list of ARRL nets with "no qualitative or quantitative" information.

It would seem, therefore, that the ARRL request was a case of "too little and too late." Since the NPRM was proposed in 1971, the ARRL has had plenty of time to exert its influence upon the outcome. Was there any follow-up to the ARRL reply in August 1971? With a new Chief of the Amateur and Citizens Division of the FCC taking office in May, 1971, this would have been appropriate time to take stock of things and review the long-term interests of amateur radio with the FCC. Apparently, ARRL never made this gesture.

Docket 19245 (In the Matter of Inquiry into the extent to which amateur stations should be used on behalf of non-amateur organizations). The original Notice of Inquiry was printed in the July, 1971 issue of *QST*, pages 72-73 and the ARRL filed for an extension of filing time. The Report and Order is printed in the December, 1972 issue of *QST*, pages 74-76.

The Report and Order is an attempt to clarify a muddled situation as to what kind of traffic can be handled by an amateur station. The FCC defined what third party traffic is . . . the first time it has ever been done.[4] Then it specified the types of traffic that can be handled on amateur stations, excluding commercial messages. This enables an Amateur station to be used on behalf of say, the Red Cross or the Eye Bank but precludes such use in handling operational or commercial traffic for those and other organizations except in cases of emergency. Anyone may now participate in amateur radio communication provided that a control operator

[4] Section 97.3 Definitions. . . . (w) Third party traffic. Amateur radio communication by or under the supervision of a control operator at an amateur radio station to another amateur radio station on behalf of anyone other than the control operator.

Section 97.114 (b) Third Party Traffic. The transmission or delivery of the following amateur radio communication is prohibited: (a) International third party traffic except with countries which have assented thereto; (b) third party traffic involving material compensation, either tangible or intangible, direct or indirect, to a third party, a station licensee, a control operator, or any other person. (c) except for an emergency communication as defined in this Part, third party traffic consisting of business communication on behalf of any party. For the purpose of this section, business communication shall mean any transmission or communication the purpose of which is to facilitate the regular business or commercial affairs of any party. Section 97.116 Amateur Radio Communication for unlawful purposes prohibited. The transmission of radio communication or messages by an amateur radio station for any purpose, or in connection with any activity, which is contrary to Federal, State or local law is prohibited.

is present to ensure correct operation. This was not previously permitted except for radiotelephone and RTTY; it now encompasses all types of amateur communication. Use of an amateur station for unlawful purposes was delineated. All in all, the R & O vastly clarified the entire area. Undoubtedly, there are areas of continued confusion, but these will no doubt become clear as time passes. If communications are not available except by means of amateur stations, perhaps special consideration should be given to such cases or to provision of communication by means of proper channels. This remains to be clarified.

Again, the Docket in question was several years old by the time the Report and Order was published. A new regime was in office at the FCC; however, helpful input to the FCC again seems to be lacking, and the ARRL filed no petition for reconsideration.

Concluding Remarks

Many amateurs, "with justification," have expressed the view that portions of the recent Dockets are unrealistic and overly restrictive. Many amateurs have felt that the FCC reflects a picture of harassing the law-abiding amateur while letting the outlaw C.B.ers ride high in the saddle. The ARRL has dramatically stated its views to the membership and readers, where the ARRL Resolution calls for the President and General Manager to undertake a "vigorous program to seek reasonable and technically viable philosophies of regulation and interpretation, conferring at all necessary levels with appropriate Government departments and officials."

What has come of this provocative call to arms? Is the situation better now than before the Resolution was passed? What "vigorous program" has been undertaken by the ARRL officers as called for in the Resolution? A careful search of the recent issues of *QST* leaves these interesting questions unanswered.

What Next?

Certainly many amateurs and radio clubs have supported the ARRL philosophy, expressed by President Dannals, W2TUK, and his speech to the Washington QCWA Chapter (*QST*, May, 1973, pgs. 59-61). Valid reasons exist for this support as a key philosophic crisis is at hand. The basic ARRL position, namely, minimum regulation of amateur radio, is the heart of the matter, and some recent FCC rules seem to be examples of overly-restrictive regulation.

However, correction of the difficulties is a two-way street and a detente between the ARRL and the FCC is the first step down this street. A compromise area in the interpretation of regulations must be achieved, balancing the regulations demanded by the advancing state of the art against the time-honored concept of minimum regulation. Action must be taken to reach this detente.

Because nothing of substance has been done to improve the relationship between the ARRL and the FCC, however, does not mean that nothing can be done. The ARRL Directors will hold their second general meeting this coming July. Sufficient time exists between now and then to reestablish meaningful communication with the FCC. *This they must do for the good of amateur radio, since they mounted the divisive call to arms in the first place.*

Hopefully, the ARRL Directors, at their forthcoming meeting can hammer out a solution to this vexing impasse so that the important problems facing amateur radio may be solved in joint effort with the FCC. Large applications of goodwill—on the part of both the directors and officers of the League and the FCC—are obviously required, each side realizing the rules and limitations imposed on the other side by virtue of the arena in which each operates. Inputs from radio amateurs to their ARRL directors and inputs to the FCC from the ARRL will be of great help, as neither the ARRL nor the FCC should have to "fly blind" in important matters affecting the very life of the Amateur Radio Service.

All ARRL members should consider the issues at hand unemotionally, and make appropriate suggestions to their Directors before the forthcoming Board meeting so that the vital and necessary steps which make the ARRL a democratic spokesman for amateur radio may continue to be effective. ■

This guest editorial was written by a licensed radio amateur and a long-time ARRL member who requests to be anonymous.

Tuning In On Touch-Tone Pads

BY JOHN J. NAGLE,* K4KJ

Part II—Adjustment and Application

LAST month we discussed the basic principles of the touch-tone system and described the basic oscillator circuit. In this part we will describe the frequency adjustment and alignment of the pad and also show a simple, basic circuit for using the pads.

The set-up to test a touch-tone pad is very simple; plus 9 volts is connected to the green lead and minus 9 volts to the blue and orange/black leads (two wires). Output is taken across the red/green and black leads with the black lead grounded. It is important that the B minus lead and the output ground lead not both be grounded. In practice, it is convenient to ground the output lead and use a 9-volt transistor battery, with both leads floating, as the power source. All other leads should be taped and left floating.

The load impedance on the output appears to be critical. The pad I have will develop 0.6 volts r.m.s. (single tone) across 500 ohms. I suggest that initially a 1 K variable resistor be placed across the output leads and adjusted for maximum output and then a fixed resistor of this value be used as a load. Bell System specifications quote the output level into a 600 ohm test termination.

In measuring the frequency it is essential that a counter be used. Comparison against an audio oscillator is not practical since the frequency tolerance is only $\pm 1\frac{1}{2}$ percent! It is also convenient to connect an oscilloscope and/or an audio voltmeter to the output. See fig. 5.

Because this article is intended only to describe frequency adjustments, we will assume that the pad is working, but not on the right frequency.

The first step in adjusting the frequency is to provide yourself with the proper adjusting tool. The slug material is brittle and crumbles very easily if overstressed. The hole in the slug for the adjusting tool is triangular in shape. Small screw drivers have been used, but these tend to bite into the material at the point of contact and cause the slug to crumble. A few minutes spent in making a proper tuning tool will save much time and grief later on. A proper tool is very easily made by filing a plastic screwdriver or alignment tool to the proper shape. The important things are to make sure the tool is a snug fit and is not tapered. These steps will insure that the mechanical stresses are evenly distributed

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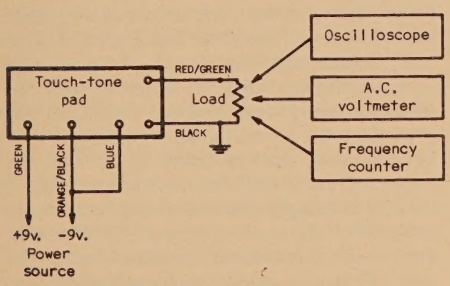


Fig. 5—Test set-up for testing Touch-Tone pads.



Overall view of the Touch-Tone pad assembly.

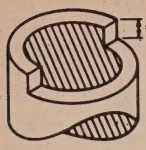


Fig. 6—Sketch of the center section (only) of the cup core showing the shoulder used for inductance adjustment.

throughout the slug and not concentrated at one point.

Assuming now that the pad is working and that a proper alignment tool is available, connect the battery and counter, scope or voltmeter and termination to the proper leads and begin. Turn the pad over and notice the two cup-core coils; one coil is the inductor for the low-frequency group and the other coil for the high-frequency group.

Push two buttons (and only two) in the first row, say 1 and 2, adjust the variable terminating resistor for a maximum output voltage and read the frequency. It should be 697 Hz; if not, turn the slug in one of the coils one turn and look for a frequency change. If there is no frequency change, you picked the wrong coil; try the other one. Normally, turning the slug in will decrease the frequency and turning it out will increase the frequency. If the opposite occurs, the slug is turned past the point of maximum inductance and is starting to come out the bottom of the coil. Simply back the slug out; the frequency will decrease to a minimum and increase again. Adjust the slug for a frequency of 697 Hz. If this frequency cannot be obtained, set it as close as you can and proceed to the high-frequency group. Assuming the frequency can be set to 697 Hz, push two buttons in the bottom row, * and 0 for a 12 button pad (or 7 and 8 for a 10 button pad), and check the frequency. It should be 941 Hz (or 852 Hz for 10 button pad). Touch up the adjustment as necessary. Check the middle row of buttons for 770 Hz and recheck the top row at 697 Hz.

Now adjust the high-frequency group in the same manner and then recheck the low-frequency group again. Some interaction may occur in one group of frequencies if a large adjustment was made to the other group. You should now be ready for business!

If either, or both, frequency group(s) can not be lowered to the desired value (minimum frequency too high), you have a problem, but one that can be solved. The first step is to remove the slug from the core and measure its length; it should be 5/16 inches long. If it is shorter than this, remove the slug from the other core and if it is the proper length, try it.

Slugs become shortened when they are adjusted with improper tools. The top of the slug crumbles away with each adjustment due to high mechanical stress. A slug that is too short will not completely shunt the air gap in the center of the core, thereby preventing the maximum inductance from being obtained. This will be explained in greater detail later. If the slug is too short, it must be discarded. Slugs can generally be obtained from junked pads.

If the slug is the proper length or if the maximum frequency is too low (unable to tune high enough), the air gap of the core must be adjusted. The slug actually provides only a fine adjustment of the inductance; a coarse adjustment is obtained by rotating the two halves of the cup-core with respect to each other. However, since the two halves are glued together, the glue must first be dissolved.

Obtain a bottle of acetone and a supply of Q-tips from the drug store. Remove the slug from the core and save. Moisten the Q-tip with acetone and liberally apply acetone to the crack between the two core halves. After a few minutes the glue will soften sufficiently to allow the two halves to be separated. Warning! Acetone and cotton are an inflammable combination; don't smoke and do unplug your soldering iron. In removing the upper half of the core, be careful of the plastic sleeve in the center of the core; it is used as a threaded insert for the slug and must be replaced when the core is reassembled.

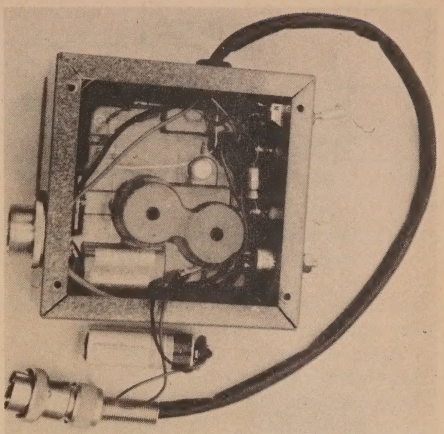
After separation, carefully examine both halves, especially the center secion; it should appear as shown in fig. 6. If there are pieces of core material inside the cores or other signs of broken cores, the broken half/halves of the core should be discarded. If the upper half is broken, it can be easily replaced; if the lower half is broken, the coil assembly must be removed and the lower half replaced. This will be described later.

Assuming the cores are in good condition or have been placed in good condition, the procedure for adjusting the air gap will now be described. Notice from fig. 6 that the center section of each half core has a shoulder cut in it which provides an air-gap in the magnetic path. The cut in each half is sufficiently deep to effectively lower the inductance of the coil. When the cores are assembled so that the cut sections of each core are opposite each

other as shown in fig. 7(A), the inductance will be a maximum. If one core is rotated 180 degrees so that the cut sections are on opposite sides as in fig. 7(B) the inductance is a minimum. A much greater range of inductance values can be obtained by rotating the cores than is possible by adjusting the slug. In fact, it is possible to change the inductance to a point where the pad will stop oscillating. The slug provides a fine variation of inductance by providing a magnetic "short circuit" across the air gap. That's why the slug, if too short to completely bridge the air gap, may not provide a sufficient increase in inductance to lower the frequency to the desired value. In its simplest terms the air gap adjustment consists of rotating the upper half of the core until the desired frequency is obtained. In practice it's a little more involved.

Begin by carefully cleaning the mating surfaces of both cores of old glue with acetone and Q-tips; do not sand or file the surfaces since it is essential that the mating surfaces of the cores be perfectly flat and parallel. When all surfaces are clean, reassemble the core and coil assembly including the plastic tube, and screw in the slug about 1/8 inch. Now hold the pad with your thumb over the core and fingers pushing two buttons to activate the oscillator under test. If the pad does not oscillate, make sure your fingers are touching only two buttons; then rotate the top cup of the core until oscillations begin. Adjust the cup until the approximate desired frequency is reached. It is not necessary that the exact frequency be obtained as small adjustments can be made with the slug. Notice that the frequency is also dependent on the pressure applied. When the desired frequency is obtained, make a scratch mark across the gap between the cores so the cores can be reassembled in the same relative position after gluing.

The next step is to glue the two halves together. The core material is not porous so that Duco cement or Elmers glue type materials tend to peel off after hardening. Epoxy cements will stick to anything, but are too thick and cause too large an air gap; the same is true of silicon bath-tub sealer. I have found that "Pliabond" manufactured by Goodyear Rubber is satisfactory. Put a thin coat of cement on the two sections of the bottom core and assemble the top half at the reference mark; make a quick frequency check before the glue hardens. Put a suitable weight on the core and let set overnight at room temperature. I used a 1⅝" socket punch as a weight.



Inside of the pad assembly with the back cover removed.

So far we have assumed that the coil-core combination was in good condition. If either the coil or the lower half of the core is damaged, it must be replaced. In either case the coil must be removed from the p.c. board. This looks difficult, but is not; with experience it can be done in 10-15 minutes, although the first time around may take longer.

Note that the p.c. board is held to the pad base plate by two screws and three nuts; also note the location of several white nylon spacers and notice the spring clips around the periphery of the board through which contact is made between the board and base-plate. These spring clips are spot welded to insure contact. The spot welds are easily broken by slitting the spring clips apart with a razor

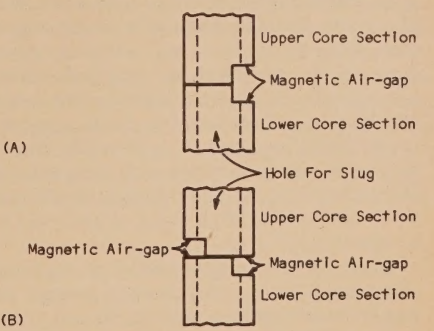


Fig. 7—Positions of upper cup-core section for maximum and minimum inductance. (A) Upper core adjusted for maximum inductance. (B) Upper core adjusted for minimum inductance.

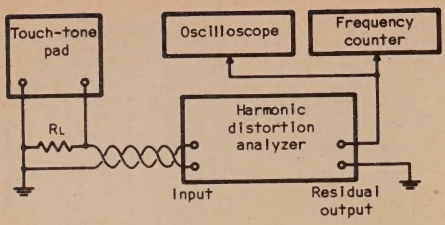


Fig. 8—Test set-up for measuring the individual frequencies of a Touch-Tone pad.

blade. Try not to damage the spring clips as they must be soldered back together.

After slitting the spring contacts with a razor blade and removing the two screws and three nuts, the p.c. board may be removed from the base-plate. The inductor may now be unsoldered and removed from the p.c. board using conventional p.c. board repair techniques.

The pad is reassembled in the reverse manner. The spring clips should be mechanically aligned so that they make good contact before they are soldered. During soldering a third hand may be borrowed from the XYL or jr. op to hold the pad with the push buttons up so that excess solder will not run into the pad. The pad should then be tuned as previously described.

As mentioned previously with telephone type pads there is some interaction between the high and low frequencies so that a given tone will not be exactly the same when it is generated by itself (pushing two buttons) as it is when generated simultaneously with a tone from the other frequency group. Although this difference is small and pads that are adjusted on a single tone basis will usually work satisfactorily on a two-tone basis, it is frequently desirable to be able to measure a tone when transmitted with its mate. Also, many of the non-telephone type pads which use IC's do not generate a single tone when two buttons are pushed, but rather generate a non-valid frequency. It is therefore necessary to be able to measure each frequency in the presence of the other if exact results are to be obtained or if all types of pads are to be measured.

Since digital counters become confused when more than one frequency is present, the two-frequency groups must be filtered or the undesired frequency must be suppressed in some other manner.

There are several ways of filtering the two-frequency groups: One can build two band-pass filters, one filter for the high and one for the low bands and measure the output of each filter separately. Alternately, high and low-pass filters can be used to separate the two frequency groups.

A more sophisticated way of separating the two tones that has become practical with the advent of economical IC's is to use two phase-locked oscillators. One PLO is designed to lock in in each frequency group. When a single button is pushed, each oscillator will lock in with the tone in its respective frequency group. The output of each oscillator is then measured by a counter. This method has the advantage that with proper PLO design, the input to the counter will be relatively noise-free insuring an accurate count even when measuring a noisy signal off-the-air. Secondly, if two counters are available, the two frequencies can be measured simultaneously. Both of these can be important advantages for checking weak signals and minimizing channel or repeater time. The PLO system has the disadvantage that one can not easily check relative amplitudes and that relatively specialized, special purpose test equipment must be constructed.

Another method of isolating the two frequencies for counting is to suppress one frequency and count the other. Old-timers may remember the "Hetrofil" manufactured by James Millen as a way of suppressing one tone. A slightly different method that I have found convenient, and which uses equipment already available, is to use a harmonic distortion analyzer.

The harmonic distortion of an amplifier is measured by feeding a sine wave, supposedly pure, through the amplifier under test. The harmonic distortion analyzer is connected to the output of the amplifier and contains a notch network which is used to null-out the amplifier input frequency. Only noise and distortion products which are harmonics of the input signal remain and these are measured by the meter and are also made available for oscilloscope observation, or otherwise, at output jacks on the instrument. In the present application the "distortion products" consist of the desired tone.

The test set-up is shown in fig. 8; the output of the pad is connected to the distortion analyzer input. A counter is connected to the analyzer output; an oscilloscope also connected at this point is convenient for nulling out the undesired tone.

To make a measurement depress one (and

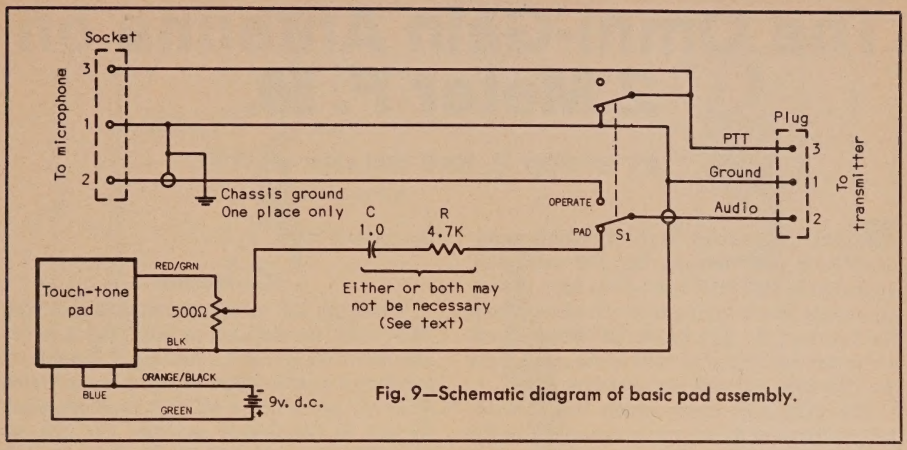


Fig. 9—Schematic diagram of basic pad assembly.

only one) button on the pad, null out one tone as seen on the 'scope and read the counter. If an amplitude comparison is desired, adjust the meter for a convenient meter reading, such as 0 db with the LEVEL ADJUST control. Now readjust the TUNING control to null out the other tone and reread the counter. Also read the meter and note any amplitude difference from the first tone. With a little practice both frequencies and their relative amplitudes can be measured in about 30 seconds.

We will conclude this discussion with some comments on sources of pads and with a simple, basic circuit for using the pads.

As mentioned above, pads can be grouped into two categories: "telephone type" pads and IC pads. When one thinks of telephone type pads, the first thought that comes to mind as a source is the Bell System. The IC pads use a specially made, and usually proprietary, integrated circuit chip. These pads are available from several amateur supply houses and are advertised in *CQ*. These pads are usually available with dual outputs for working into repeaters with different deviation requirements and with circuitry to activate the PTT bus when a button is depressed. This latter feature can considerably simplify dialing, especially from a mobile.

With regard to telephone type pads, neither the Bell System nor its manufacturer, Western Electric, will sell to non-telephone company users; therefore, any pads from the Bell System or Western Electric were, strictly speaking, illegally obtained. Telephone type pads can be purchased legally from Automatic Electric Company of Chicago, Illinois; standard pads sell for about $20 and Styline pads (Automatic Electric term for "Princess") for about $22. I purchased a Styline pad from this source. Automatic Electric has sales representatives in most major areas. Check your 'phone book for listings. I also understand that the Northern Electric Company will sell to the general public, but I have not had any experience with this firm.

When I first acquired my pad I had no information on it whatever and not much more on the audio input characteristics of my "Dispatcher." I, therefore, wanted a circuit that was as simple and basic as possible. The result is shown in fig. 9. Here the red/green and black output leads are connected to a 500 ohm miniature pot. The blocking capacitor is necessary since the Dispatcher applies approximately 2 volts d.c. to drive a carbon microphone, if one is used. If there is a blocking capacitor in the microphone input of your rig C_1 is not necessary. Also, if the input impedance is high compared to 500 ohms, say greater than 5000 ohms, as it is on the Dispatcher, the loading effect is negligible. For rigs with low input impedance a series resistance may be used as shown to minimize loading. It should not be necessary to go above 4.7K ohms.

To avoid the problem of paralleling the pad and the microphone, a switch is included to choose either the pad or the microphone. This switch also activates the PTT line to turn on the transmitter when in the pad position. This allows one-hand operation. With my Dispatcher an audio output of 0.1 volts

[*Continued on page 76*]

The Omni-Gain Antenna on 2 Meter F. M.

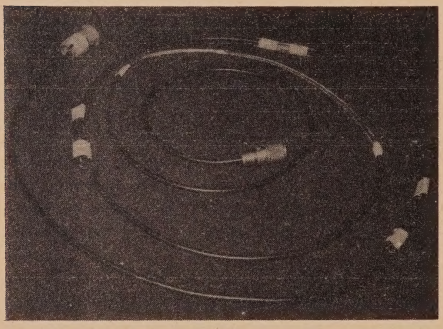
BY BYRON H. KRETZMAN,* W2JTP

SINCE the description of the Harris omni-directional gain antenna for 220 mHz f.m. appeared in *CQ*,[1] the author has been getting numerous letters asking how it could be built for 2-meter f.m. As a matter of interest, such a 2-meter antenna *was* built at the same time the 220 mHz antenna was constructed.

The principles upon which this 2-meter gain antenna is based are as described in the article on the 220 mHz antenna. Figure 1 gives the dimensions, figured upon a center of design frequency of 147.5 mHz using the ARRL *Handbook* formula. The v.s.w.r. stays below 1.2 to 1 through 146 to 148 mHz, the portion of the band used mainly for f.m. Like the other antenna, which is also basically three half waves in phase stacked vertically, gain is in the order of 4 db. A nice feature of this antenna is that no ground radials are necessary. A short length of close-woven copper-braid, from a piece of scrap RG-8/U, was used as a decoupling sleeve, electrically ¼ wavelength long, taking in account the propagation factor of the vinyl covering of the coaxial cable.

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[1] Kretzman, B. H., "The Motorola 80D on 220 mc F.M., Part III—Antennas," *CQ*, Dec. 1971, P.28.



Similar in design to the 2-meter Omni-Gain antenna, a 220 mHz version is shown here constructed of RG-58/U for low power operation. If only low-power operation is contemplated, this same construction may be employed on 2-meters using the dimensions of fig. 1.

Construction

While the 220 mHz antenna was built with RG-58/U, we decided to build the 2-meter antenna with RG-8/U, making it capable of handling a quarter kilowatt of r.f. input. Using RG-8/U presented a bit of a problem when we got to the folded sections. On 220 we simply bent the RG-58/U. On 2-meters we actually cut the RG-8/U, making the middle fold 6¼" long and then soldered the three sections together. Figure 2 shows how this was done. Figure 3 details the preparation of the ends of the coax. It is recommended that ¾" of the braid be tinned and then cut back to expose ¼" of polyethylene insulation; plus the ¼" extra of the center conductor. The soldered connections can be wrapped with Scotch #88T electrical tape.

The top half of the 2-meter gain antenna was also constructed of RG-8/U although the center conductor is really not necessary, electrically. (It does provide some mechanical strength, though.) As the result, the top folded section need not be made exactly as shown in fig. 2 for the bottom section. In the top section we soldered both inner and outer conductors together.

Figure 4 details the connections at the electrical center feed point. To give the necessary mechanical strength to this joint, two pieces of glass-base printed circuit board, without the copper, were cut to roughly 6 inches long by ⅜ inch wide. These strips were then taped, parallel to the joint, with Scotch electrical tape.

Figure 5 shows how the decoupling sleeve is attached. About ¼" of the outer vinyl covering of the RG-8/U is removed at the measured location and the exposed braid is tinned. The copper braid sleeve is then slipped over the RG-8/U and soldered to the exposed braid of the RG-8/U. The connected braid sleeve is then pulled down to smoothly fit over the RG-8/U for a total length of 12⅜ inches. Do not connect anything to the bottom end. The whole sleeve, top connec-

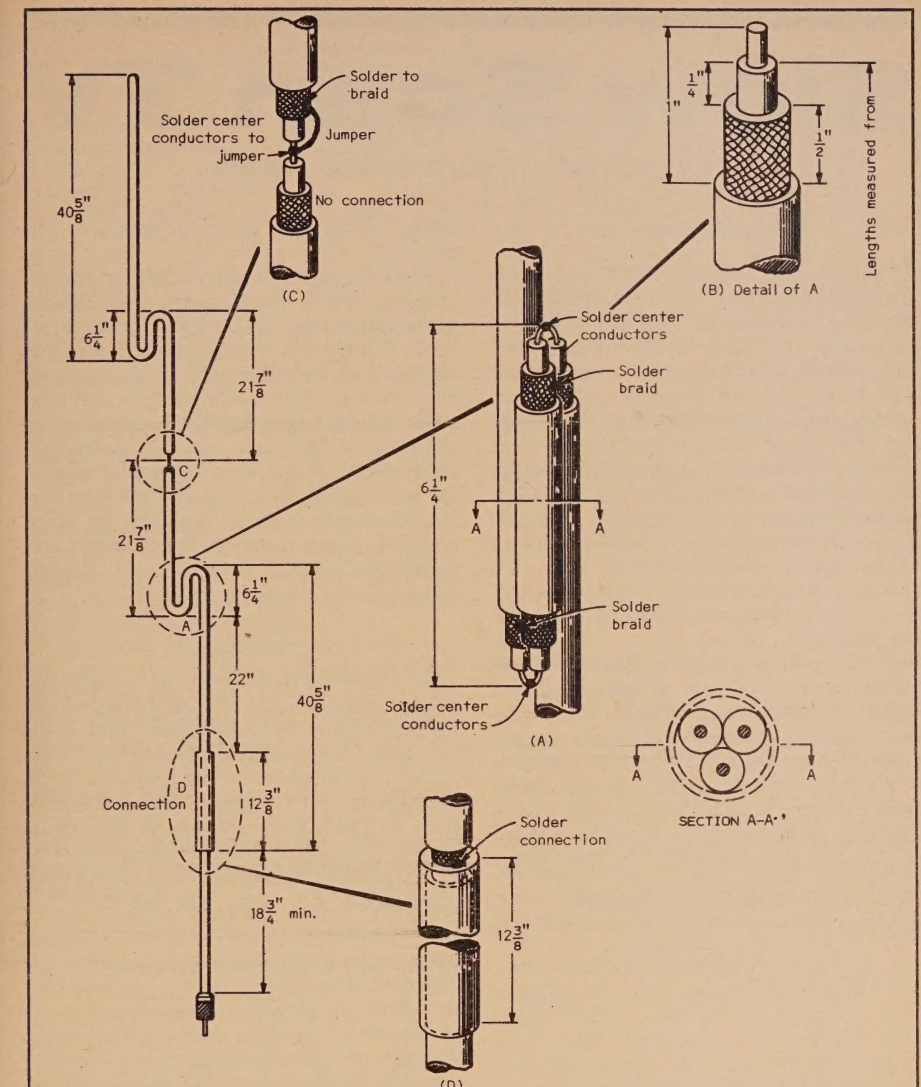


Fig. 1—Construction details of the 2-meter Omni-Gain antenna. (A) Detail of construction of folded section. (B) Preparation of ends of RG-8/U coax for folded sections. (C) Assembly of center feed point. (D) Assembly and connection of de-coupling sleeve.

tion included, is then taped with the electrical tape.

The complete antenna is then slipped into a 10 foot length of thick wall 1" inside diameter "PVC" pipe. The bottom end was cemented into a PVC threaded pipe adaptor into which an 18 inch length of aluminum pipe was screwed. U-bolts were then used to mount the antenna by bolting to the pipe. Of course the top to the antenna was plugged. Like the 220 antenna, the 2-meter antenna can be made water proof by pouring into the pipe expandable polyurethane foam. Appearance, except for size, is similar to that of the 220 antenna as pictured on page 30 of December 1971 *CQ*. ■

Slow Scan TV

BY COPTHORNE MacDONALD,* WØORX

Flying-Spot Scanners

IF the slow-scan bug has bitten, and if you are into building your own gear, you'll probably start a flying-spot scanner project at some time or other. Flying spot-scanners have several advantages over vidicon cameras. First, they are less expensive. If you already have a monitor with a P7 cathode ray tube, it can actually serve as the light source for the scanner. Adding a photomultiplier tube and a modest amount of straightforward transistor circuitry will give you image generating capability. (If you are willing to work in a totally dark room, it is even possible to do "live" scanning of objects such as your face using the flying-spot scanner principle.)

A second advantage of the flying spot scanner is the relative ease of debugging and adjusting, relative to a vidicon. Third, the picture quality is excellent. FSS pictures are generally very "crisp" (have high aperture response) and have a high signal-to-noise ratio. Finally, the fixed format lends itself to operating convenience. Slides can be changed quickly and they are always in focus if the optics have been properly designed and adjusted.

The basic principle of the FSS is, of course, scanning a small spot of light in raster fashion across the desired visual object. If that object is a photographic transparency, a sensitive photocell on the other side of the transparency picks up the *transmitted* light and converts the light variation into variations in electrical current—the raw or "baseband" video signal. If the visual object is opaque, the photocell picks up the *reflected* light and converts it into the video signal. When white areas are scanned, more light reaches the phototube than when dark areas are scanned, and the output current is greater.

The FSS CRT

To keep the effective spot size in our scanner as small as possible, the persistence of the phosphor must be quite short—preferably well under the total time the spot dwells on each picture element. In ham SSTV the dwell time is roughly 0.5 millisecond, or 500 microseconds. The common phosphors with decay times appreciably under this amount are: P4, P5, P7 (Blue component), P11, P14 (Blue component), P15, P16, P24 and P31. Un-

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

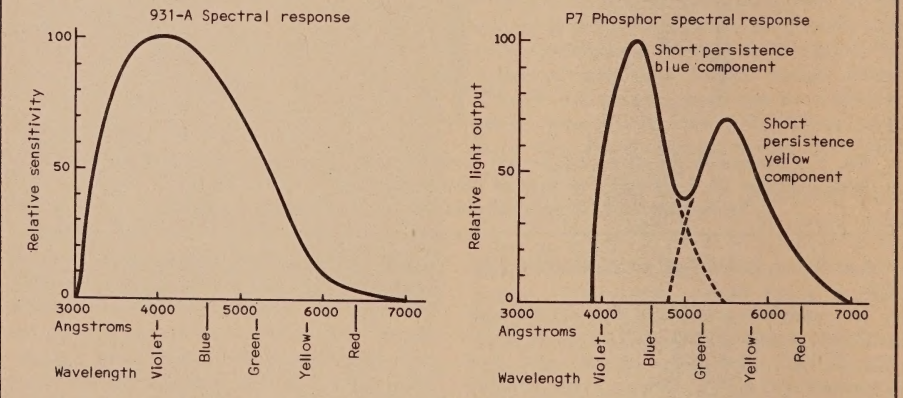


Fig. 1— Spectral responses of 931-A photomultiplier and P7 phosphor.

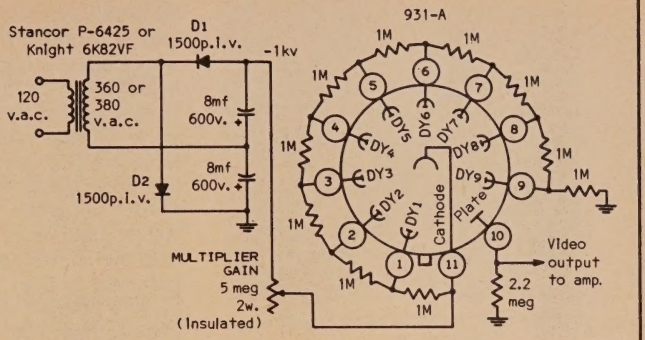


Fig. 2—Photomultiplier bleeder and power supply. Divides D_1 and D_2 can be Varo VF5-5 5 kv p.i.v. or equivalent.

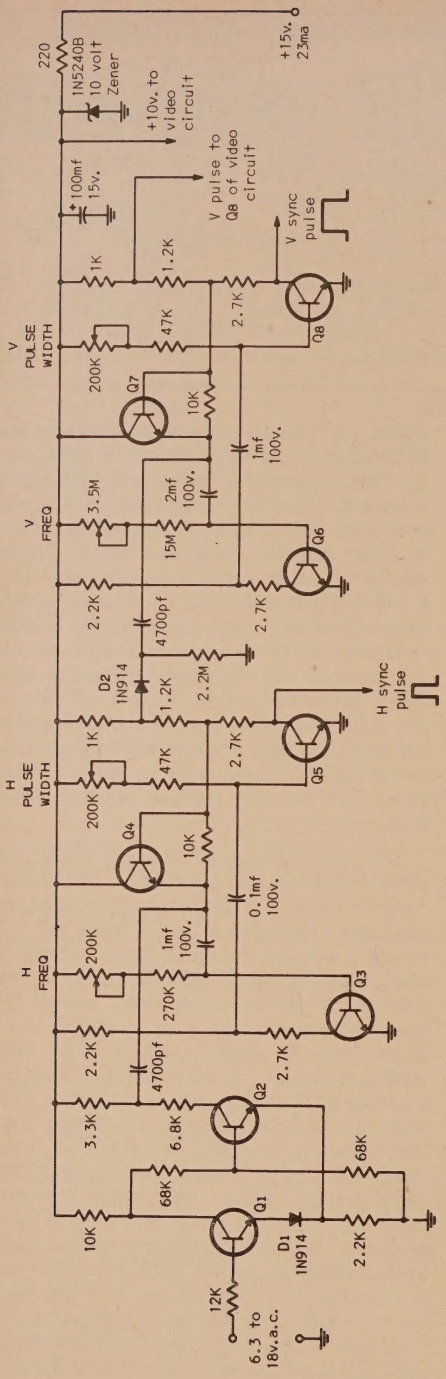
fortunately one of the most common phosphors, the familiar green P1, is *not* a good choice. It takes 20 or 25 milliseconds to decay to 10% brightness. A flying-spot scanner using this phosphor would have good vertical resolution, but very poor horizontal resolution since there would be no flying "spot", but a flying "comet" with a tail dragging out for a third of a line in length.

P7 is the slow-scanners "do everything" phosphor. It was developed during World War II for radar use. It is a two layer phosphor. Directly on the inside of the glass faceplate a long persistence phosphor is deposited. This phosphor produces a long persistence yellow-green light when excited. The experimentors found that a brighter glow and longer persistence could be obtained by exciting the phosphor with blue and UV light, rather than directly with electrons. For this reason another phosphor layer is deposited on the inside of the yellow-green layer. This inner layer is a short persistence blue phosphor similar to P11. The electrons strike this layer and cause it to produce a blue fluorescence, which in turn produces a yellow phosphorescence in the outer layer. The blue light shines through to the outside also, and it is this blue "flash" that is useful in flying-spot scanner work.

Light Detectors

In this age of solid-state we would naturally like to use a solid-state pickup device to convert the varying light intensity during scan into a varying electrical signal. It may be possible with optimum optics, but at this writing I do not know of anyone who has successfully used a phototransistor, photo diode, or photoconductive cell in a flying-spot scanner. The problem is primarily one of light level. The light output of the phosphor is very low. If the beam current is 10 μa and the CRT accelerating potential is 2000 volts, the power delivered to the phosphor is only 0.02 watt. Of this, only 5% may be converted to light, resulting in a total radiated light energy of about 1 milliwatt. Perhaps only 1/1000 of the radiated light will find its way through the slide and optics to the photosensitive area of the detector, even if we are very careful. Our light power level is now down to one microwatt! To this we add the problem of spectral mismatch. The phosphor radiates blue light at about 4400 Angstroms wavelength. A phototransistor is most sensitive in the red and infrared regions, above 6000 Angstroms.

The best all-around device is still the amazing 931-A photomultiplier tube, which looks at first glance like an octal based receiving tube. (Actually, it has 11 pins, not 8.) Inside is a photoemissive cathode; one which *emits* electrons when light strikes it. It also contains 9 curved metal plates called dynodes. These dynodes emit secondary electrons when an electron strikes them with sufficient energy. In other words, when an electron strikes a dynode, it knocks a few electrons loose. The plates are shaped, and the voltages are applied, in such a way that these freed-up electrons are attracted to the next dynode. When the voltage between adjacent dynodes is 90 or 100, roughly four electrons are knocked loose for every one that strikes a dynode. So, if a light photon hits the photocathode and releases an electron, that electron will strike dynode 1 and release 4 electrons. Those 4 will strike dynode 2 which will release 16 electrons. By the time dynode 9 releases its electrons, the original one elec-



tron has been multiplied to several hundred thousand electrons. Gain attained by electron multiplication is freer of noise than that attained in an amplifier. Even a thousandth of a microwatt of light input will produce a healthy output of several microamps, and a signal to noise ratio of 40 to 60 db. Furthermore, the S-4 spectral response of the 931-A is a good match for the blue component of the P7 phosphor, and a bad match for the yellow component, as shown in fig. 1. The blue match is so good, in fact, that it is not necessary to filter out the yellow component of the P7 output with a blue filter. The 931-A photocathode acts as its own blue filter.

The tube is normally operated with the anode near ground potential and with the cathode and dynodes negative, as in the circuit of fig. 2. The voltage applied to the entire dynode bleeder will range from −600 to −1000 volts, depending on the sensitivity required. (The higher the voltage between dynodes the higher the secondary emission ratio and the higher the overall gain.) This voltage is easily obtained if an electrostatic CRT is being used, since −2 or −3 kv will be needed for the CRT accelerating potential anyway.

With magnetic CRTs, the supply voltage is generally positive with respect to ground. If the transformer voltage is not too high it should be possible to add a rectifier and filter capacitor to the existing circuit to get a negative voltage, using the a.c. drive from the existing transformer. If this is not practical, you will have to build a separate power supply. Only about 0.1 ma is needed by the tube and bleeder if 1 meg resistors are used between dynodes. High frequency transistor oscillator supplies are quite practical at this power level. Finding the right transformer is the main problem. Multi-tap TV horizontal sweep/h.v. transformers are one possibility, and the transformers used in battery operated electronic flash units are another. Most flash units charge a capacitor to 450 volts or so, and if modified with a voltage doubling rectifier circuit should produce the required 800-1000 volts. Naturally, a conventional 60 Hz

Fig. 3—Flying-spot scanner sync pulse generation circuitry to accompany the video circuit presented in the May Column. All transistors are 2N3566, HEP55 or similar. All capacitors are plastic film type.

supply can be built using a small plate transformer as shown in fig. 2.

Adding FSS Capability To a Monitor

Last month's column included the video amplifier and subcarrier oscillator for a flying-spot scanner. Figure 3 shows circuitry that will generate the proper horizontal and vertical rate sync pulses. The 931A, video, and pulse circuits, together with a slow-scan monitor are all you need for a rudimentary flying-spot scanner.

Let's take a brief look at the pulse circuitry. It is desirable to synchronize the 15 Hz horizontal pulses with the 60 Hz power line frequency. The first step in this process takes place in the Schmitt trigger circuit formed by Q_1 and Q_2. The input is 6 to 18 v.a.c. possibly from the monitor low voltage power supply or CRT filament circuit. It is "squared up" in the Schmitt trigger circuit and the steep edges of the output waveform are coupled into the horizontal rate pulse generator—Q_3, Q_4 and Q_5. This circuit is a fairly conventional astable multivibrator with the exception of Q_4. Q_4 is an emitter follower that quickly charges the 1 mf timing capacitor when the collector of Q_5 goes positive. This gives a steep-edged output pulse at the Q_5 collector instead of the usual rounded pulse caused by the loading of the output by the timing capacitor. The H. FREQ. control is adjusted to lock the generator at the proper subharmonic of 60 Hz. The H. PULSE WIDTH control adjusts the width of the positive output pulse. When these controls have been properly set, the output pulses will have a duration of 5 milliseconds and a spacing of 66.7 milliseconds.

To insure that the vertical retrace occurs at the beginning of a line, horizontal rate pulses are coupled into the vertical pulse generator, Q_6, Q_7 and Q_8. The V. FREQ. and V. PULSE WIDTH controls are adjusted to give a pulse width of 30 ms and a spacing of 8 seconds. The V and H pulses are directed to the points indicated on the diagram in the May Column.

To use a monitor as a flying-spot source we must cause it to scan a raster in synchronism with the Hand V pulses. In addition, the raster must be unmodulated, *i.e.*, "white." There are several ways of accomplishing this. One is to couple our H and V pulses through some sort of Monitor/FSS switching scheme into the monitor sweep circuits. In this case we would not feed any video signal into the monitor, and the screen brightness would remain uniform. A second method would be to feed the FSS modulator SCFM output signal into the monitor, and install a switch to kill the video going to the CRT. The incoming signal with this method serves to sync the monitor sweeps to the FSS pulses indirectly. A third approach is to build a duplicate subcarrier oscillator that operates at "white" and "sync" frequencies only, and feed the monitor video input from this source. Since the subcarrier being fed to the monitor would be the "white" frequency of 2300 Hz except at sync times, the desired uniform white raster would appear on the screen. This last approach has the advantage that no monitor modifications are needed if you get your voltages from other sources. (If you use a yellow filter over the monitor CRT it naturally must be removed when using the FSS mode.)

Next month we'll dig into some FSS optical schemes in detail.

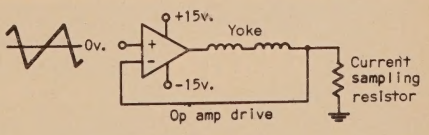


Fig. 4—Tape splicer with roll of splicing tape stored in the base.

Tape Splicer

While looking for a faster way to splice up SSTV program tapes I ran across the item shown in fig. 4. I saw several models similar in appearance, but this one is particularly useful as it holds a roll of splicing tape in its base. The unit is quite fast. While two metal

[*Continued on page 80*]



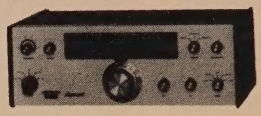
Correction

Corrected schematic for figure 6 in the March 1973 SSTV column.

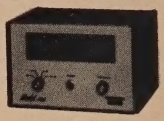
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ARGONAUT

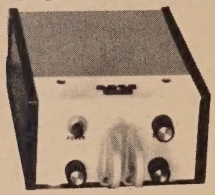


405

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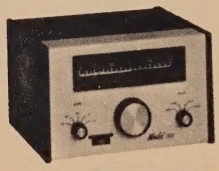
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MATH'S NOTES

BY IRWIN MATH,* WA2NDM

In our September column of last year, we described an interesting integrated circuit manufactured by Lithic Systems which was essentially a complete "transmitter-on-a-chip." This month we have a companion! Ferranti Electric Company of Oldham, England, has announced their ZN414 radio receiver integrated circuit. This device contains practically all components and circuitry for a 10 transistor TRF receiver in a *little TO-18 3 lead package!* To quote from the manufacturer's preliminary data, "the ZN414 provides a complete a.m. radio circuit which operates from 1.1 to 1.8 volts and requires only battery, earphones and antenna plus a tuning capacitor, coil, two decoupling capacitors and two resistors...effective built-in a.g.c. is provided which is variable if required. Sufficient output (typically 30 mv r.m.s.) to drive a simple audio amplifier is provided at a total current consumption of only 1 milliampere. Excellent audio is achieved with a total harmonic distortion of less than 1%."

Fig. 1 is our schematic of the ease with which this chip can be used. You will have to choose L and C values for the frequency range of interest and the manufacturer says the device will function from 200 kHz up to about 5 mHz. To obtain good selectivity, the inductor and capacitor chosen should present a high Q of 70 to 100 or so, and, if this is done, selectivity will be comparable to that of a superhet.

Specific precautions for circuit layout are as follows:

1. C_3 should be as close to the chip as possible.
2. All leads from the ZN414 should be as short as possible.
3. A ferrite antenna coil, if used for L_1, should be at least one inch away from ZN-414 to prevent oscillation.
4. The value of R_2 can be selected for best AGC action.

At present we have some ZN414's on order and will report on our success (or failure?) as soon as we get them. These devices, as well as preliminary data sheets are available from Ferranti Electric Inc., East Bethpage Road, Plainview, N.Y. 11803, for the following prices: 1-49, $4.00; 50-99, $3.40; 100-499, $2.95; 500-999, $2.65; and 75c for 1 million (if you need them). Minimum quantity at present is 5 pieces although this *may* change once the initial "surge" of orders is over.

Elsewhere, Texas Instruments has some new N channel dual gate MOSFET's for r.f. amplifier use this month. These TO-72 case units offer noise figures of 2 db at 200 mHz to 7db at 900 mHz and power gains of up to 24db. 100 quantity prices of these devices, the 3N204 and 3N205 are from 70 to 80 cents each. Write for more data to TI if receivers are your thing!

RCA is also on the scene with r.f. devices but these are for power use. Their 40972 (2 watts) 40973 (10 watts) and 40974 (25 watts) are designed for use at up to 175 mHz and with a B+ of only 12.6 volts, making them perfect for mobile use. Prices for these units (in 100 quantity) are $2.40 for the 40972, $6 for the 40973, and $12 for the 40974.

We have been asked recently why we so often give 100 quantity prices when describing new semiconductor devices and would like to explain by indicating that most preliminary data sheets, representative quotes, and company publications where we try to obtain our advanced information all seem to have established the "100 quantity" level as the one of most interest to industrial users. In the trade, this level extends from 100 to 999 units and almost always contains the quantity purchased for preliminary or pilot production runs of new equipment. Experimenters can therefore often only judge what the initial single quantity price will be, although a reasonable rule of thumb might be 1¼ to 2 times the 100 quantity price.

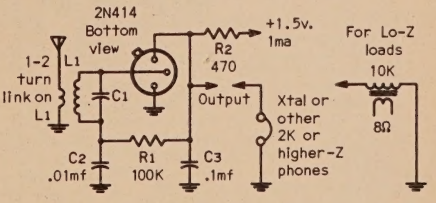


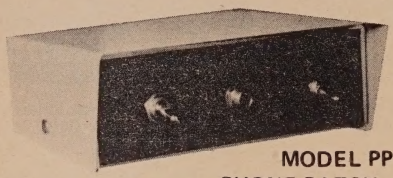
Fig. 1—Hookup of the Ferranti ZN414 radio receiver chip. R_2 is the a.g.c. resistor.

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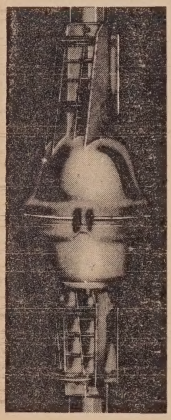
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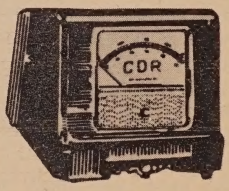


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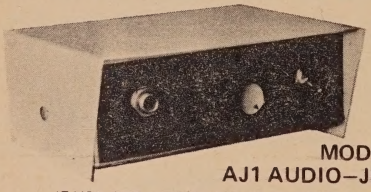




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In response to overwhelming requests, we will close this month with our updated list of semiconductor manufacturers' names and addresses and suggest that you contact them for specific data sheets about devices that interest you by mail as most will be happy to supply reams of application notes and hints for almost any of the devices they manufacture. If we have omitted anyone please let us know and we will be glad to indicate their name and address in this column as well as try to update the list at least once per year.

73, Irv, WA2NDM

Semiconductor Manufacturers

American Micro-Systems, Inc.
3800 Homestead, Santa Clara, Cal. 95051
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[*Continued on page 76*]

Understanding Ten Meter Propagation

BY STEPHEN J. BURNS,* WA3CXG

Novice and oldtimer alike are often perplexed by the vagaries of the ten meter band. As the highest in frequency of the so-called "low bands," its performance is more subject to the sunspot cycle, time of month, and even weather than that of the other amateur frequencies in the h.f. range. Because of its inconsistency, the band is often deserted even when conditions are such that a quick CQ could raise an answer from half a world away.

Across Town

Even if there were no ionosphere enveloping the earth, radio waves would travel in more or less straight lines at least to the horizon. Thus, energy radiated from your antenna would go just as far as the eye could see, the exact distance being proportional to the square root of antenna height. But because of the peculiar bending of electromagnetic waves termed diffraction, the signal will in effect follow the curvature of the earth for some distance.

Just how far "ground wave" alone will carry the signal depends on a host of factors, foremost among which are intervening terrain, r.f. power output, and angle of radiation. Roughly speaking, for two stations employing vertical antennas and 50 watts c.w. output, distances in excess of twenty-five miles can be spanned. However, there is occasionally another mechanism at work unique to the ten meter band and shorter wavelengths, namely tropospheric bending.

As far back as the early nineteenth century, high altitude balloonists observed that there sometimes occurs a sharp change in temperature and water vapor pressure at about 4,000 feet. When this happens, radio waves will be propagated along the boundary separating the two dissimilar air masses, and communication between stations up to three hundred miles distant will be possible. Note that there is no skip zone exhibited by this phenomenon; propagation is continuous until either the interface disappears or the wave diminishes, according to the inverse-square law, into the noise. Tropospheric bending occurs most frequently in the late summer, especially around daybreak and dusk, when changes in atmospheric conditions are most abrupt. The interested reader is referred to the Collier article, cited in the References.

Cross Country

By and large the mode of propagation that bears the brunt of ten meter traffic is skip via the F_2 layer. First, however, a word about how we know what we do about the gross structure of the ionosphere. Working on much the same principle as conventional radar, an *ionosonde* produces pulses of radio waves which an antenna directs vertically up into space, and records the pulses upon their return to ground. The idea is that if there exists in the ionosphere a layer capable of reflecting waves of a particular frequency, its height above ground can be deduced from the time it takes for the round trip, since we know the velocity of radio waves (3×10^8 meters per second).

The block diagram of an ionosonde is shown in fig. 1. The device is usually capable of sweeping over a frequency range of ten to one, say 1 to 10 mHz. Its output can be panoramically displayed as in fig. 2, which depicts an *ionogram*. Notice how the F layer

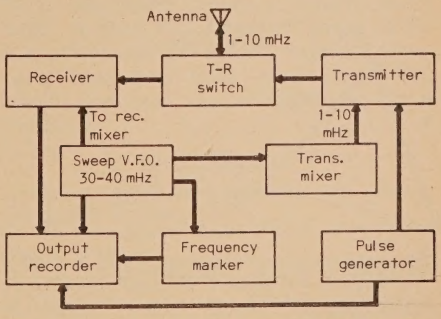


Fig. 1—Block diagram of a 1 to 10 mHz ionosonde.

*126 East Walnut Park Drive, Philadelphia, Pa. 19120

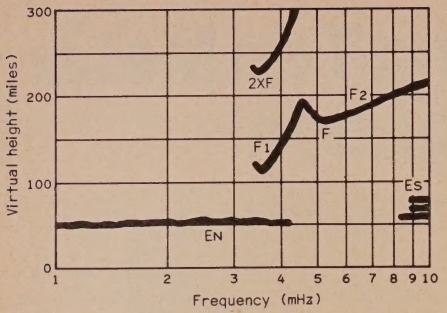


Fig. 2—A typical daytime ionogram. Note the logarithmic frequency display and the "echo" at twice the F-layer height caused by a double reflection of the ionosonde signal from the F layer.

(comprising both F_1 and F_2) has a faint "echo" at twice its actual height. This represents the pulse having gone the following route: transmitting antenna, F layer, ground, F layer again, receiving antenna—in effect executing a double hop.

The activity of the F_2 layer, the highest (200 miles and up) in the ionosphere, follows closely the 11 year sunspot cycle. In years of high solar activity, it remains ionized nearly all day long, thus permitting trans-global communication. In times of moderate activity, as is currently the situation, its performance is correspondingly less energic, though predictable. A handy rule of thumb is: conditions between any two distant locations will be best when local time at the midpoint

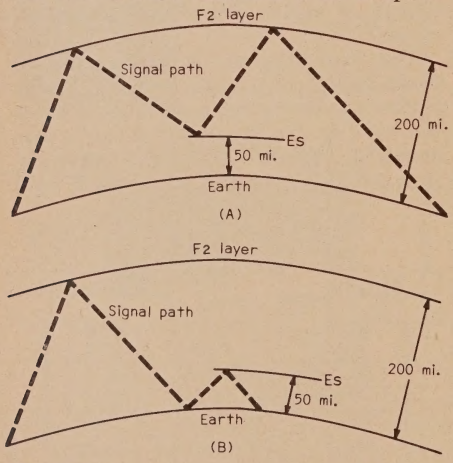


Fig. 3—Numerous combinations of skip from the F and E layers are possible. One such combination is shown at (A) and is referred to as "m-type." At (B) is another combination: "n-type."

is just after noon. This is the period of greatest solar intensity, and hence ionospheric activity.

The rapidity with which ten meters will "turn on" is sometimes astounding. Many east coast hams are familiar with the sudden populating of the band with strong African stations around midmorning (EST), where just an hour before the band was totally quiet. Under such conditions, skip distances of 2,000 miles and more are common, with multi-hop paths being correspondingly longer.

From Here . . .

Least predictable of all forms of propagation encountered on ten meters is Sporadic E, or Es as it is commonly designated. Though occurring at about the same height as normal E (see fig. 2) the sporadic clouds are mysterious in origin; they are held by some to be the result of high velocity wind shears in the upper atmosphere, and by others to be the product of meteor activity. Unlike its normal counterpart, Es shows no apparent correlation with the progress of the solar cycle. Although more common in the early summer months than others, it can occur during any season, night or day.

Sporadic E clouds are most prevalent in the equatorial regions. In fact, commercial communications networks make use of its more constant nature in tropical zones. Using very high power in the 30-50 mHz range, reliability in excess of 99% on transglobal teletype circuits can be obtained. But for those of us limited to far less input, Es remains, as name indicates, a sporadic event. In either case, skip distances range between 500 and 1,500 miles. Signals propagated via Es can be generally recognized by their hollow or fluttery sound, though strengths may be quite good.

Not uncommonly, particularly when a signal path crosses the equator, a mixture of F_2 and Es may be found to occur. The two most frequent patterns are shown in figs. 3(A) and (B) respectively; combinations of these have been frequently observed. Needless to say, it is often difficult for even serious workers in the field to identify exactly what path a signal has traversed, especially in long-haul circuits.

. . . To There

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which is especially beautiful to behold when one is close to the polar region, is the result of severe storms in the magnetic field surrounding the earth. At such times radio blackouts occur, rendering ionospheric communication impossible. However, directing one's beam to the auroral curtain will bring in signals from stations up to 1,000 miles away. Communication by c.w. is the most effective, as the unstable nature of the aurora imparts to signals modulation which impairs the intelligibility of s.s.b. or a.m. This effect is well known to v.h.f. enthusiasts, who have employed this mode of propagation on as high as the 220 mHz band.

. . . And Back Again

The least common method of communication on ten meters is by backscatter. Whereas normally after coming from the ionosphere and striking the ground, electromagnetic waves will continue in the same direction in which they were transmitted, surface irregularities may send part of the radiation back the way it came. The reflections will be propagated in the same manner as the direct waves —either by the F_2 or Es layers—and end up in the vicinity of the transmitting station. This way stations inside the skip zone may be contacted, although signal strength will be low and quality poor because of rapid fading. Backscatter remains, nonetheless, a consistent mode for working points just beyond the reach of ground wave. High power and directional antennas are advised; experience has shown that both stations should point their arrays toward the equator for best results.

In Short

The author hopes he has encouraged many operators, especially Novices, not to give up hope when tuning through a vacant ten meter band. A short CQ instead of a flick of the bandswitch should become standard operating procedure. Who knows—that long sought after rare one just might pop out of nowhere! ■

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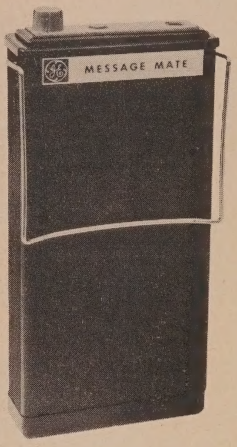
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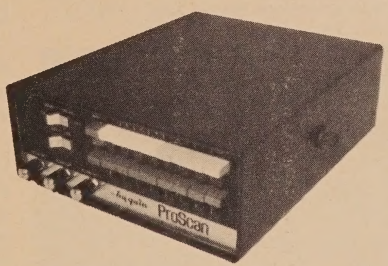
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Flash!

AMSAT reports that due to power supply difficulties, the OSCAR 6 satellite cannot be operated for more than one day at a time. Its new operating schedule is now Thursday, Saturday and Monday, GMT.

OSCAR-6 News & Orbital Predictions

BY GEORGE JACOBS,* W3ASK

By mid-April, despite some quirks, all continued to go well with the Oscar-6 radio amateur satellite.

With each passing orbit hundreds of additional two-way contacts are being made by radio amateurs in all areas of the world through the satellite's 2-to-10 meter translator (145.90 to 146.00 mHz uplink passband; 29.45 to 29.55 mHz downlink passband.)

Another satellite *first* to report, this time contacts made through Oscar-6 from a low power mobile station in a car. This honor goes to Fred Merry, W2GN, who contacted W3TMZ on March 22 using his mobile rig. In the week following this initial contact, Fred added 21 more QSOs with 17 different stations, including a trans-continental chat with K6DS.

Fred was so excited about his first satellite QSO, he drove to Newington, Conn. to demonstrate his mobile setup to the staff at ARRL Headquarters. He made three successful QSOs through Oscar-6 while parked outside the Headquarter's building!

Fred's 2 meter transmitting equipment consists of an IC-20 keyed for c.w., feeding a 60 watt amplifier. The antenna used was a 5/8th wavelength whip mounted on the car. For receiving the 10 meter downlink signal he used an FT-101 and a conventional mobile h.f. antenna.

Besides being the first reported satellite operation from a mobile station, this is further proof that high power and sophisticated equipment *are not* necessary to communicate through the Oscar-6 satellite.

Who will be the first to make a maritime or an aeronautical mobile QSO through the satellite?

A new country has recently been put on the Oscar-6 map with the operation of VU2UV in Bangalore, India. A sample of the wide range over which VU2UV has made successful Oscar QSOs, using about 100 watts, can be seen from his reported contacts with UJ8-AG in the Tadzhik area of the Soviet Union and ZE7JK in Rhodesia. He reports hearing stations as far east as Japan.

*Space Communications Editor, *CQ*, 11307 Clara Street, Silver Spring, Md. 20902



Here's Randy, VE3BYG tuning for OSCAR-6 signals at his Alouette, Quebec QTH. By mid-March Randy had confirmed QSOs with 40 states and 25 countries through OSCAR-6, and more than 350 trans-Atlantic contacts.

OSCAR-6 Quirks

A few problems have developed with the Oscar-6 satellite.

The power output of the 435.1 mHz beacon transmitter has dropped considerably, and it's signal is too weak to copy, except with antennas having gains in excess of 20 db.

The satellite's battery temperature continues to rise (telemetry channel 3D). Designed to run between 60 and 70° F., it has been as high as 117° F. While there is yet no sign of degradation in the spacecraft's power system, there is concern that this may be a limiting factor on Oscar-6's useful lifetime, since battery life can be shortened considerably at elevated temperatures.

Fortunately, the signal from the 29.45 mHz beacon now seems to be quite readable, although still below its designed level. This is now the only source of Oscar-6 telemetry data, so be sure *not* to transmit between 145.900 and 145.910 mHz since signals on these frequencies can result in down-link interfer-

ence to the weakened 29.45 mHz beacon frequency.

The CODESTORE system, while operating properly, has not been used very often because there is only one ground station that can load it at present. Additional ground loading units are being constructed and should be in operation soon. Keep listening to CODESTORE transmissions on the 29.45 mHz beacon for stored operational information sent in Morse Code at about 13 w.p.m.

New OSCAR-6 Operating Schedule

Things seem to be going well enough with OSCAR-6 that AMSAT has extended the satellite's operating schedule by an additional day. It is now ON for five consecutive days and OFF for two, as follows:

Day (GMT)	*Operational Status of* OSCAR-6
Thursday	ON
Friday	ON
Saturday	ON
Sunday	ON
Monday	ON
Tuesday	OFF
Wednesday	OFF

In terms of EST, the satellite's translator will begin operating at 7 P.M. every Wednesday evening and remain in continuous operation until 7 P.M. every Monday.

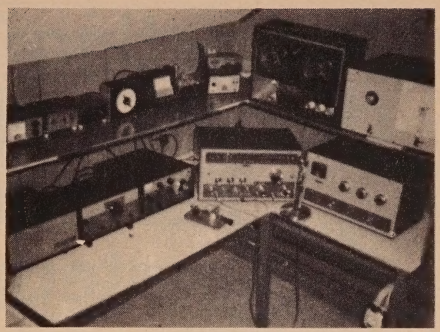
It's hoped that the satellite's battery can recharge sufficiently in the two day rest period. If not, the above operating schedule will have to be altered to allow more rest time. In this case it will be turned OFF on Thursdays as well.

A word of caution from AMSAT—*do not* attempt to use the satellite if you should happen to hear it on during a scheduled off period. The translator will be turned on for short periods daily to obtain telemetry data, and at times to conduct special experiments. Use of the satellite during the scheduled off periods could hamper collection of telemetry data from an already weakened beacon signal, may obstruct a special test and will lead to discharge of the battery when it should be charging. BE SURE NOT TO USE THE SATELLITE DURING SCHEDULED OFF PERIODS.

Orbital Information

The following is orbital information for the *initial* orbit on each day that OSCAR-6 is scheduled to be ON during June, July, August and September. To produce orbital information for other than the referenced orbits, simply keep adding 115 minutes and 28.75 degrees for each succeeding orbit.[1] More comprehensive orbital data for June appeared in last month's issue of *CQ*.[2]

Save the following table so that it can be used for the next four months, since updated orbital information will not appear in *CQ* again until September.



The neat OSCAR-6 setup at K7BBO's Tacoma, Washington QTH. From this position Dave had racked up more than 2700 QSOs through OSCAR-6 by early April, including about 40 states and 12 countries. He holds the distinction of working stations in both Europe and Japan.

[1] See "OSCAR-6 News," *CQ*, Feb. 1973, p. 38, for a method to determine what orbits will be within communication range of a specific QTH.

[2] See "OSCAR-6 News & Orbital Predictions," *CQ*, May, 1973, p. 40.

[*Continued on page 76*]



Ray, K2QBW/3 proves that it doesn't take much equipment to work through the OSCAR-6 satellite. Shown here is his 40 watt 2 meter c.w. transmitter. A 56 inch whip transmitting antenna is perched outside his window. The KWM-2 is used for 10 meter reception with a dipole antenna. In less than a month Ray made 35 two-way contacts with 25 different stations.

Converting The Western Union Telefax Machine For Use In The Amateur Service

BY IRWIN MATH,* WA2NDM

Part 3—Synchronizing Circuits

Now that we have finished the preliminary re-wiring and testing of the Telefax machines, we are ready to install the synchronizing circuits, get the mechanical parts working properly, and begin transmitting and receiving messages. Since new components are used for these steps, we will proceed as before, one stage at a time. Because all of the circuitry we will add is solid state, we will require a simple 12-13 volt power supply and fig. 1 shows our method for obtaining this voltage.

1. Install a 2 lug terminal strip (one lug grounded) in the hole near the 100 ohm adjustable resistor. Be sure to use a star-type lock washer under the head of the screw to be certain a good ground is being made.

2. Connect five 1N2070, or 1N4005 silicon diodes in series between the non-grounded lug of the terminal strip and the side of the 100 ohm power resistor connected to the HR relay. Be sure that the cathode of each diode is connected to the anode of the preceding diode, and that a cathode connects to the terminal lug while an anode goes to the resistor.

3. Install a 1000 mf 15 volt (or more) electrolytic capacitor between the terminal strip side of the diode string, and the ground lug. Be sure the + lead of the capacitor goes to the diodes and the − lead to ground.

4. Plug in the a.c. line cord and turn on the Telefax machine but do not push any of the buttons. When the Ready light comes on, measure the voltage across the 1000 mf capacitor just installed and be sure that it is between 12 and 13 volts. Then turn off the machine and unplug the a.c. line cord.

The Telefax machine as normally supplied, made use of a central office inverter to transmit positive pictures. Since we do not have the advantage of such a circuit, we must employ an optical pseudo-inverter as shown in fig. 2. Next month, we will completely explain the theory behind this scheme, but for now we will simply build the device. At this point I would like to give credit to R & R Electronics, who supplied the basic information for the fabrication of this "block." Don't let the drawings of the inverter scare you. Several people who are "all thumbs" built these with no problems at all!

1. Begin by obtaining a #328 pilot lamp and referring to fig. 2. Cut a piece of bakelite, phenolic or aluminum to the size shown in the figure (which is 1⅜"×⅝"×½").

2. Drill a ¼" hole in the location shown, deep enough to allow the #328 pilot lamp to

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

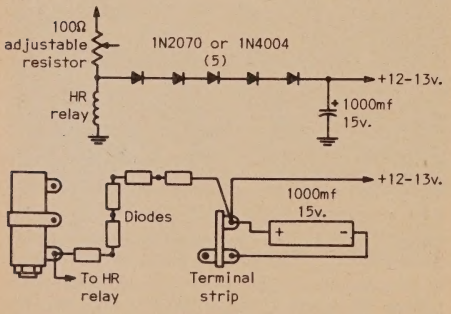


Fig. 1—12-13 v. power supply assembly. The 100 ohm resistor and relay HR are existing components in the Telefax machine.

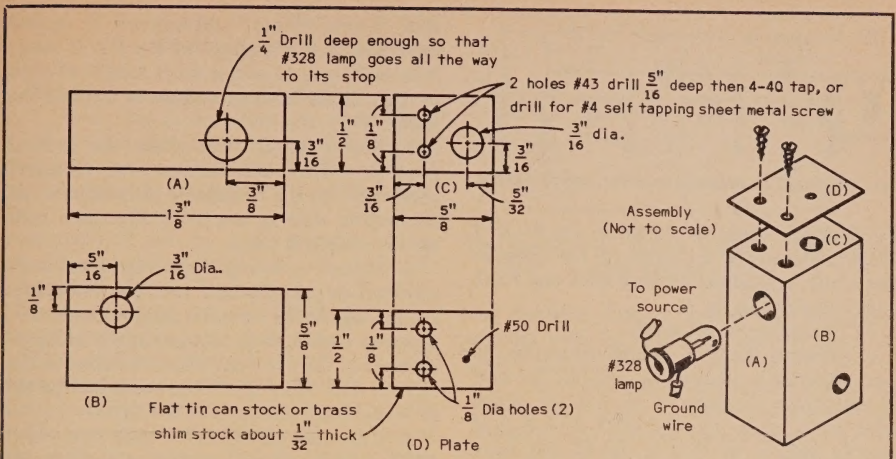


Fig. 2—Construction of the optional inverter used to produce positive pictures from normal negative transmissions.

slide all the way into the hole until it hits the ridge at the edge of its base. Be careful not to allow the hole to break through the opposite side of the block,

3. Drill two 3/16" dia. holes in the block as shown. When drilling these holes, be sure to remove any burrs that may occur.

4. Drill two holes in the end of the block as shown in fig. 2(C). Use either a #43 drill and then tap the holes as shown, or use the proper size drill for any small diameter self-tapping screws you may have (#4 is fine). Small Minibox screws should work for this application.

5. Out of either 1/32" brass, aluminum, or tin can stock (flattened or use the lid), fabricate the piece shown in fig. 2(D).

6. Slide the #328 lamp into the 1/4" hole, wedging a piece of small gauge hookup wire between the lamp base and the block. If a block made of insulating material is used, this wire should extend past the lamp several inches. If an aluminum block was used, the aluminum will serve as the contact. In either case, be sure there is good contact to the lamp shell and that the lamp is securely held in the hole by friction.

7. Solder a 6 inch length of insulated hookup wire to the center contact of the lamp.

8. Mount the plate made in step 5 to the block by means of two screws through the 1/8" holes. Only tighten these screws enough to hold the plate in position. It must first be aligned.

9. Remove the right hand screw holding the Telefax pin hole assembly. Using a 1" long 8-32 screw, mount the block and lamp in the screw hole.

10. Referring to fig. 3, wire the circuit shown on a small 3 lug (one lug grounded) terminal strip mounted under the exciter lamp socket on top of the chassis.

11. Connect the output of this supply to the wire from the center pin of the #328 lamp.

This completes the fabrication of the "optical inverter." We must now align it.

1. Place a sheet of white paper on the Telefax drum. Set the 75 ohm pot for maximum resistance and place a piece of paper between the LR relay contacts.

2. Plug in the exciter lamp and the a.c. line cord. Also, connect a pair of earphones or an oscilloscope to the transmitter output connector.

3. Turn on the power and when the Ready lamp comes on, push the outgoing push button.

4. Realign the exciter lamp assembly and/or pinhole assembly so that maximum light is being reflected on to the pinhole disk.

5. In a darkened room, observe the spot of light coming out of the pinhole. Adjust the 75 ohm pot so that the inverter spot of light is of about the same intensity.

6. Stop the chopper wheel by gently grasping it and allowing it to come to a slow stop.

7. Observe the spot of light from the pinhole. It should just cover one of the teeth of

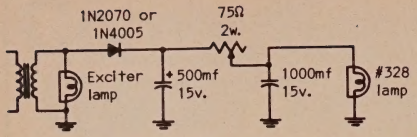


Fig. 3—Circuit of optional inverter power supply.

the chopper wheel as shown in fig. 4. If it doesn't, loosen the set screw on the chopper disk's hub, and adjust the disk back and forth until it looks like fig. 4.

8. Retighten the set screw.

9. Observe the spot of light from the optical inverter. It should look just like the spot of light from the pinhole. If it is not of the same size, ream out the #50 drilled hole *slightly* until it is. If it is not of the same brightness, adjust the 75 ohm pot until it is.

10. Release the chopper disk now, and press the Start push button.

11. Listen to the tone in the earphones (or look at the waveshape on the scope) and slowly move the #50 drill hole plate until *minimum* output is detected. When this occurs, tighten the two #4 holding screws securely.

12. Readjust the 75 ohm pot for an even better null or minimum signal if possible. When the null is achieved, the optical inverter is complete.

13. Remove the paper from the LR relay.

Those not wishing to go through the preceding procedure can still use their machines by ignoring this whole inverter section and being satisfied with transmitting negative pictures. They will always receive positive pictures from a person who is using an inverter such as this, however.

The next stage to be added is a unijunction oscillator that will be used to generate the start sync pulse. Figure 5 shows the schematic of this stage as well as a slight circuit modification, the function of which will be explained in detail next month.

1. Locate the 1.5K ½ watt resistor going to ground from pin 7 of the 6AU6 near the P2 Xmtr potentiometer.

2. Carefully remove the ground connection of this resistor and connect it to one normally closed contact of the PWR relay. You will have to add a short length of wire to the resistor lead, so be sure to insulate the splice.

3. Run another wire from the ground point to which the resistor was formerly connected, to the remaining normally closed contact as well as one normally open contact of the PWR relay.

4. Mount a 5 lug (one lug grounded) terminal strip in the hole near the HR relay. On the lugs of the terminal strip, wire the unijunction oscillator circuit as shown in fig. 5. Hook it to the various indicated points in the circuit. The 5K potentiometer should be set to maximum resistance at this time.

5. Carefully install the exciter lamp, and all vacuum tubes, and connect an oscilloscope or pair of earphones to the transmitter output connector. Plug in the a.c. line cord and turn on power. When the Ready light goes on, press the Outgoing push button.

6. You should hear (or see) pulses of 2500 Hz energy which are the sync pulses. Press and hold the Start button. You should now hear a low frequency tone of about 500-600 Hz which is the circuitry just added.

7. Release the Start button. You should now hear a continuous 2500 Hz tone.

8. If the above has occurred, turn off the power, unplug the line cord, and remove the oscilloscope and/or earphones. Again, remove the exciter lamp to prevent breakage.

This completes the transmitter sync circuitry. All that now remains is to wire the receiver sync decoder circuitry, do some minor mechanical alignment, and we will be on the air.

The receiving sync decoder circuit is shown in fig. 6. For ease in both construction and alignment, two NE567 phase locked decoder integrated circuits are employed. One of these is tuned to detect the 2500 Hz sync pulses while the other is tuned to detect the Start pulse. When either of these are detected, the appropriate NE567 activates a relay which in turn drives a dual triode vacuum tube. This tube drives the relays that accomplish the actual timing.

For those who wonder why we chose to employ a tube to drive the relays rather than a transistor, the reasons were as follows: The relays supplied with the Telefax are all high voltage relays; The switching transients that occur when operating these relays would require very high voltage, costly driving tran-

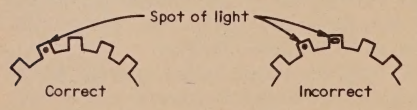


Fig. 4—Alignment of spot of light on chopper wheel.

sistors. Since almost the whole unit uses vacuum tubes, we felt one more wouldn't be objectionable.

Now for the actual fabrication.

1. Referring to the schematic diagram of fig. 6 and the pictorial wiring diagram of fig. 7, wire the entire control circuit. Time did not allow a printed circuit board to be designed. However, a perfectly acceptable method of construction can be point-to-point wiring on a bakelite board (our method) or the use of push-in clips on Vectorboard or the like. Whatever method you use, follow the layout and you should have no problems.

2. Once the board is completely wired and triple checked, mount it to the Telefax chassis using machine screws, spacers, the blank hole in the chassis near the PWR relay and one of the mounting screws for the exciter lamp transformer.

3. Now connect the board to the appropriate points in the chassis, being certain to double check before you solder.

Once this is done, the Telefax conversion is complete. All that remains is the final alignment. Before proceeding however, one final test is required.

1. Plug in the a.c. line cord and turn on the power. Plug a 12AX7 into the 9 pin tube socket.

2. When the Ready light comes on, momentarily activate the two 12 volt relays on the control board, one at a time, by pressing

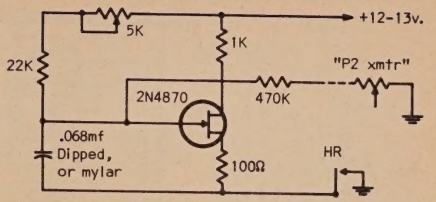


Fig. 5—Circuit of 625 Hz oscillator used to generate Start sync pulse.

the movable contact toward the stationary contact with an insulated piece of wood or plastic alignment tool. Do not use your finger.

3. One relay should cause the BR relay to pull in and drop out, and the other relay should do the same to the LR relay.

In one of the units we modified, the LR relay would not drop out. The trouble was traced to a very weak spring and, by replacing the spring with one from the discarded ACK relay, the unit operated normally.

The final alignment procedure for the Telefax machine consists of cleaning and lubricating all mechanical parts and adjusting the phase decoder chips to operate at the proper frequencies. Proceed as follows:

1. Thoroughly clean the moving parts of the Telefax machine with a cloth moistened in alcohol or other solvent.

2. When clean, apply a small amount of silicon grease or other lubricant to the worm

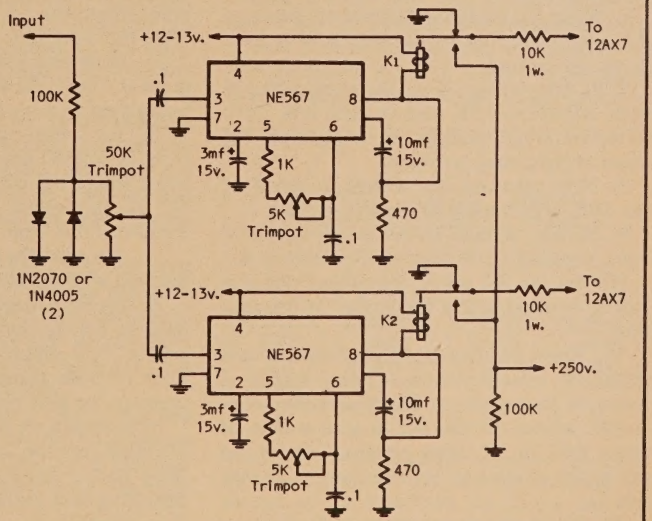


Fig. 6—Receiving sync decoder circuit. Relays K_1 and K_2 are Sigma type 65FP1A-12DC.

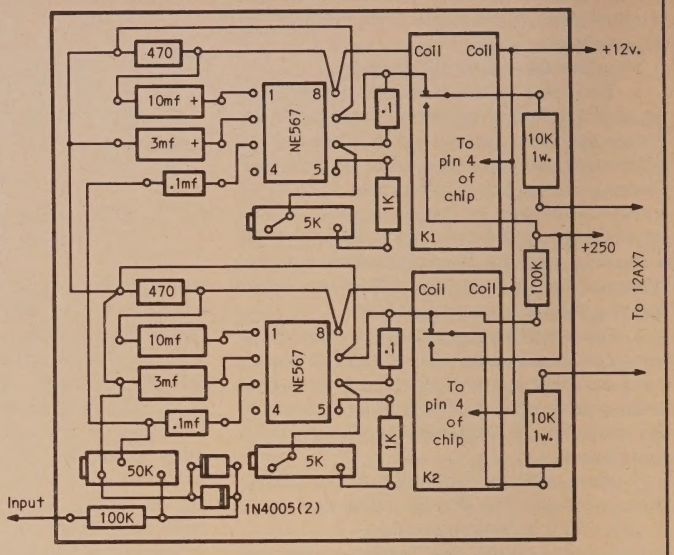


Fig. 7—Recommended board layout for sync decoder of fig. 6. Hard wiring on perf board is satisfactory, though a printed circuit could be fabricated.

and worm gear on the drum motor.

3. Apply a few drops of a light oil such as automotive type 10W on the drum shaft bearings. Be sure to wipe the drum shaft after oiling to remove any oil that may remain on the shaft.

4. Check to be certain that all moving parts do so easily.

5. Plug in the a.c. line cord, and turn on power.

6. When the ready light comes on, measure the voltage at pin 4 of the 6V6 with respect to chassis ground.

7. If this voltage is not between 260-280 volts, adjust the 3.5K resistor until it is. Turn off power when making this adjustment because of the voltages present.

8. Now measure the voltage at pin 8 of the 6V6 with respect to chassis ground.

9. If this voltage is not between 16-18 volts ,adjust the 100 ohm resistor until it is.

10. Set the 5K pot in the unijunction circuit to approximately the center of its rotation.

11. Press the Outgoing push-button and then the Start button. Using either a scope or earphones at the transmitter connecter, adjust the 5K pot to give a tone of about 625 Hz. If using phones, just set the pot to the center and be sure there is an output.

12. If an audio generator is available it can be used to set the phase locked decoders. Otherwise, a signal from another unit must be employed at this time and fed to the receiver connector.

13. Press the Incoming push button on the unit you are adjusting and insert a 2500 Hz tone or 2500 Hz sync pulse from another Telefax machine.

14. By adjusting the trimpot to both chips and the trimpot in the LR chain, find the point where the LR relay operates everytime 2500 Hz is present.

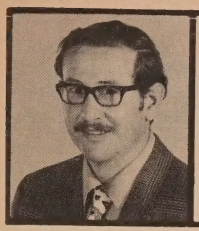
15. Now turn the generator to 625 Hz, or press and hold, the start button on the Telefax being used as a source.

16. By adjusting the trimpot associated with the NE567 driving the BR relay, find the point where the BR relay pulls in everytime 625 Hz is present. Do not disturb the input trimpot at this time.

17. Reinsert the exciter lamp and you are finished with the conversion.

At this time messages can be sent between units as per the instructions in Part 1 of this article. You should experiment with the settings of both transmit and receive potentiometers for best picture quality.

Next month we will present a complete description of the circuitry, troubleshooting hints and, a detailed set of instructions for operating and realigning the machine. Until then—have fun! ■



DX

BY JERRY HAGEN,* WA6GLD

DXpedition Activity

It did not take long for 1973 to produce some significant DXpedition Activity. One of the rarest countries, Spratley Island was activated in late February despite immense logistics and weather problems. Unforhandled by Scott and Don (Ex HS3DR) of was poor and QSL's were very limited in that area. Organization of the DXpedition was handled by Scott and Don (Ex-HS3DR) of XV5AC with Pete, HS4AGN as primary c.w. operator. An ex-Army 65 foot "Q" Boat was used and attempts to leave XV land on February 9 and 11 were postponed due to 9 foot waves and 30 knot winds. On February 20, a successful landing was made despite HS4-AGN being swept away from the island while ferrying supplies ashore in a whale boat. Pete was afloat for 8 hours before being located and rescued by the main boat. After rest on the island, operation on 80 through 15 meters was initiated and approximately 5000 QSOs were made. Unfortunately, conditions to the east coast were poor, however the tenacity and bravery exhibited by the operators is in the highest tradition of DXpeditioners!

WPX Honor Roll member XE1J and contest specialist XE1IIJ operated from Revilla Gigedo Islands in mid-March using the call XF4J on s.s.b. and 4C4AA on c.w. All band activity including 160 meters was emphasized.

The Brazilian Islands of St. Peter and Paul Rocks and Fernando de Noronha were activated by PY2WH in March using the special prefixes PSØWH and ZVØWH respectively. Of course, these were a good catch for both the *CQ* DX and WPX Awards.

Another operation with a rare prefix was the KA1CQ operation from the Osgasawara Islands during the *CQ* WPX S.S.B Contest. All band activities were made with a number of KA's operating including KA2AS, KA2-BL, KA2BW, DA2DX, KA2RG, and KA1-IW. Separate locations for stations on each band were linked by 2 meter f.m. rigs!

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

The CQ DX Award Program

CW DX

112.....DK3SN	113.....DJ9NA

SSB DX

263.....WB8IAY	268.....I4CSP
264.....VE1ANZ	269.....UA9MP
265.....W7UG	270.....K6WR
266.....W8YEK	271.....PY2BZD
267.....DK3SN	

Endorsements

C.W.: DJ2VZ-250

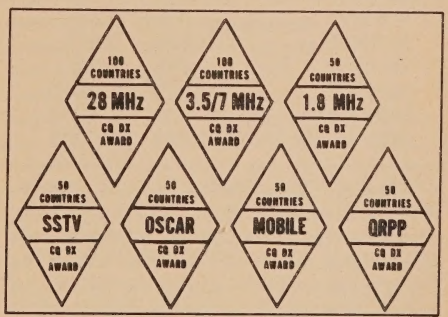
S.S.B.: K6WR-310, WØSFU-275, VE1ANZ-150

SSTV: VE3GMT, W8YEK

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

The Country List

During the past few months you have no doubt noticed quite a bit of comment on the DXCC Country list. During the past year, 3 countries have been eliminated by change in governmental status (Minerva, Okinawa, and Swan Island). In the October issue, DX EDITOR K4IIF published an article entitled "These Things We Call Countries—What Are They" in which he catagorizes countries by the type of government which exists. In the December issue he examined the possibility of adding to the DXCC countries list by



These are the Special Endorsements now available for the CQ DX Award Program. These are holders of the CQ2×SSB DX Award and CQ CW DX Award Certificates.

WPX HONOR ROLL

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

MIXED

W4LRN	1225	YU1AG	860	SM7TV	752
VE3GCO	1014	W4IC	850	K8UDJ	750
F9RM	1003	W4CRW	849	CT1LN	749
W2NUT	967	W4BQY	839	WA5LOB	749
W8LY	959	W4WSF	823	WAØKDI	739
DJ7CX	930	I6SF	814	PY4AP	735
WA6MWG	928	W9WHM	811	KØBLT	733
ON4QX	916	G3DO	810	K6SDR	716
W3PVZ	913	W6TCQ	804	WA6EPQ	709
DL1MD	892	W6ISQ	803	K2ZRO	708
PAØSNG	882	W3GJY	797	W6NJU	706
W8ROC	882	WØAUB	785	W9ZTD	700
DL1CF	872	K2AAC	763	W8GMK	683
K1SHN	867	WB4KZG	760	WAØCPX	656
				WA2EAH	650

CW

W8LY	953	DJ7CX	730	W4IC	652
W8KPL	910	G2GM	728	WA6MWG	644
DL1QT	844	K1SHN	696	K1LWI	629
W2HO	825	OK2DB	693	W8GMK	628
ON4QX	823	YU1AG	687	K2ZRO	612
W2AIW	813	K2AAC	676	VO1AW	605
VK3AHQ	809	W6ISQ	666	WA6JVD	602
WB2FMK	740	I6SF	658	VE4OX	600
W9FD	740	SM5BNX	652	OK2QX	600
K7ABV	735				

SSB

W4NJF	1031	PAØSNG	758	OK1MP	680
CT1PK	930	WA5LOB	747	W6RKP	678
IØAMU	863	F2MO	730	I4ZSQ	669
DL9OH	841	G3DO	719	I8YRK	662
K2POA	833	I1ZV	716	YU1AG	635
W9DWQ	826	IT9JT	710	WB6DXU	631
DL1MD	805	W4IC	702	CR7IK	613
HP1JC	800	K1SHN	697	I4LCK	608
WØYDB	792	W3DJZ	694		
I8KDB	790	ZL3NS	685		

a different interpretation of this criteria. WB9BUV, provided an interesting press story regarding the islands Serrano, Roncador, and Quito Sueno which are 150 miles east of the Nicaraguan coast. Of course the DXCC list knows these islands as Seranna Bank, which is jointly claimed by the US and Colombia. At this time, Nicaragua is also claiming jurisdiction of the Islands as the US was apparently thinking of ceding jurisdiction to Colombia. This may not be a significant diplomatic problem, but consider the possible impact of the DXCC list if changes were to be made in the administration of these islands. If Nicaragua or Colombia were recognized as the sole administration then these islands would not qualify as a country as the distance to Nicaragua or the San Andres Islands does not exceed the 500 miles required for separate DXCC country status.

A change in administration could also effect the status of Bajo Nuevo which is 140 miles northeast of Serrana Bank and less than 300 miles from San Andres. Thus, if Colombia administered Serrana Bank, Bajo Nuevo would likewise no longer qualify for a DXCC Country under the 500 miles water separation rule. My, these things called countries do get complicated!

Outstanding DX Achievements

An outstanding achievement has been made by Roger Trapp, K6SSN (Avid WPXer and DXer) who has received 5 Band DXCC in the past 23 months. The unusual accomplishment is the fact that Roger used *only* a single trap vertical and 2 × s.s.b. exclusively. In addition K6SSN holds only an Advanced class license and could not operate in the lower 25 kHz DX band of 75 meters. Rogers' big day was February 22, when he worked YJ8GH, 1S1A, and 9M2PV and the next day worked VP2SAB for #100 on 75 Meters.

New CQ DX Award Endorsements

Don't forget that the new endorsements are now available for the *CQ* DX Award. These endorsements (*not* separate awards) are given for 50 countries confirmed in the following specialties: 160 Meters (1.8 mHz), Slow Scan TV (SSTV), Amateur Satelite (OSCAR), Mobile, and QRPP (under 5 watts input). To qualify for these endorsements the basic *CQ* DX Award for the appropriate mode (c.w. or 2 × S.S.B.) must be held by the applicant. The SSTV endorsement is available only for the 2 × S.S.B. Award.

We are happy to announce that VE3GMT and W8YEK are the first recipiants of these special endorsements; both qualifying for the SSTV sticker. Congratulations fellows!

Trans-Equatorial 160 Tests

Trans-Equatorial 160 m. DX tests have once again been organized by PY1DVG and EI9J for June 1973 daily at 0000-0030 GMT, when special efforts at Trans-Equatorial DX QSO's will be made. Eu and Asians use the DX "window" 1825-1830; others including W/VE use 1800-1807 kHz. Stations N of equator call first 2½ min. of each 5 min. period; those S of equator use second 2½ min. Usually several days in June will show exceptional N/S peaking, so it is important to check conditions daily.

Here And There In The World Of DX

Bob, KA2BL/K9FOH reports that the 1972 *CQ* WW effort at KA1DX was a success, with particularly good openings to Europe on 15 and 10 meters where Marcus Island is quite rare. Approximately 5000 QSO's were made and a score of 3.6 million in the *CQ* DX Test (Phone). The only frequency authorized on 80 is 3537.5 kHz, which makes operation difficult. Steve (WA4UAZ) reports over 6000 QSO's as GM5AXO while in Edzell, Scotland. Steve is working on Novice WAS and hoped to be quite active in the WPX SSB Contest. ZE8JN reports that W operators are a pleasure to

THE WPX PROGRAM

2 × S.S.B. WPX Awards Issued

737.....PAØLVK 738.....DK3SN

C.W. WPX

1232.....K3NEZ 1235.....DK3SN
1233.....I5FID 1236.....K9UIY
1234.....UA3EK

Mixed WPX

382.....W6JHV 384.....DK3SN
383.....HA5KFN 385.....UK5MAG

WPNX

55.....WN8LVA

VPX

51.....OE1-101171

WPX Endorsements

S.S.B.: 800—DL1MD, 650—UC2BF, 550—VE7WJ, 350—W2SZ, G3TLV

C.W.: 650—W9IRH, 600—K7NHG, 350—K3AQR, K3NEZ, K9UIY

Mixed: 1000—F9RM, 950—DJ7CX, 900—DL1MD, 650—UC2BF, 600—K9YXA, JA2HNP, 450—HA5KFN, DK3SN

160 Meters: K4RDU

80 Meters: WA2EAH, DK3SN

20 Meters: WA3GNW, K3AQR

15 Meters: W9EVD, K2MFY

Asia: JA2HNP, UB5LS, UC2BF

Europe: JA2HNP, DK3SN, K3AQR, UV3-BG, UC2BF, K3NEZ, I5FID, PAØLVK, HA5KFN

North America: WA3GNW, WA5VDH, WA-5ZWC, K2MFY

Oceania: JA2HNP

South America: UC2BF

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



Bob, W6HUR, along with his Swan transceiver has worked 280 countries and received CQ SSB DX Award #116.

work with their snappy operation. Neil's 6 element Quad produced 816 QSO's on 28 mHz in the 1972 *CQ* WW CW Contest before being hit by lightning in December. K2EJ spent 5 days operating VP2VAN producing 493 QSO's mostly on c.w. and then followed with 6 days operation as PJ8DX from St. Eustatius and made 1559 QSO's. Chuck, Ex-9M8OEA and Mary, Ex-9M8-SPD are QRX for reciprocal licensing in DU-land. Both miss the amateur bands and hope to be QRV soon. Father Dave, CEØAE/6 has been QRT with rig difficulties, it seems that even allen wrenches are hard to come by in Mafil. The Camel Drivers Radio Club (YA) continues to be active, and now sponsors the CDRC Award. The JARL reports that WPX activity in Japan is becoming more popular. The JARL sponsors several DX awards including AJD (All Japan Districts), WAJA (Worked All Japan Prefectures—the JA WAS), and the ADXA (Asian DX Award). Rules are available from the JARL Award Manager, P.O. Box 377, Tokyo Central. Andre, 5Z4KL will end 6 years activity in Kenya this month during which he has worked 313 countries and has been active on



The Midwest was well represented at SAROC by top DXer John, W9GIL (l.) and contest specialist Butch, W9EWC (r).

The WAZ Program

S.S.B. WAZ

1070.....WB6WHM	1075.....K6GUY
1071.....W5KGJ	1076.....OE8RT
1072.....JA1OTX	1077.....KH6GKD
1073.....JA7ZF	1078.....UR2KAW
1074.....LU8FP	1079.....UV3GW

C.W.—Phone WAZ

3518.....K3SWZ	3525.....SM2DR
3519.....WA2DHS	3526.....WA5VDH
3520.....K9ZXG	3527.....W5IJW
3521.....G5GH	3528.....K3SXQ
3522.....KØALL	3529.....F6BJR
3523.....W2GOF	3530.....EI2BB
3524.....F6KCO	3531.....DJ8DF

Phone WAZ

483.....K7GYA

Complete WAZ rules are shown on pages 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, Florida 33880.

all bands including 160 meters. Andre will return to Scotland and his home call of GM3-VLB. WB2AQC says that he and XYL Eva are busy answering QSL's for their 9000 QSO's made in Africa last summer. Some cards were evidently lost in the mail, so those not receiving cards should re-apply. Ron, ZF1SB is disappointed to report that his call is pirated as Ron is QRX for time to iron some bugs out of his HW-101 transceiver.

QSL Information

A2CCY—Via K4CDZ	FM7WN—Via K2KGB
A4FD—Via G3XEC	GM6RV—Via K9KLR
CR6FW—Via W5QPX	JD1AHC—Via JA8AWH
CR6II—Via W8CNL	JY9VO—Via W7JHO
CR6IK—Via W8CNL	KA1DX—Via WA6AHF
CR6YY—Via W8CNL	KA1CQ—Via WA6AHF

[*Continued on page 74*]



This photo shows KA6IX, Doc, and his Siberian Husky. Doc is the one with the hat. Doc holds mixed WPX #355!



Propagation

BY GEORGE JACOBS,* W3ASK

SORRY about that gremlin sneaking into April's column and printing the wrong Area Code for *CQ's* new DIAL-A-PROP service. Fortunately, the number was given correctly in the *Zero Bias* column and on the W1AW Bulletins. This no doubt accounts for the almost continuous ringing of the DIAL-A-PROP phone at *CQ's* headquarters. The *correct* number is Area Code 516-883-6223.

The up-to-date propagation reports, solar data, DX tips and forecasts of ionospheric openings on the v.h.f. bands given in the two minute or so recorded announcements are intended as a supplement to the propagation data appearing monthly in this column. Covering day-to-day events for a period of a week, the announcements are revised every Monday afternoon and more often if sudden changes in propagation should occur. Special Contest forecasts are made on Friday afternoons preceding ARRL and CQ DX Contests. DIAL-A-PROP is available 24 hours a day.

Be sure to have paper and pencil handy to jot down notes, since a lot of information covering an entire week is packed into each announcement, and it plays only once before disconnecting. Better yet, tape record the announcement, so that you can listen to it as often as necessary at your leisure.

June's Forecast

Solar activity continues to decline at a relatively steady rate. The Federal Solar Observatory at Zurich reports a monthly mean sun-spot number of 42 for February, 1973. This results in a 12-month running smoothed number of 65 for August, 1972. A smoothed number of 41 is forecast for this June. This means that DX propagation conditions on the 10, 15 and 20 meter bands will be considerably *below* those experienced last summer when solar activity was in the 60's. Conditions in the 40, 80 and 160 meter bands are expected to be somewhat *better* than last summer.

Here's a band-by-band description of propagation conditions expected this month.

10 Meters: Plenty of short-skip openings between distances of about 500 and 1300 miles as a result of sporadic-E propagation. Considerably fewer DX openings are forecast as compared to the spring months, but a few should be possible during the late afternoon hours to South America and to the South Pacific area.

15 Meters: Excellent short-skip openings expected between distances of approximately 400 and 1300 miles. Fewer DX openings are forecast, but some good ones should be possible to South America and somewhat less frequently to Africa and the South Pacific area. DX conditions should peak during the late afternoon and early evening hours.

20 Meters: Excellent short-skip and good DX conditions are expected almost around-the-clock. At almost any time openings may be as short as a few hundred miles and as long as several thousand miles. The band should open for DX shortly after sunrise and remain open to some DX area of the world or another well into the evening hours. During

* 11307 Clara Street, Silver Spring, Md. 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For June, 1973

	Rating & Forecast Quality			
Propagation Index	(4)	(3)	(2)	(1)
Date				
Above Normal: 1-2, 5, 17, 19, 26, 28-29	A	A	C	C
Normal: 3-4, 6-7, 10-11, 15-16, 18, 20-21, 24-25, 27, 30	B	C	D	E
Below Normal: 8-9, 12, 14, 22-23	C	D	E	E
Disturbed: 13	D	D	E	E

Where *expected signal quality is:*

A—Excellent opening, exceptionally strong, steady signals.

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

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

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

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the particular opening for any day of the month. For example, all openings shown in the Charts with a *propagation index* of (4) will be excellent on June 5, will be fair on June 10, and poor on June 12.
3. For a more updated forecast dial Area Code 516-883-6223 for DIAL-A-PROP.

much of the daylight hours, however, DX signals may be masked by exceptionally strong short-skip signals. Optimum DX conditions should occur during the late afternoon and evening hours, with signal levels often very strong. This is expected to be the best band for DX during June and the summer months.

40 Meters: Excellent short-skip openings, between distances of less than 100, to approximately 1300 miles are expected during the daylight hours. As darkness approaches, the skip is expected to lengthen considerably. After sundown, the band should open for DX signals to many areas of the world. Conditons are expected to peak to the east about midnight, local time and to the north and west just before local sunrise.

80 Meters: Increasing static levels and the shorter hours of darkness will result in fewer DX openings as compared to the spring months. During the daylight hours, good short-skip openings should be possible out to a distance of about 250 miles. As darkness approaches the skip should extend out to 2300 miles and beyond. DX conditions peak at about the same times as on 40 meters.

160 Meters: During the daylight hours very few openings are expected beyond about 100 miles. As darkness approaches, the skip will begin to lengthen. By nightfall, fairly good short-skip openings should be possible out to about 1300 miles. An occasional opening beyond 1300 miles, and openings into some DX areas may also be possible during the hours of darkness and the sunrise period.

This month's *CQ* Propagation Charts contain DX predictions for the period June 15 through August 15, 1973. Instructions for the use of these Charts appear elsewhere in this column. Short-skip predictions for June, for distances between 50 and 2300 miles, and from Hawaii and Alaska, appeared in last month's column.

V.H.F. Ionospheric Openings

Sporadic-E short-skip propagation should increase considerably during June, resulting in fairly frequent 6 meter openings over a range of 1000 to 1400 miles. During periods of widespread ionization, two-hop 6 meter openings may occasionally be possible up to distances of approximately 2300 miles. An occasional 2 meter short-skip opening, be-also be possible during periods of intense sporadic-E ionization. Short-skip openings most often occur between 9 A.M. and 1 P.M. and again between 5 P.M. and 9 P.M. local standard time, although they can take place at all other times as well.

Trans-equatorial (TE) scatter propagation should fall off considerably during June, but an occasional opening might be possible on 6 meters between 8 and 11 P.M., local standard time, on long north-south paths which cross the geomagnetic equator at nearly a right angle.

TE openings favor locations in the southern third of the USA, with openings into more northerly areas unlikely during June.

No major meteor showers are forecast for June, and very little auroral activity is expected. Check the "Last Minute Forecast", since whatever auroral propagation may be possible during the month is most likely to occur on those days shown as below normal or disturbed.

Solar Eclipse

On June 30 a total eclipse of the sun will take place. The path of totality, where the sun will be shielded completely by the moon, will extend from northeastern South America, across the South Atlantic and central Africa, ending in the Indian Ocean. Interesting shortwave wave propagation is often observed during the period of eclipse, as the sun's radiation is cut-off from reaching the ionosphere.

A large number of French scientists will be observing the eclipse at several places in Mauretania, West Africa. Among them will be A. Duffau, 5T5AD, who will be conducting shortwave observations on the amateur bands. He will set up two c.w. beacon transmitters which will operate continuously between 0930 and 1130 GMT, using the callsign 5T5SOL. The beacon will operate in the 20 meter band, on approximately 14,050 kHz, and in the 15 meter band at approximately 21.050 kHz.

Amateurs throughout the world are asked to monitor the beacon, and to send reports of reception, noting especially the times of signal fades, to Serge Canivenc, F8SH, 6, rue de Pont-Hele, 22700 PERROS-GUIREC, France. Amateurs are also urged to keep the beacon's frequency clear of QRM.

A commemerative QSL card will be sent in return for each report of 5T5SOL's reception received by F8SH.

73, George, W3ASK

SUBSCRIBE TODAY

June 15—August 15, 1973

Time Zone: EST (24-Hour Time)

EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North America	*Nil*	14-18 (1)	06-08 (2) 08-11 (1) 11-13 (2) 13-15 (3) 15-19 (4) 19-20 (3) 20-21 (2) 21-06 (1)	19-21 (1) 21-22 (2) 22-00 (3) 00-01 (2) 01-02 (1) 21-23 (1)* 23-00 (2)* 00-01 (1)*
Northern Europe & European USSR	*Nil*	14-17 (1)	08-14 (1) 14-18 (2) 18-22 (3) 22-00 (2) 00-05 (1) 05-08 (2)	20-21 (1) 21-23 (2) 23-01 (1) 20-23 (1)*
Eastern Mediterranean & Middle East	*Nil*	15-17 (1)	11-13 (1) 13-17 (2) 17-23 (3) 23-00 (2) 00-05 (1) 05-07 (2) 07-09 (1)	19-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
West Africa	*Nil*	10-13 (1) 13-16 (2) 16-18 (1)	00-06 (1) 06-08 (2) 08-14 (1) 14-16 (2) 16-18(3) 18-21 (4) 21-23 (3) 23-00 (2)	19-21 (1) 21-23 (2) 23-01 (1)
East & Central Africa	*Nil*	12-14 (1) 14-16 (2) 16-18 (1)	13-15 (1) 15-17 (2) 17-20 (3) 20-21 (2) 21-23 (1) 23-01 (2) 01-05 (1)	20-23 (1)
South Africa	*Nil*	09-12 (1)	23-00 (1) 00-03 (2) 03-06 (1) 14-15 (1) 15-17 (2) 17-18 (1)	20-21 (1) 21-23 (2) 23-01 (1) 22-00 (1)*
Central & South Asia	*Nil*	*Nil*	16-19 (1) 19-21 (2) 21-23 (1) 06-08 (1)	18-20 (1)
Southeast Asia	*Nil*	*Nil*	05-06 (1) 06-08 (2) 08-10 (1) 18-20 (1)	*Nil*
Far East	*Nil*	*Nil*	05-06 (1) 06-09 (2) 09-11 (1) 19-23 (1)	*Nil*
South Pacific & New Zealand	17-20 (1)	15-17 (1) 17-20 (2) 20-21 (1)	17-20 (1) 20-22 (2) 22-02 (3) 02-05 (2) 05-08 (1)	00-02 (1) 02-05 (2) 05-07 (1) 03-05 (1)*
Australasia	*Nil*	18-21 (1)	22-00 (1) 00-01 (2) 01-03 (3) 03-04 (2) 04-07 (1) 07-09 (2) 09-11 (1) 15-17 (1)	02-03 (1) 03-05 (2) 05-06 (1) 03-05 (1)*
Northern & Central South America	10-14 (1) 14-16 (2) 16-17 (1)	07-08 (1) 08-14 (2) 14-15 (3) 15-17 (4) 17-19 (3) 19-20 (2) 20-21 (1)	05-06 (2) 06-07 (3) 07-09 (4) 09-11 (3) 11-15 (2) 15-17 (3) 17-21 (4) 21-23 (3) 23-00 (2) 00-05 (1)	20-22 (1) 22-03 (2) 03-05 (1) 22-03 (1)*
Brazil, Argentina, Chile & Uruguay	13-14 (1) 14-16 (2) 16-17 (1)	07-08 (1) 08-10 (2) 10-14 (1) 14-15 (2) 15-16 (3) 16-17 (4) 17-18 (3) 18-20 (2) 20-21 (1)	15-16 (1) 16-18 (2) 18-19 (3) 19-21 (4) 21-23 (3) 23-01 (2) 01-06 (1) 06-08 (2) 08-10 (1)	22-00 (1) 00-03 (2) 03-05 (1) 00-04 (1)*
McMurdo Sound, Antarctica	*Nil*	14-17 (1)	16-18 (1) 18-22 (2) 22-00 (1)	02-04 (1)

*Predicted times of 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.

How To Use The DX Propagation Charts

1. Use Chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 call areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. An * indicates 80 Meter openings. Openings on 160 meters are likely to occur during those times when 80 meter openings are shown with a *propagation index* of (2), or higher.

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place, as follows:

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

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

4. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *standard* time is used, *not* GMT. To convert to GMT, *add* to the times shown in the appropriate Chart 8 hours in the PST Zone, 7 in the MST Zone, 6 in the CST Zone and 5 in the EST Zone. For example, 14 in Washington, D.C. is 19 GMT and 20 in Los Angeles is 04 GMT, etc.

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

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

Time Zones: CST & MST (24-Hour Time)

CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	*Nil*	14-17 (1)	05-06 (1) 06-08 (2) 08-12 (1) 12-14 (2) 14-19 (3) 19-21 (2) 21-23 (1)	19-22 (1) 22-00 (2) 00-01 (1) 21-23 (1)*
Northern Europe & European USSR	*Nil*..	14-16 (1)	04-06 (1) 06-08 (2) 08-15 (1) 15-21 (2) 21-23 (1)	19-23 (1)
Eastern Mediterranean & Middle East	*Nil*	13-15 (1)	12-16 (1) 16-18 (2) 18-20 (3) 20-22 (2) 22-00 (1) 06-08 (1)	20-23 (1)

West & Central Africa	*Nil*	09-12 (1) 12-15 (2) 15-17 (1)	13-15 (1) 15-17 (2) 17-20 (3) 20-22 (2) 22-00 (1) 04-07 (1)	19-23 (1) 22-23 (1)*
East Africa	*Nil*	11-15 (1)	14-17 (1) 17-20 (2) 20-23 (1) 05-07 (1)	19-22 (1)
South Africa	*Nil*	09-11 (1)	21-23 (1) 23-02 (2) 02-06 (1) 12-14 (1)	20-22 (1) 22-23 (2) 23-00 (1) 22-00 (1)*
Central & South Asia	*Nil*	*Nil*	16-18 (1) 18-21 (2) 21-23 (1) 04-06 (1) 06-08 (2) 08-09 (1)	*Nil*
Southeast Asia	*Nil*	19-21 (1)	04-06 (1) 06-09 (2) 09-10 (1) 20-23 (1)	*Nil*
Far East	*Nil*	19-22 (1)	06-07 (1) 07-09 (3) 09-10 (2) 20-21 (1) 21-23 (2) 23-00 (1)	03-04 (1) 04-05 (2) 06-08 (1)
South Pacific & New Zealand	17-19 (1)	12-15 (1) 15-17 (2) 17-20 (3) 20-21 (2) 21-22 (1)	16-18 (1) 18-21 (2) 21-22 (3) 22-00 (4) 00-02 (3) 02-06 (2) 06-08 (3) 08-10 (2) 10-12 (1)	22-00 (1) 00-02 (2) 02-04 (3) 04-06 (2) 06-07 (1) 00-06 (1)*
Australasia	*Nil*	13-14 (1) 14-16 (2) 16-18 (1) 18-20 (2) 20-22 (1)	21-23 (1) 23-00 (2) 00-02 (3) 02-06 (2) 06-08 (3) 08-10 (2)	00-02 (1) 02-06 (2) 06-07 (1) 03-06 (1)*
Northern & Central South America	10-14 (1) 14-16 (2) 16-17 (1)	07-08 (1) 08-10 (2) 10-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	01-04 (1) 04-05 (2) 05-06 (3) 06-08 (4) 08-10 (3) 10-15 (2) 15-17 (3) 17-21 (4) 21-23 (3) 23-01 (2)	20-22 (1) 22-03 (2) 03-05 (1) 23-02 (1)*
Brazil, Argentina, Chile & Uruguay	13-17 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-20 (2) 20-21 (1)	13-15 (1) 15-16 (2) 16-17 (3) 17-21 (4) 21-23 (3) 23-02 (2) 02-04 (1) 04-06 (2) 06-09 (1)	21-22 (1) 22-01 (2) 01-04 (1) 23-03 (1)*
McMurdo Sound Antarctica	*Nil*	14-17 (1)	16-18 (1) 18-22 (2) 22-00 (1)	02-05 (1)

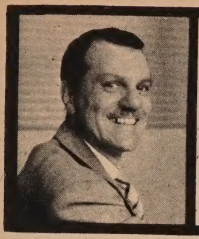
Time Zone: PST (24-Hour Time)

WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western Europe & North Africa	*Nil*	14-16 (1)	04-05 (1) 05-07 (2) 07-14 (1) 14-16 (2) 16-18 (3) 18-21 (2) 21-23 (1)	19-22 (1)
Central & Northern Europe & European USSR	*Nil*	*Nil*	04-05 (1) 05-07 (2) 07-09 (1) 07-09 (1) 12-16 (1) 16-21 (2) 21-22 (1)	19-21 (1)
Eastren Mediterranean & Middle East	*Nil*	*Nil*	16-19 (1) 19-21 (2) 21-22 (1) 05-07 (1)	*Nil*
West & Central Africa	*Nil*	09-11 (1) 11-14 (2) 14-15 (1)	14-17 (1) 17-19 (2) 19-21 (3) 21-23 (2) 23-02 (1) 06-08 (1)	20-23 (1)
East Africa	*Nil*	12-15 (1)	16-19 (1) 19-21 2() 21-22 (1)	*Nil*
South Africa	*Nil*	09-11 (1)	14-16 (1) 21-22 (1) 22-00 (2) 00-01 (1)	19-22 (1)
Central & South Asia	*Nil*	*Nil*	04-06 (1) 06-08 (2) 08-10 (1) 16-20 (1) 20-22 (2) 22-00 (1)	*Nil*
Southeast Asia	*Nil*	19-21 (1)	20-22 (1) 22-00 (2) 00-06 (1) 06-08 (2) 08-10 (1)	02-06 (1)
Far East	*Nil*	19-21 (1)	17-19 (1) 19-21 (2) 21-23 (3) 23-01 (4) 01-03 (2) 03-06 (1) 06-09 (2) 09-11 (1)	01-02 (1) 02-05 (2) 05-06 (1) 02-04 (1)*
South Pacific & New Zealand	15-19 (1)	10-12 (1) 12-16 (2) 16-20 (3) 20-22 (2) 22-23 (1)	16-18 (1) 18-20 (2) 20-00 (4) 00-02 (3) 02-07 (2) 07-09 (3) 09-10 (2) 10-12 (1)	21-22 (1) 22-00 (2) 00-05 (3) 05-06 (2) 06-07 (1) 23-01 (1)* 01-04 (2)* 04-06 (1)*
Australasia	*Nil*	12-14 (1) 14-17 (2) 17-20 (3) 20-21 (2) 21-22 (1)	19-21 (1) 21-23 (2) 23-00 (3) 00-06 (2) 06-08 (3) 08-09 (2) 09-12 (1) 12-14 (2) 14-15 (1)	23-01 (1) 01-03 (2) 03-05 (3) 05-06 (2) 06-07 (1) 01-06 (1)*
Northern & Central South America	10-14 (1) 14-16 (2) 16-18 (1)	07-10 (1) 10-12 (2) 12-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	08-10 (2) 10-13 (1) 13-15 (2) 15-17 (3) 17-21 (4) 21-23 (3) 23-01 (2) 01-03 (1) 03-06 (2) 06-08 (3)	20-22 (1) 22-03 (2) 03-05 (1) 22-03 (1)*
Brazil, Argentina, Chile & Uruguay	11-16 (1)	07-10 (1) 10-13 (2) 13-14 (3) 14-16 (4) 16-17 (3) 17-19 (2) 19-20 (1)	13-15 (1) 15-17 (2) 17-18 (3) 18-20 (4) 20-22 (3) 22-00 (2) 00-04 (1) 04-06 (2) 06-09 (1)	21-23 (1) 23-01 (2) 01-03 (1) 23-02 (1)*
McMurdo Sound, Antarctica	*Nil*	13-17	16-18 (1) 18-20 (2) 21-22 (1)	02-06 (1)

CQ Country Chart

A two color, wall-sized country chart is available on poster stock and in large type for only $1.25 per copy postpaid. Address request to: CQ DX Country Chart, CQ Magazine, 14 Vanderventer Ave., Port Washington, N.Y. 11050.



Contest Calendar

BY FRANK ANZALONE * W1WY

Calendar of Events

June 3	Minnesota QSO Party
June 2-3	RSGB National Field Day
June 1-4	CHC/FHC/HTH QSO Party
June 10-14	Mass. Cities & Towns Party
June 10-17	Mass. Amateur Radio Week
June 17	WAB VHF Phone Contest
June 23-24	ARRL Field Day
June 25-	
July 15	NRL 50th Anniversary
July 7-8	Oregon QSO Party
July 7-8	Venezuelan Contest
July 21-22	VHF Space Net Contest
July 28-29	Pan American Contest
July 28-29	YV Air Force C.W. Contest
July 28-30	Kentucky QSO Party
July 28-30	County Hunters C.W. Contest
Aug. 11-12	WAEDC C.W. Contest
Aug. 18-19	New Jersey QSO Party
Aug. 18-19	SARTG RTTY Contest
Aug. 25-26	All Asian C.W. Contest
Sept. 8-9	WAEDC Phone Contest
Sept. 29-30	Delta QSO Party
Oct. 6-7	VK/ZL/Oceania Phone
Oct. 13-14	VK/ZL/Oceania C.W.
Oct. 13-14	RSGB 21/28 mHz Phone
Oct. 20-21	RSGB 7 mHz C.W. Contest
Oct. 27-28	**CQ WW DX Phone Contest**
Nov. 3-4	RSGB 7 mHz Phone Contest
Nov. 24-25	**CQ WW DX C.W. Contest**

ARRL Field Day

Starts: 1800 GMT Saturday, June 23
Ends: 2100 GMT Sunday, June 24

This one really stirs up a lot of stateside activity and probably involves more man power than any other activity in the country. The May issue of *QST* told you all about it.

Additional information and etc. can be secured from Headquarters, 225 Main Street, Newington, Conn. 06111.

Minnesota QSO Party

Three Periods, Sunday June 3. (GMT)

Phone:
0000—0400, 0400—0800, 1600—2000.
C.W.:
0400—0800, 1200—1600, 2000—2400.

This one is sponsored by the Viking ARS. The same station may be worked on each band and each mode. In-state contacts are permitted.

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

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

There is a low power multiplier of 1.25 if power input during entire party is 250 watts or less.

Minn. stations get a bonus of 25 points per mode for every 5 Minn. counties worked.

Out-of-state stations get a bonus of 25 per mode for every 5 Minn. counties worked.

Final Score: QSO's × Multiplier × power multiplier + bonus.

Frequencies: C.W. — 3580-3590, 7080-7090, 14080-14090, 21080-21090. Phone—3980-3990, 7280-7290, 14285-14295, 21380-21390. (Avoid net frequencies)

Awards: Certificates to highest scoring station in each Section. (min. of 10 QSO's) And top scorer in each Minn. County. (Min. of 20 QSO's) Special certificate to the leading station in Minn. and out-of-state.

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

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

Mass. Cities and Towns Party

Starts: 0001 GMT Sunday, June 10
Ends: 0400 GMT Thursday, June 14

This has been organized as part of the Mass. Radio Week, but is a separate activity.

Exchange: Signal report, city or town,

* 14 Sherwood Road, Stamford, Conn. 06905

county and state.

Scoring: One point for each Mass. station worked regardless of band or mode. And a multiplier for each Mass. city or town. Final score: total different Mass. stations worked multiplied by sum of cities and towns. (Mobiles do not count as a multiplier.)

All bands may be used but a station may be worked only once. Portables and mobiles will be considered as a separate entry from each location. A station may enter as a single band or all band operation.

Awards: Separate certificates will be issued for single and all band operation to the top scorers in each state, province and country. A minimum of 25 points required for an award.

Logs must be received no later than July 31st and go to: Nina Robbins, 30 Prospect Street, Bridgewater, Mass. 02324.

Mass. Amateur Radio Week

Starts: 0001 GMT Sunday, June 10
Ends: 2400 GMT Saturday, June 16

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

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

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

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

NRL 50th Anniversary

As part of its 50th Anniversary celebration the U.S. Naval Research Laboratory is making a concentrated effort to contact as many stations as possible during the period between June 23rd and July 15th. The program of activities has been in progress since the 1st of the year, as reported in Ed Hopper's AWARDS COLUMN in the February issue, and will end on July 16th.

A commemorative QSL will be sent to all stations contacted, and a special certificate will be awarded to all those who work 5 or more NRL amateurs. They will be using the general call CQ NRL and the club station call W3NKF.

The exchange will be: QSO no., signal report, state and name.

Look for activity on the following frequencies: C.W.—1805, 3560, 7060, 14060, 21060, 28060. SSB—1820, 3860, 7230, 14260, 21360, 28560. RTTY—Usual RTTY frequencies. The above modes and frequencies will be active between 1600 to 1800 and 2100 to 2200 GMT daily.

Look for *v.h.f.* activity on Sat. and Sun. from 1400 to 2300 GMT as follows: RTTY—146.70, F.M.—146.94, A.M.—145.20 and AFSK—221.00. A 150 ft. parabolic antenna will be used for this operation.

SSTV will be active during the concentrated period, between 1600 and 2200 GMT on Sat. and Sun., on 3.845 and 14230 mHz.

There is also some E.M.E. Moon Bounce test scheduled. It is suggested you write The Naval Research Laboratory, Washington, D.C. 20390, att: H. O. Lorenzen, W3BLC for more information.

Venezuelan Contest

Starts: 0000 GMT Saturday, July 7
Ends: 2400 GMT Sunday, July 8

This is a world wide type contest (similar to the *CQ* contest) sponsored by the Radio Club Venezolano commemorating the anniversary of Venezuela's independence.

These are new rules, different from those used in previous years.

Use all bands, 10 thru 80, phone only. There are three categories, single operator, both single and all band, and multi-operator, single transmitter and multi-transmitter.

Exchange: The RS report plus a three figure contact number starting with 001.

Scoring: One point per contact, 2 points if its with a YV station. Contacts with stations in the same country are not valid.

Multiplier: One for each country, YV call area and U.S. call area worked on each band.

Final Score: Total QSO points × the sum of the multiplier from each band.

Awards: There are Trophies for the leading station in each category and for the leaders in each of the following areas: No. America, So. America, Central America, Caribbean area, Bolivarian countries, Europe, Africa, Asia and Oceania.

In addition certificates will be awarded to each station with the following totals:

Americas: Working 20 YVs and stations in 10 other countries. *Other Continents:* Working 5 YVs and stations in 5 other countries. S.w.l.s. must report at least 50 stations in the contest.

A remittance of $1.00 or its equivalent in IRC's is requested with each application.

Entries must be postmarked no later than Sept. 15th and go to: Radio Club Venezolano, P.O. Box 2285, Caracas ,Venezuela 101.

Oregon QSO Party

Starts: 0000 GMT Saturday, July 7
Ends: 2400 GMT Sunday, July 8

This is a new one organized by the Emerald ARS. In-state contacts may be made for both QSO and multiplier credit by Ore. stations. The same station may be worked only once per band regardless of the mode.

Exchange: Signal report and QTH. County for Oregon; state, province or country for all others.

Scoring: *For Oregon:* One point for W, VE, KH6, KL7 QSO's; 3 points for DX. Multiplier for each state, province and DX country worked. (Including KH6 & KL7).

For W/K and VE: 5 points for each Ore. QSO, 7 points if it's a Novice. Multiplied for each Oregon county worked.

DX Stations: 10 points for each Oregon QSO, 15 points if its a Novice. Multiplier for each Oregon county worked.

Final Score: Total QSO points times the multiplier. (max. of 36 Ore. counties).

Frequencies: CW — 1810, 3550, 7050, 14050, 21050, 28050. Phone—1810, 3900, 7250, 14280, 21400, 28600. Novice—3710, 7110, 21110, 28110.

Awards: Certificates to top scorer in each state, province, DX country and Novice in each state. Overall high score in the U.S., Canada and DX country. Oregon regulars and novices will compete for top 3 places in each county. Special award for high scorer.

Mailing deadline July 31st to: EARS Activity Chairman, WN7TDZ, 2188 East Irwin Way, Eugene, Oregon 97402. Include s.a.s.e. for results.

Space Net VHF Contest

Starts: 6:00 P.M. Saturday, July 21
Ends: 6:00 P.M. Sunday, July 22
(Your Local Time)

This is another in the series of Space Net activities commemorating Apollo moon missions. This one is for Apollo 15, first use of the lunar roving vehicle to transport astronauts over the Moon's surface, and first live TV coverage of LM lift off from the Moon.

Use any of the v.h.f. bands, 50, 144, 220 and 432 mHz. (But no repeaters)

Exchange: RS(T), and Zip Code number. Non-US use P.O. name.

1972 VK/ZL/O Contest Results
North America

C.W.		Phone	
W1EVT	8778	W2FCR	4900
W2LWI	6006	W3TV	5184
W8CQN/2	2325	W3QDR	125
W3TV	2832	W4WSF	14850
W3QOR	184	W5SBX	5940
K4RDU	882	K5LVZ	360
W4HOS	492	W6OXS	1598
W4JUK	130	W7SFA	22140
W5OB	1650	WA7PAB	1777
W6TZD	7100	K8VIR	1254
WA6JVD	6208	W8FJS	156
W6OXS	2200	HP1JC	480
K6RU	1092	XE1LLS	2794
W7IR	15980	XE2LLX	168
HP1AC	224	KL7HDX	252
HR1AT	880	VE7VP	6237
VE7HQ	714	VE6MP	2850
VE3CDK	25	VE3SLC	885
		VE6AYU	50

Scoring: Two points per QSO on each band. Multiplier is sum of different Zip Code areas worked. (Counted once only) There is also a bonus of 10 you add to your multiplier.

Final Score: Zip Code + 10 × QSO points. Same station may be worked on each band for QSO points but multiplier is counted once.

Awards: To 1st and 2nd place winners in three classes based on power used. 1-25, 25-100 and over 100 watts input. There are also awards for multi-operator stations, club participation and Novices. All stations submitting a log will receive attractive certificate.

Logs and request for additional information go to: Space Net VHF Contest, Att: A. W. Slapkowski, WB2MTU, Box 909 Sicklerville, N.J. 08081. Deadline August 18th.

Editor's Notes

Conditions for the WPX Contest back in March were pretty horrible. W3ASK had predicted normal for Saturday and below normal for Sunday. However they were disturbed and well below normal on both days. George had updated his forecast on the Dial-A-Prop supplement so we knew what we were going to be up against. In case you haven't heard about it, just dial 516-883-6223 for the very latest propagation forecast. W3ASK updates it weekly and the tape is renewed each Monday.

I am sure that a lot of the fellows gave it a try but turned their attention to other things when they found conditions so poor. I hope you will send us your log, no matter how small. Especially you fellows in areas where you were probably the only active station. It is vital in our program of checking the claims of stations who are in competition for higher honors. 73 for now, Frank W1WY

The most powerful signals under the sun!

hy-gain

Redesigned HAMCAT

Out-hustles them all!

The famous HAMCAT...now redesigned for greater performance...*equals* or *exceeds* the performance of any other Amateur Mobile antenna. *We guarantee it!* And you need buy only one mast...whether you mount it on fender, deck or bumper. There's just one set of coils and tip rods...and they all stand up to maximum legal power. That's performance, that's value...*THAT'S HY-GAIN!*

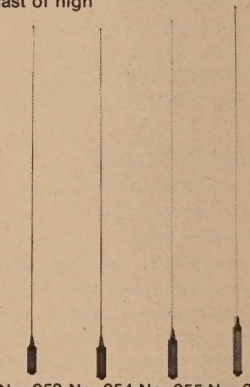
Original Hy-Q "quick changer" coils wound on tough fiberglass coil forms for greater heat resistance, less RF absorption / Fiberglass shielded coils can't burn up, impervious to weather / Shake-proof, rattle-proof, positive lock hinge now even stronger...eliminates radio noise / All stainless steel tip rods won't bend or break / Full 5' mast gives you 10% more radiating area than the competition / Rugged swivel-lock stainless steel base for quick band changes, easy garaging.

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Order No. 257 All new design 5' long heavy duty mast of high strength heavy wall tubing **$16.95**
Order No. 252 75 meter mobile coil **$19.95**
Order No. 256 40 meter mobile coil **$17.95**
Order No. 255 20 meter mobile coil **$15.95**
Order No. 254 15 meter mobile coil **$12.95**
Order No. 253 10 meter mobile coil **$10.95**
Order No. 499 Flush body mount **$ 6.50**

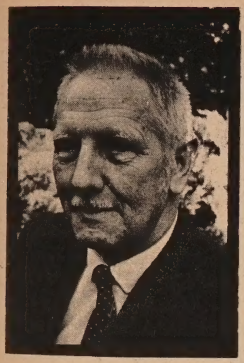








HY-GAIN ELECTRONICS CORPORATION
P.O. Box 5407-FE Lincoln, Nebraska 68505



THE awards PROGRAM

BY ED HOPPER,* W2GT

Special Honor Roll
All Counties

#96—Andy Draeger, SH-W5-109, 2-10-73. (ex.WPE9ETT #2 to s.w.l.).
#97—Leroy M. Friestad, WA9OFF, 2-23-73.
#98—Myron L. Braun, K8IQB, 3-8-73.

THE "Story of The Month" for June is:

Arthur R. Dority, Sr., K1OAZ

(All Counties #81, 7-27-72)

Art was born February 17, 1929 in Camden, Maine where he attended grade school. After two years of high school, he left for two years in the Navy, 1946-1948.

He returned to Camden in January of 1948 and married his local sweetheart in July 1948. They are proud and happy to have five girls, one boy and three grandchildren.

After working for his Dad in a woolen mill for a couple of years, Art decided he did not like the work and turned instead to driving a tractor trailer. He worked as driver, dozer operator and mechanic until moving to Connecticut in 1967 as foreman for a local glass firm. In October 1969, poor health forced him to retire.

In early 1959 a Novice ticket was obtained and four months later a Conditional. He was very active with traffic handling and rag chewing on phone, c.w. and RTTY until about 1964. Art was one of the last die-hard a.m. men and went off the air in 1964 and stayed off until early 1967 when he put together an HW-12, his first s.s.b. rig. Presently the equipment includes an HW-101 driving a home-brew final and a Mosley Classic 33 up 70 feet.

In October of 1970, while tuning around 14 mHz, he ran into the ICHN with Arnie, K9DCJ running Counties and he followed Arnie all afternoon. Later that week, Art again checked into the Net., for something to do, and got the bug, and the rest is history.

In the past, Art has spent many hours as Net. control and has driven many thousands of miles mobiling. He got back from a cross country trip in September and has been off the air much of the time since. But Art hopes to be back on the Net on a daily basis by the time you read this.

Art waited until April 1971 to apply for USA-CA-500, 1000, and 1500. Then in April 1972 he applied for USA-CA-2000, 2500 and 3000. June 27, 1972 he applied for All Counties #81, endorsed All A3A. No photograph arrived by my deadline, so we will have to do without it until Art tries SSTV, Hi . . .

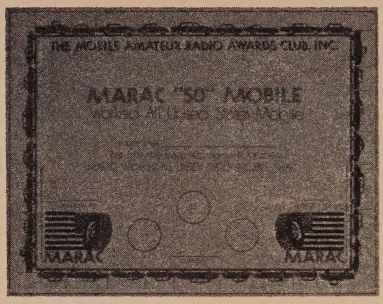
* P.O. Box 73, Rochelle Park, N.J. 07662

USA-CA HONOR ROLL

3000		1500		500	
W3LDD	118	WAØYJL	215	WAØYJL	925
WA9OFF	119	WA9OFF	216	WA9OFF	926
K8IQB	120	K4KZP	217	K4KZP	927
2500		SM6DHU	218	SM6DHU	928
WA9OFF	150			WB2NHP	929
K8IQB	151	**1000**		OE3RE	930
2000		WAØYJL	291		
WAØYJL	175	WA5EEM	292		
WA9OFF	176	WA9OFF	293		
K8IQB	177	K4KZP	294		
		SM6DHU	295		



MARAC Associate Membership Award



MARAC M-50-Award.

Awards Issued

Three is sure a lucky number, once again 3 new *All Counties*.

Andy Draeger, ex-WPE9ETT (now living in Mountain Home, Ark.) made #2 to an s.w.l. He has been working on it since the early 1960s.

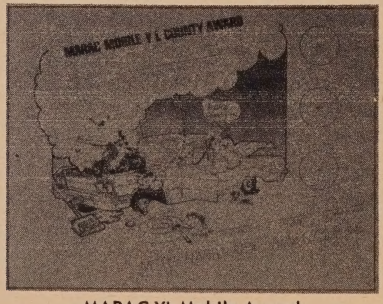
Lee Friestad, WA9OFF waited until he had them *all* and got #97 endorsed *All S.S.B.*

Lou Braun, K81QB, who also has been working at it on and off since the early 1960s, made #98. He also raised his endorsements of USA-CA-500 to All S.S.B., All 7, All 14, All 75, All Mobiles. USA-CA-1000 to All S.S.B., All 14, All Mobiles. USA-CA-1500 to All S.S.B., All Mobiles. USACA-2000 and 2500 to All S.S.B.

Walter Carr, W3LDD added All A-3 endorsements to his 2500 Award and made 3000 Mixed.

Tom Storm, WAØYJL took time to do all the paper work and received USA-CA-500, 1000 and 1500 All 14, S.S.B., All Mobiles. Also 2000 Mixed.

Bill Barr, K4KZP was issued USA-CA-500 and 1000 endorsed All 14, All S.S.B., All Mobiles. And USA-CA-1500 endorsed All S.S.B., All Mobiles.



MARAC YL Mobile Award.

Matt Alfredson, SM6DHU applied for USA-CA-500 and 1000 endorsed All 14, All S.S.B., All Mobiles. Also USA-CA-1500 Mixed.

Damon Ginbey, WA5EEM added USA-CA-1000 endorsed All A-1 to his collection.

Jimmie Freeman, WB2NHP won USA-CA-500 All S.S.B.

Dr. Amery Rath, OE3RE collected USA-CA-500 mostly on A-1. Be careful, he is Judge in his district.

Letters

Ray E. Meyers, W6MLZ writes: "In *CQ* for Feb. '73, page 80, the item on Naval Research Laboratory Certificates/QSL states—Fred Schnell, 1MD of the ARRL Hqts. as the *Fleet Radio Officer*. This is somewhat incorrect—Fred was a Lieutenant at the time and involved with the Amateur station NRRL. Comdr. (now Captain) Wilbur J. Ruble, USN (Ret.) was Fleet Radio Officer on Admiral S. S. Robinson's staff as CinCUS, the last one to be in Command of the Combined Fleets and I happened to be Red Ruble's assistant as Chief Radioman on the staff and looked out for the Flag radio personnel in the receiving room. Frank Hall, Chief Warrant Officer was in charge of the transmitting room, Frank died at Pearl Harbor and his XYL is presently living in Long Beach. Anyone who was aboard the *Seattle* at the time will remember me as "Heinie Meyers". The Flag also had its own MHF xmtr and rx and we kept regular skeds with NSS, NPL and NBA on Navy frequencies. Fred's station NRRL operated on the amateur bands".

Awards

OZ Cross Country Award: The OZ-CCA was instituted in 1952 and on the occasion of EDR's 25 year Jubilee a new certificate with the same name is being offered. Unfortunately the rules are a bit long, and although someone committed me to list the rules, I have previous commitments and thus the rules will be printed later. If you can not wait, send s.a.e. and IRC for data to EDRs Traffic Department, Box 335—DK 9100—Aalborg, Denmark. Oh, yes, naturally the Award is for working OZ stations after April 1, 1970.

Mobile Amateur Radio Awards Club Inc. Awards Program: Have promised for a long time to list their full Awards Program and am finally going to keep my promise. If I run out of space, see it next month.

Special Notes:

Awards: Send all applications or inquiries on **Awards** to: Jack Scroggin, WØSJE, 602 Jefferson, Lee's Summit, MO. 64063. Also **Newsletter** Information should be sent to Jack.

Membership Application And Dues: To Bob Dyson, KØAYO, 5142 Nall, Shawnee Mission, Kansas 66202. Bob is also Custodian of the Club Station, WBØDPD.

Information: Information on nets., addresses, net controlling, mobile operations, county hunting in general, etc. Legal size s.a.s.e. with 24c postage to: Bertha Eggert, WA4-BMC, P.O. Box 6811, Southboro Station, West Palm Beach, Florida 33405.

Award Points: Club station can be counted for 5 points, Charter members (including W2GT-C-81 can be counted as 3 points, Regular members count 2 points, Associate members 1 point toward the Associate Award.

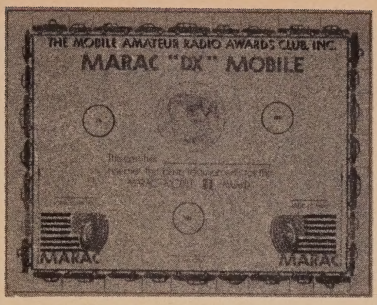
Regular Members: Regular members of MARAC are issued billfold size membership cards. They may use the letters MARAC R followed by their issued number on their QSL cards.

Associate Award: Issued to any radio amateur (s.w.l. on heard basis) for working Charter, Regular or Associate members for a total of 100 points. Red seal and ribbons for 250, blue seal and ribbons for 500, gold seal and ribbons for 1000. Fee $1.00.

M-50-M Award: Issued any amateur (s.w.l. on heard basis). Work mobiles in all 50 States, from fixed, mobile, portable or combination of such. Original Award for 48 states, red seal and ribbons for 49, blue seal and ribbons for 50. Gold seal and ribbons for working all States mobile to mobile. Fee $1.00.

YL Mobile Award: Issued any amateur (s.w.l. on heard basis). Work 5 or more YLs or XYLs, or combination of such while they are operating mobile in a total of 50 different counties. They may be worked from mobile, fixed, portable or combination of such. Red seal and ribbons for 100 counties, blue seal and ribbons for 200, gold seal and ribbons for 500. MARAC Plaque for 1000. Fee $1.00. List alphabetically by States and Counties.

MARAC DX Mobile Award: Issued for working 25 DX countries while operating mobile. Red seal and ribbons for 50 DX countries, blue seal and ribbons for 75, gold



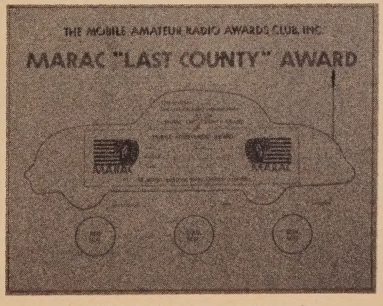
MARAC DX Mobile Award.

seal and ribbons and MARAC Plaque for 100. Fee $1.00, Plaque compliments of MARAC. Current ARRL countries list honored. Contacts will be accepted while DX station is operating fixed, portable or mobile. Mobiles working for this Award may be operating from any location or with any assigned call. Aeronautical or maritime mobiles should be within the territorial limit of any country given.

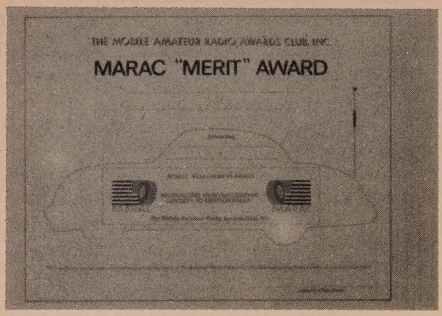
MARAC Last County Award: (1st Category) Basic award issued to any station giving last county to fiinish a particular State. Red seal and ribbons for 2nd time, blue seal and ribbons for 3rd time, gold seal and ribbons for 4th time. Same county and State may be given in each instance. Send application and mobile reply card signed by

MARAC Last County Award: (2nd Category) Basic Award with all seals and ribbons plus MARAC Mobile Plaque issued any station giving last county to finish *all States*. Application with mobile reply card signed by recipient for verification. Fee $6.00. As an expression of gratitude, recipient should apply for the Award and Plaque for the station. MARAC awards date does not apply.

MARAC Merit Award: This award with gold



MARAC Last County Award.



MARAC Merit Award.

seal issued free to any amateur upon recommendation of any MARAC member. If in your opinion any amateur has contributed some outstanding service to amateur radio, write to Awards Chairman, stating facts. The information will be presented to MARAC Executive Board for action. This award also issued free each year to 1st and 2nd runners-up for "Best Net Control" and "Best Mobile" of the year.

MARAC Mobile Award: Category 1—issued to any mobile, including air mobile, for giving out at least one county in each of 15 States, blue seal for 35, gold seal for 45 States. MARAC Plaque for giving out 48 States. MARAC Plaque for 49th State. MARAC Plaque for 50th State.

Category 2—issued any station, fixed, portable, mobile or combination of such, for working the same mobile in 15 States. Red seal for 25 States, blue seal for 35 States, gold seal for 45 States. MARAC Plaque for 48th State. MARAC Plaque for 49th State. MARAC Plaque for 50th State.

Category 3—issued to any mobile, including air mobile, for giving out 100 different counties. Red seal for 250 different counties, blue seal for 500 different counties. Gold seal for 1000 different counties. MARAC Plaque for 1500 counties. MARAC Plaque for 2000 different counties. MARAC Plaque for 2500 different counties. MARAC Plaque for 3000 different counties. A special MARAC Plaque for All 3077 (now cut to 3076).



MARAC Mobile Award.

Category 4—issued to any station, fixed, portable, mobile, or any combination of such, for working same mobile in 100 different counties. Red seal for 250 different counties, blue seal for 500 different counties, gold seal for 1000 different counties. MARAC Plaque for 1500 different counties. MARAC Plaque for 2000 different counties. MARAC Plaque for 2500 different counties. MARAC Plaque for 3000 different counties. A special MARAC Plaque for All 3077 (now 3076).

Send log data, alphabetically by States and counties, certified by two amateurs or club official for *All* awards. Basic $1.00, seals and ribbons for s.a.s.e. *Plaque Free*, unless otherwise stated. No fee to handicapped. Only contacts after January 1, 1969 will count for MARAC Awards unless otherwise stated. More about MARAC Plaques, County Hunter Contest Award and Cliff Corne, Jr., K9-EAB Memorial Award next month.

Notes

Remember *ICHN-1973* at Fort Wayne, Indiana, July 6-7, if you do not yet have full data write: Bill Nash, W9MNE, 215 West Washington Blvd., Fort Wayne, Indiana 46802.

Hope you had fun in the 2nd Annual County Hunters SSB Contest in April. Due to illness of WAØZCQ, all contest returns should go to: KØARS.

May I again remind U.S. Stations that the ARRL QSL Bureaus do *NOT* forward QSLs from U.S. stations to other U.S. Stations. Two QSL Bureaus/Agencies have been formed to help with County Hunter QSLs. For full data write WA2AEA or W6CCM. And for you fellows who have moved around so much—the Bureaus/Agencies are having a lot of QSLs returned, *Not* forwarded—please advise W6CCM & WA2AEA of your new QTH—Thanks.

George, WB6IFA/VE6 has spent a lot of time on a big big project which got so big that it will have to be cut down a bit. It is a booklet with *all kinds* of data for County Hunters and will be handled through Jim Hoffman, K1ZFQ, 42 Gresham St., Milford,

[*Continued on page 74*]

SURPLUS sidelights

BY GORDON ELIOT WHITE*

I AM often asked how does one bid on surplus? Obviously there are millions of R-390-A receiveds, late model f.m. units, and like-new Army jeeps being sold by Uncle Sam to somebody. How do I get in on this good deal?

Well, here is *CQ's* primer on buying surplus:

First, write to the Defense Surplus Sales Agency, Box 1370, Battle Creek, Michigan, and ask them to send you an application for bidders. DSS is part of the Defense Property Disposal Service, and it is located in Michigan because it uses some of the same computers that the Civil Defense people set up in the late 1950's when we were all going to build atomic bomb shelters and Civil Defense was a big thing.

They will send you a complicated IBM card on which you may indicate what classes of surplus you are interested in, and where you want to buy it.

I find it impractical to bid on goodies in depots located outside of reasonable driving range unless they are very rare and interesting items, or I have a friend in that area who will inspect them and pick them up if I buy them. Having spent an unreasonable number of hours driving a couple of hundred miles to get questionable items from Defense Depots, I think it is well to consider very carefully before you bid on something you have never seen, five hundred miles away.

In addition to getting on the DPDS list, you may want to contact the local General Services Administration office and ask to be put on their list. GSA sells excess from the civilian agencies, and it is a distinctly different operation from Pentagon surplus.

Both GSA and DPDS use sealed bidding procedures. They mail out catalogs which describe the material briefly. They also send bid sheets upon which you can enter the amount you want to bid. DPDS generally requires a 20 percent deposit. GSA generally requires no deposit.

In addition, both agencies use "local" bidding, or "spot" bids. These require the bidder to drop his bid in a box at the sale site, or go to the sale itself and hand in his bid in person. These are generally different lists than sealed bidding, and require a separate application in each local area.

The local bid offerings are often more interesting to amateurs because by their nature they eliminate some of the competition from major dealers located hundreds of miles away. In addition, they are generally set up in small lots which you or I can handle, not in 100,000 pound heaps which require semi-trailers to haul away.

The procedure in bidding is to go and look at anything that looks interesting in the catlog. Inspect it very carefully, alert to possibly important items that might be missing such as the permeability tuned oscillator from the R-390-A, as an example. After all, if the military is dumping it there may be a reason.

The amount you bid must be arrived at on your own. There are no rules except what you want to pay. The Government has some level below which it will not sell some things, but this is pretty much a guess on the government's part except on such things as scrap metal or typewriters upon which there may be a more or less logical value level established. On a mixed lot of 500 pounds of scrap electronics, who can say?

Generally it is more sophisticated to bid $1.02 than $1, say, for an item. You might win by 2¢ over someone who bid a round figure.

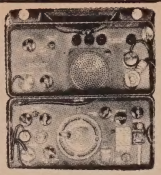
Assuming that you win a bid, it is important to get the item as quickly as possible. Unfortunately people occasionally swipe things from the depots, and it has happened that a careless depot employee has loaded my lot of goodies on someone else's truck by mistake.

If you are the trusting type and bid sight-unseen on something you may be in for an unpleasant surprise. Almost everything is described as "used, fair, repairs required." Occasionally this means the depot people didnt' know if the thing needed repairs, but guessed it might when it was really in first-class condition under a layer of dirt.

However, whatever it is may well need "repairs," including straightening the frame where a tank ran over it. You can't tell for sure unless you look. If you guess and everyone else looks, your bid will undoubtedly be the winning one, to your sorrow.

If you do buy something in a distant depot,

* 1502 Stonewall Rd., Alexandria, Va. 22302



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1.5 to 18 mHz in 4 Bands, AM, CW and MCW, continuous tuning & 10 pre-set frequency, 200 kHz crystal calibrator, 4" P.M. speaker, 12 tubes, with power supply for 115V. 50/60 cyc., 6, 12, or 24V. DC - Also dry cells 90 & 1.5 VDC. Size: 13½ x 18½ x 12½". Shpg. Wt.: 75 lbs. USED, reparable: **$49.50.** CHECKED: **$59.50.** Power Plug: **$2.00.** Manual: **$7.50**

R - 392 RECEIVER -- 500 kHz to 32 mHz, 32 Bands, 25 Tubes, 24/28 VDC. Size: 11½ x 14 x 11"; 70 lbs. USED, reparable: **$295.** CHECKED: **$350.** Manual: **$8.50.**

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$15/case 5 pkg.
Cut to size $5
1000 blanks.....

302Y Passaic Ave., Stirling, NJ 07980

you will probably have to hire an agent to pack and ship it for you. Truck lines will not pick up unpacked items. Movers might, but they charge quite a bit for the service. The depots will not pack most items, so the best solution is to pick up your goodies yourself.

Be certain that you bid only on things you want. Throwing in low bids on 15 lots to "be sure" of getting one is a likely route to disaster. You might get all 15. You can't just take the one you want, you'd have to take everything, and figure how to get it home and what the XYL will say when you appear with 15 six foot equipment racks. . . .

Finally, forget those acres of R-390-A's and like-new jeeps. This is 1973, not 1946. There are no surplus jeeps except piles of junk that the Israeli Army probably couldn't make run. There are very few R390-A receivers either. There is a lot of pretty junky equipment that the taxpayers paid a lot of money for and which the government spent a lot of highly-paid federal workers' time turning into scrap.

But there are some sows' ears which will make interesting additions to your junk box, and maybe even a goodie or two. Lots of luck. ■

Awards [*from page 72*]

Conn. 06460. As you know, Jim publishes the *CW County Hunters Newsletter*. If you are interested, drop a card to Jim, they would like some idea about how many to print. It will sell for about $1.50.

County Hunting growing so *BIG*, I'm having a time keeping up with the mail, but I will! So write and tell me, How was your month? 73, Ed., W2GT

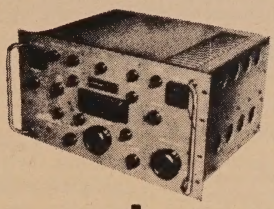
DX [*from page 60*]

WB6CV—Via WA6AHF
WB4LDK/KB6—Via WA6AHF
KJ6CW—Via WB6QAS
MP4TEE—Via G3LQP
OK5BOB—Via OK2BOB
OM0BOB—Via OK2BOB
OX5BA—Via WA6AHF
PJ8DX—Via K2FJ
PS0WH—Via W3DJZ
PV0WH—Via W3DJZ
WA9VYR/TF—Via W9MKZ
TU2DO—Via WA2DHF
TU2DV—Via WA6NFC
TY5ABK—Via W8CNL
VK0WW—Via VK3FF
VP2GNE—Via W4YNB
VP2MY—Via W1IXL
VP2VAN—Via K2FJ
VP5LD—Via WA1HAA
WA1RHD/VQ9—Via W4WFL
VR1PA—Via WA6HF
VS6AW—Via WB6ZUC
ZK1CD—Via ZL2FA
1S1A—Via W1YRC
3B8DA—Via K6KII
4C4AA—Via W2GHK
6Y5EE—Via VE3EDC
9J2BL—Via SM6CKU
9L1VW—Via K9QZI
9X5NA—Via W7LFA
YV4AGP and 4M4AGP—Via W0YVA/4 P. O. Box 6226, Shirlington Sta., Arlington, VA 22206
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TY0ABD
TZ2AB
TZ2AC
ZD3N
DJ6QT/5T5
DJ6QT/5U7
5V8WS

73, Jerry, WA6GLD

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WILL BUY FOR CASH ALL TYPES



WILL BUY FOR CASH ALL TYPES

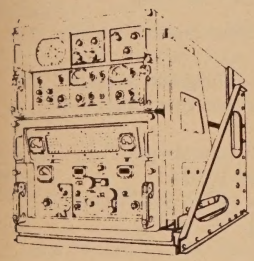
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- SEMICONDUCTORS
- Military Electronic Equipment
- Test Equipment

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Send for FREE Literature

Touch-Tone Pads [*from page 35*]

r.m.s. (two-tone) gives reliable autopatch operation.

Mechanically the pad is mounted in a 4×4×2 inch Minibox and plugs into the microphone connector of the Dispatcher. The microphone, in turn, plugs into the pad box. Use a Motorola part number 28-16370 to plug into the Dispatcher and a Motorola socket, part number 9-16345 mounted on the pad box. While these connectors are almost the same as the Amphenol 91-MC4 series, the Motorola parts have the number 1 pin opposite the keyway; the Amphenol parts rotate the keyway 22½ degrees from the number 1 pin so the two types of connectors are not directly interchangeable.

The photos show an overall view of the pad assembly with a microphone, and the inside of the pad assembly with the back cover removed.

In the preceding material we have described telephone pads and explained how they function and why they work the way they do. We have concluded with several ideas for measuring touch tone frequencies and given a simple basic circuit for using pads. Let's hear those golden tones ring out! ■

Math's Notes [*from page 44*]

Raytheon, Special Microwave Devices Operation,
130 Second Ave., Waltham, Mass. 02154
Signetics, 811 E. Arques Ave., Sunnyvale, Calif. 94086
Siliconix, Inc., 2201 Laurelwood Rd., Santa Clara, Calif. 95054
Solid State Devices, 12741 Los Nietos, Santa Fe Springs, Cal. 96070
Solitron Devices, 1440 W. Indiantown Rd., Jupiter, Fla. 33458
TRW, 14520 Aviation Blvd., Lawndale, Calif. 90260
Teledyne Semiconductors, 1300 Terra Bella Ave., Mountain View, Cal. 94040
Texas Instruments, Inc., P.O. Box 5016, Dallas, Texas. 75222
Toshiba America Inc., 200 Park Ave., Rm. 1609, New York, N.Y. 10017

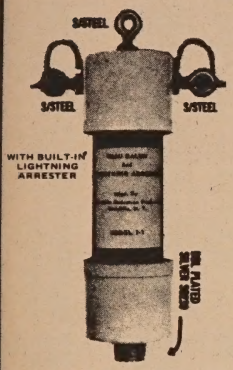
Oscar-6 News [*from page 51*]

Late operational news concerning the satellite and orbital data also can be obtained from the AMSAT Hotline; Area Code 301-654-

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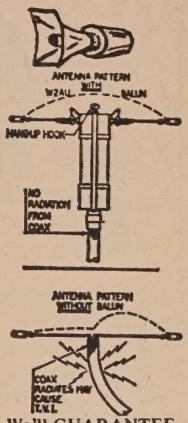
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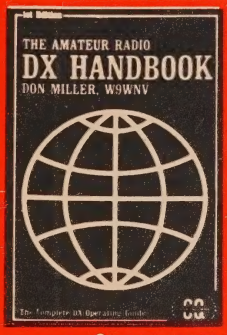
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Sundays	1900 GMT	21280 kHz
Tuesdays	0100 GMT	3855 kHz

South-North Orbit No.	Date	Time (GMT)	Long. of Equatorial Crossing (°W)
2860	June 1	0154	75.9
2872	2	0054	60.9
2885	3	0149	74.6
2897	4	0049	59.6
2935	7	0139	72.1
2947	8	0039	57.1
2960	9	0133	70.8
2972	10	0033	55.8
2985	11	0128	69.5
3022	14	0023	53.2
3035	15	0118	66.9
3047	16	0018	51.9
3060	17	0113	65.6
3072	18	0013	50.6
3110	21	0103	63.1
3122	22	0003	48.1
3135	23	0057	61.8
3148	24	0153	75.5
3160	25	0052	60.5
3198	28	0142	73.0
3210	29	0042	57.9



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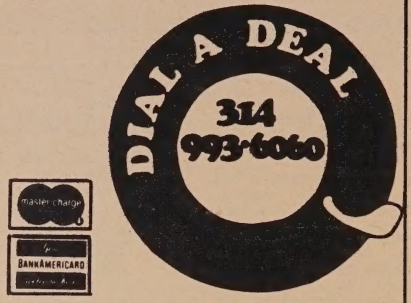
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South-North Orbit No.	Date	Time (GMT)	Long. of Equatorial Crossing (°W)
3223	30	0137	71.7
3235	July 1	0037	56.6
3248	2	0132	70.4
3285	5	0027	54.1
3298	6	0122	67.8
3310	7	0022	52.8
3323	8	0116	66.5
3335	9	0016	51.5
3373	12	0106	64.0
3385	13	0006	48.9
3398	14	0101	62.7
3410	15	0001	47.7
3423	16	0056	61.4
3461	19	0146	73.8
3473	20	0046	58.8
3486	21	0141	72.5
3498	22	0040	57.5
3511	23	0135	71.3
3548	26	0030	55.0
3561	27	0125	68.7
3573	28	0025	53.7
3586	29	0120	67.4
3598	30	0020	52.4
3636	Aug. 2	0110	64.8
3648	3	0010	49.8
3661	4	0150	63.6
3673	5	0005	48.5
3686	6	0059	62.3
3724	9	0149	74.7
3736	10	0049	59.7
3749	11	0144	73.4
3761	12	0044	58.4
3774	13	0139	72.1
3811	16	0034	55.8
3824	17	0129	69.6
3836	18	0029	54.6
3849	19	0123	68.3
3861	20	0023	53.3
3899	23	0113	65.7
3911	24	0013	50.7
3924	25	0108	64.4
3936	26	0008	49.4
3949	27	0103	63.2
3987	30	0153	75.6
3999	31	0053	60.6
4012	Sept. 1	0148	74.3
4024	2	0048	59.3
4037	3	0142	73.0
4074	6	0037	56.7
4087	7	0132	70.5
4099	8	0032	55.4
4112	9	0127	69.2
4124	10	0027	54.2
4162	13	0117	66.6
4174	14	0017	51.6
4187	15	0112	65.3
4199	16	0012	50.3
4212	17	0106	64.0
4249	20	0001	47.7
4262	21	0056	61.5
4275	22	0151	75.2
4287	23	0051	60.2
4300	24	0146	73.9
4337	27	0041	57.6
4350	28	0136	71.3
4362	29	0036	56.3
4375	30	0131	70.1

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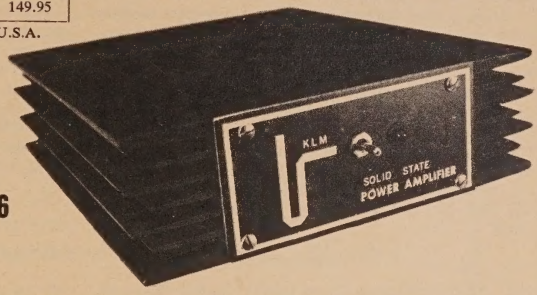
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	PA2-70B	1-4	70	149.95
	PA10-140B	5-15	140	179.95
	PA2-140B	1-4	140	199.95
220	PA10-60F	5-15	60	139.95
440	PA5-25C	4-8	25	129.95
	PA2-30C	1-4	30	149.95

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SSTV [*from page 41*]

arms hold the tape in position, you bring the lever down and a diagonal blade cuts the ends off the tape. Next you pull a little splicing tape up from the base and press it down on the butted tape ends. You then shift the button on the large lever, and bring it down again. This time it trims the splicing tape off. I found mine at Radio Shack.

Vy 73, Cop

Letters [*from page 8*]

10 Meter Intruders

Editor, *CQ*:

I read with much interest Zero Bias in the March, 1973 issue of *CQ*.

I am a firm believer of everyone playing by the rules and regulations without having to be made to do so. I also realize it doesn't work that way and have no solution to that end of the matter.

I wonder, however, if ten meters were opened to the Technician class licensee on a limited or trail basis for c.w. practice, RTTY and possibly SSTV is it would not discourage the goings on that you describe. It may be worth a try, who knows.

After all, good or bad, no sides taken, look what CB did for the apparently abandoned 11-meter band.

Wm. B. Thornton, WA4RID
Springfield, Kentucky

P.S. After rereading, I had better qualify that last paragraph. I wasn't speaking of the unregulated chaos created but was referring to the interest and participation developed, especially in the early years of CB, before a lot of honest and conscientious license holders dropped out.

Editor, *CQ*:

Enjoy your editorials very much, needless to say am in full agreement with March '73 *CQ*. But why let Barry advertise two transmitters on page 90 (same issue) showing they cover 11 meters? Who needs it? Hams?

Also, why don't you and other magazines make a big point of saying, "CB is not a hobby." Many parents are letting their kids get on CB just like they buy their child a new bike, etc. They don't know its illegal. I have a 13-year-old son. In his school its the "in" thing to get on CB. Sad to say again, most of these kids don't even know its illegal. Why not advertise that fact?

Anyway good luck. Keep up the good work and try to hold down the 2-meter ads. Can't even find an ad for an h.f. transmitter in the whole magazine. Looks like h.f. has fallen by the wayside and been replaced by 2 meters!

Ben Piller, K9CSM
Monee, Illinois

Novice VFO

Editor, *CQ*:

Although Mr. Weeks' article on converting the ARC-5 or BC-457 [Feb. p. 22] was interesting, it appears to me that in the process he has totally destroyed a good transmitter and spent too much money on his highly overcomplicated conversion.

The surplus conversion manual has an even simpler conversion, and I think I have a conversion that is even better than either one for it uses only one capacitor, and can easily be restored for operation as a full power Novice transmitter.

Since the v.f.o. section of the set already is made to run Class C final tubes, I inserted a 10mmf trimmer from pin 3 of the 1625 stages to an RCA-type jack mounted in the hole where the final trimmer capacitor is adjusted. All the filaments are wired in parallel for 12 v.a.c. operation. B+ can be taken from the transmitter, since it can be from 90-400 v.d.c. The trimmer is then adjusted to where it only drives the transmitter with enough signal. There is no need to use the 1625's, so they can be removed and saved. When operation as a transmitter is desired, simply tune the trimmer to minimum capacitance, plug in the 1625's and run 400-750 v.d.c. on the finals, 200-300 v.d.c. to the osc. One thing to note – the relays should be shorted out, and R71 can be removed when the heaters are run in parallel. Since most transmitters have frequency multipliers in them, the 80 m. v.f.o. is all that is necessary.

Hope I can be of help to some Novices who just don't want to hurt their Command Sets while using them as v.f.o.'s.

Marc Berger, WN6POA
Santa Ana, California

PLEASE USE YOUR ZIP CODE

Announcements [*from page 10*]

east of Akron, 1 mile west of Suffield, Ohio on County Rd. 87 near Ohio Rt. 43. Entertainment, swap & shop, prizes, refreshments, displays, flea market. $2 per family, $2.50 at gate. For info: Floyd Gilbert, 1976 Newdale Ave., Akron, OH 44320.

Granite City, Illinois

The Egyptian Radio Club Inc. will hold its annual Ham-Picnic Sunday, June 24, at the club grounds, 700 Chouteau Slough Rd., Granite City, Illinois. Prizes, games, food, parking for swaps, etc. For info: Everett (Andy) Anderson, K9KXP, 1712 No. Keebler St., Collinsville, IL 62234.

Huntington, West Virginia

The Tri-State A.R. Assn. will hold its 11th Annual Hamfest at Camden Park, Rt. 60 West, Huntington, West Virginia, on June 3 from 11:30 a.m. to 4:30 p.m. All amateurs, associates, XYL's and YL's. For info: Steve Norris, WN8NCL, P.O. Box 1295, Huntington, West Virginia 25715.

Salina, Kansas

The Central Kansas Amateur Radio Club, Inc., will hold their Annual Hamfest, Sunday, June 3, at the 4-H Complex, Kenwood Park, Salina, Kansas. Dinner on Saturday and covered-dish lunch. Registration starts Sunday at 9 a.m. For info: William R. Peck, WNØDEQ, 1028 West Ash, Salina, Kansa.

Old Westbury, New York

The Long Island Mobile Amateur Radio Club (LIMARC) will conduct its annual flea market of amateur radio, hi-fi and electronic equip. at the New York Institute of Technology, Rt. 25A and Whit-

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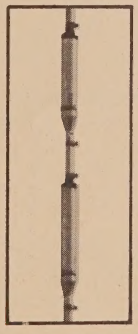
80 through 10 meters

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Pack some punch! All the omnidirectional performance of Hy-Gain's famous 14AVQ/WB...plus 80 meter capability! Unrivaled performance, rugged extra heavy duty construction, and the price you want...all in one powerful package!

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- Constructed of extra heavy wall high tensile aluminum.
- Hot performance all the way across the band with just one setting (10 through 40).
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- Maximum legal power with low frequency drift.
- Exceedingly low radiation angle makes DX and long haul contacts a cinch...whether roof or ground mounted.
- Very low RF absorption from insulating materials.



The 18AVT/WB is constructed of extra heavy duty, taper swaged, seamless aircraft aluminum with full circumference, corrosion resistant compression clamps at all tubing joints. This antenna is so rigid, so rugged...that its full 25′ height may be mounted using only a 12″ double grip mast bracket...no guy wires, no extra support...the 18AVT/WB just stands up and dishes it out!

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ney Lane, Old Westbury on Sunday, June 3rd from 12 noon to 6 p.m. Admission $1.00 for buyers and $2 for sellers. Call in on WA2PDJ 25/85 or 52 and 94 simplex. Refreshments available.

Des Moines, Iowa

The Des Moines Radio Amateur Association will hold the annual Des Moines Hawkeye Hamfest on Sunday, June 17 from 8 a.m. to 6 p.m. CDST in the Teen Town Arena of the Iowa State Fairgrounds. Free parking, refreshments, flea market. Registration $1.50, $2 at gate. Write: Des Moines Radio Amateur Association, P.O. Box 88, Des Moines, IA

Winfield, Pennsylvania

The Tenth Annual Penn-Central Hamfest will be held by the Williamsport and Milton clubs on Sunday, June 3rd at 12 noon at the Union Township Volunteer Fire Co. grounds on Rt. 15 in Winfield. Contest, auction, and flea market. Registration $3, XYL and children free. For info: Clair Yeagle, WA3QXI, 714 N. Main, Watsontown, PA or call (717) 538-9292.

Q & A [*from page 14*]

Hard to say. I do not mention the set you have for it may be one out of a 100 or a 1000 that does what you describe. I have written the company and asaked for an explanation that I can publish here. This I can say. When a transceiver exhibits non-linear output it indicates that one or more driving stages are involved; which one, is the question! Transistors are affected by *heat*. If there is not sufficient cooling performance can drop off. Remember this: when you are operating in the c.w. mode you are not cycling the set as for s.s.b. Holding a key down in the c.w. mode on *any* transceiver designed primarily for s.s.b. for long periods is never recommended. Why? Because the dissipation ratings *can* be exceeded and sooner or later you will find two (or more) "flat" final tubes! Look for the answer to this question in detail later on.

W6QLV Phone Patch

"I have looked over the literature on phone patches. I know I have not covered every article but I am still unsatisfied. Can you please recommend a patch you have used?"

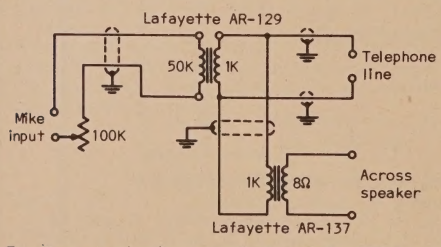


Fig. 3—A simple phone patch. Adjust the 100 k pot for proper modulation. The receiver a.f. gain controls the input to the phone.

Yes, but it is not of the sophisticated types you might have read about. This one works and costs little to make. All components should be mounted in a shielded box. See fig. 3. Switching arrangements should be made to suit yourself. Use *shielded* wire and make sure all shields are grounded.

High Line Noise

"I live within about 850 feet of a high power line. When it rains the lower frequency bands are wiped out, especially 80 meters. Anything I can do? I called the electric company, but received no help."

You are lucky you can work at all. Those high power electric lines can be "mean". The power company should at least check the insulators and the tower grounds and look for arcing. I have no solution to the problem. Anyone care to comment?

Transistor Substitution Handbook

"Can you refer me to an up-to-date publication for transistor substitution?"

Yes. *The Transistor Substitution Handbook* published by Howard W. Sams & Co. The one I currently use is No. 12 and it is great.

Microphonics

"I bought an old receiver from a friend of mine which is in good shape and seems to work alright as along as I do not put the metal cabineted speaker on top of it. When I do a ringing sound is emitted by the speaker. Being a novice studying for my General I'm not such a hotshot technician yet, but I am learning. Any idea on my problem?"

Sure, a microphonic tube. Open the cabinet lid, then take a pencil (with a heavy rubber eraser on it) and gently tap each tube in the set. Substitute another tube for the tube that "rings" the loudest. Generally, you'll find the the tube in the i.f. or audio section of the set but it could be an oscillator or r.f. amplifier.

Cascading Crystal Filters

"I am wondering if I could install another filter in series with the one in my set to give me better selectivity?"

Cascading crystal filters is not always practical, your insertion loss may have to be compensated for by adding an additional amplifier—and this is often difficult to do.

73, Chuck, W6QLV

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Additional filters available.
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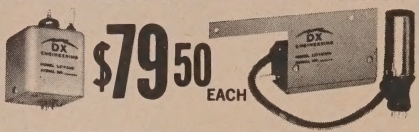
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KLEINSCHMIDT outfit, excellent, $100. Al, Box 551, Glendale, CA 91209.

WANT: Heath HW-16 CW transceiver, and HG-10B VFO in good operating condition. WN4DLL, Clark Evans, 5913 Marta Drive, Tampa, FL 33617.

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WANTED: FM transceiver-solid state-latest model. Also linear. State condition, price and what crystals. K6RQT, Ron, 5541 Mistridge Dr., Palos Verdes, CA 90274 (213) 541-1122.

MAGAZINES FOR SALE: CQ/73/QST/HAM RADIO issues at 10 cents each (plus shipping) from Lockheed Ham Club, 2814 Empire, Burbank, CA 91504. Send list and check. Available issues and any refund due will be sent promptly.

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FOR SALE: Heathkit DX-100B transmitter, Astatic D-104 mike, National NC-183 Receiver with National speaker. $150. R.W. Norton, 4065 A Foothill Road, Santa Barbara, CA 93110. W6GLW. (805) 967-5340.

FOR SALE: Heath DX60B, excellent cond. $60. Hammarlund-110C, brand new. $175. 3228 Alder Ave., Merced, California, WN6NZO.

WANTED: Sockets for 3FP7 C.R.T.'s, CQ's for Feb & March '72, May '61 and April '66. Lionel L. Sharp, VK4NS, 19 Kelso St., Chermside, Queensland 4032, Australia.

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Swan 250, $200; Swan TV2B, $250; both mint. WA1AEZ, Gary Leonard, 30 Webster St., Milford, NH 03055.

SELL: Drake TR4 with noise blanker $390; Drake MC4 $35; Drake DC4 $65; Hustler mast and super resonators 5 bands $60; Standard C806M with RP tone burst, PL board, gain mobile antenna $215; Tempo 802-3 80W amplifier $90; Heathkit IB101 counter and IB102 scaler $200; Heathkit antenna $5; Bird 43 thruline wattmeter, case, 6 slugs $150; Collins (Telex) phone and boom mic $30; Brooks phone-mic handset $10; Automatic Electric 12 button TT pad $10; Hamm-M rotor $40. All mint condition, shipping included. WA9PDJ, Bernie Burke, 6455 S. Western, Chicago, IL 60636. 312-776-7653.

FOR SALE: Gonset Model 3357 v.f.o. for 6, 2, and 220. Can be used with Models I, II, III and IV Communicators. Price $35. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

WANTED: Heath Digital Clock and CQ, QST, 73 binders. Tom Dornback, K9MKX, 2515 College Road, Downers Grove, IL 60515.

WANTED: Dictionary of American Naval Fighting ships Vol II. Good conx. W6VKY, 1522 Rainbow Dr., Santa Ana, CA 92705.

Clegg 99er 6 meter Transceiver, Telrex Beam $55. WA2PCL, 212/849-8458.



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I still have used electronic books to sell. Send SASE (long) for list. James Fred, R1, Cutler, Ind. 46920.

NEED: Coils for R388/51J3 rf 3.5-7.5 mc. Collins No. 5043060001 & Mixer coil .5-1.5 mc. No. 504-3056001. K9BSL, 122 Country Club Dr., La Porte, IN 46350.

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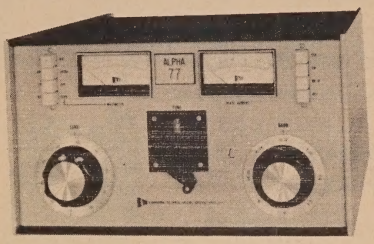
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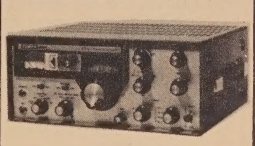


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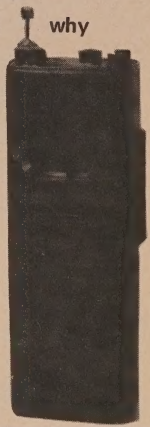
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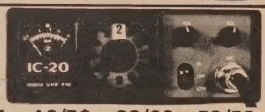
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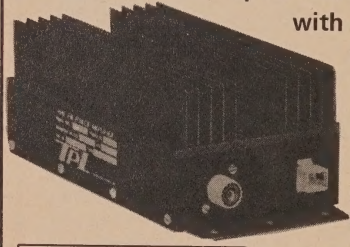
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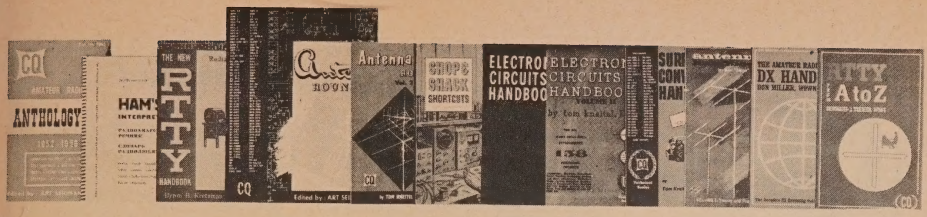
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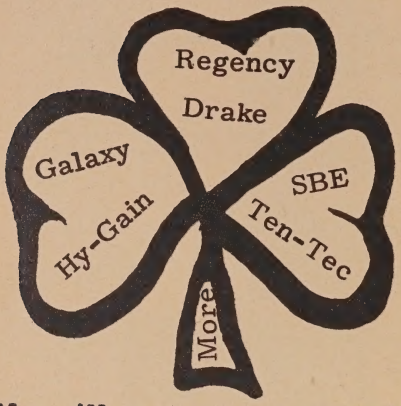
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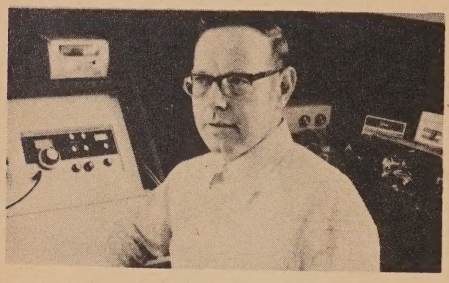
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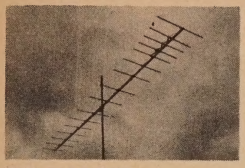
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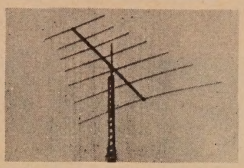
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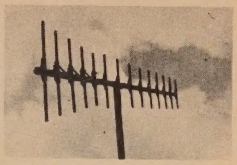
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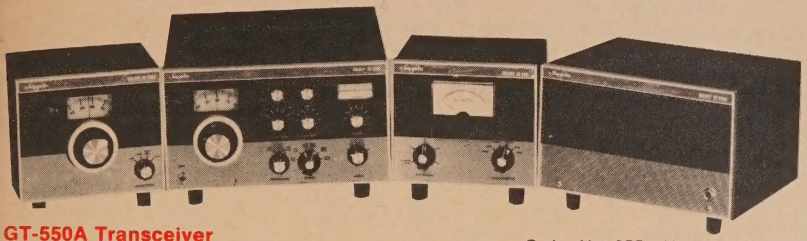
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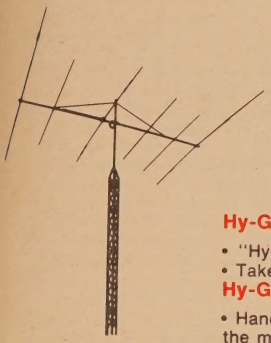
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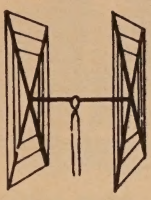
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Unadilla Radiation Products 77
Van W2DLT Electronics 74
World QSL Bureau 74
Yaesu Musen ..... Cov. III

WHICH ANTENNA WINS THE CONTEST ?

In open competition against thousands of commercial and home-brew antennas, WA1JFG won the New England championship with a Gotham beam, by a margin of 5,982 points! WB2JAM won the sectional award for the Sweepstake contest in 1969 and 1970 with a Gotham 4-element 15 meter beam! Hundreds of unsolicited testimonials from grateful hams are our proof that Gotham antennas give you the best design, and the best materials. Forget our low prices - rely on the results of open, competitive contests. Ask yourself: Why do Gotham antennas win?

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

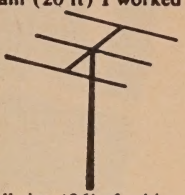
Now check these startling prices—note that they are *much lower* than even the bamboo-type:

10-15-20 CUBICAL QUAD	$41.00
10-15 CUBICAL QUAD	36.00
15-20 CUBICAL QUAD	38.00
TWENTY METER CUBICAL QUAD	31.00
FIFTEEN METER CUBICAL QUAD	30.00
TEN METER CUBICAL QUAD	29.00

(all use single coax feedline)

GOTHAM
1805 Purdy, Dept. CQ,
Miami Beach, Fla. 33139

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

ALL-BAND VERTICALS

"All band vertical!" asked one skeptic. "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty, using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: VE3FAZ, T12FGS, W5KYJ, W1WOZ, W2ODH, WA3DJT, WB2FCB, W2YHH, VE3FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YS1MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3KT. Moral: It's the antenna that counts! *FLASH!* Switched to 15 c.w. and worked KZ5IKN, KZ5OWN, HC1LC, PY5ASN, FG7XT, XE2I, KP4AQL, SM5BGK, G2AOB, YV5CLK. OZ4H. and over a thousand other stations!

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

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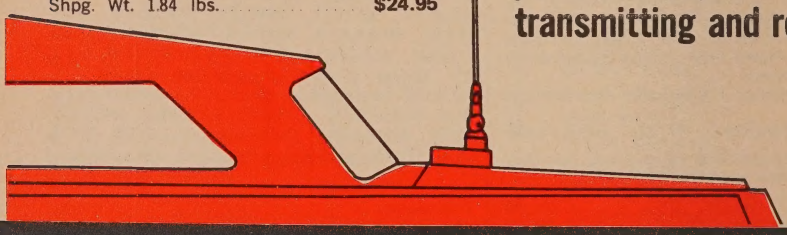
- ! 5.2 db gain over 1/4 wave ground plane
- ! SWR at resonance . . . typically 1.1:1
- ! Bandwidth . . . 7 MHz for 1.5:1 or better SWR
- ! Power Rating . . . 200 watts FM
- ! Height, including mount . . . 78"
- ! Radiator . . . 17-7 PH stainless steel
- ! Field adjustable for lowest SWR

CHOOSE FROM TWO VERSIONS

MODEL CGT-144 (illustrated) antenna complete with trunk lip mount for easy, no holes installation on side or edge of trunk lip. 180° swivel included for adjustment of antenna to absolute vertical. Supplied operational with 17' MIL spec RG-58-U and-RL-259 transceiver connector factory attached. Antenna is removable from mount. Shpg. Wt. 3.34 lbs. **$37.95**

MODEL CG-144 — Antenna only with 3/8"-24 base to fit all standard mobile ball mounts. Shpg. Wt. 1.84 lbs. **$24.95**

give your mobile signal the big push! this large aperature, two meter antenna will create a new dimension in amateur mobile communications. —where action counts, get the decisive advantage of colinear power gain performance; transmitting and receiving!



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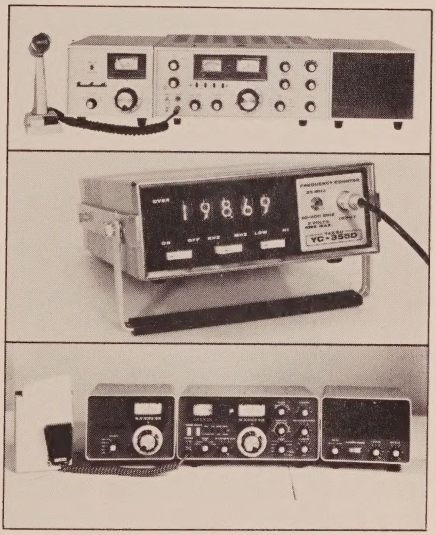
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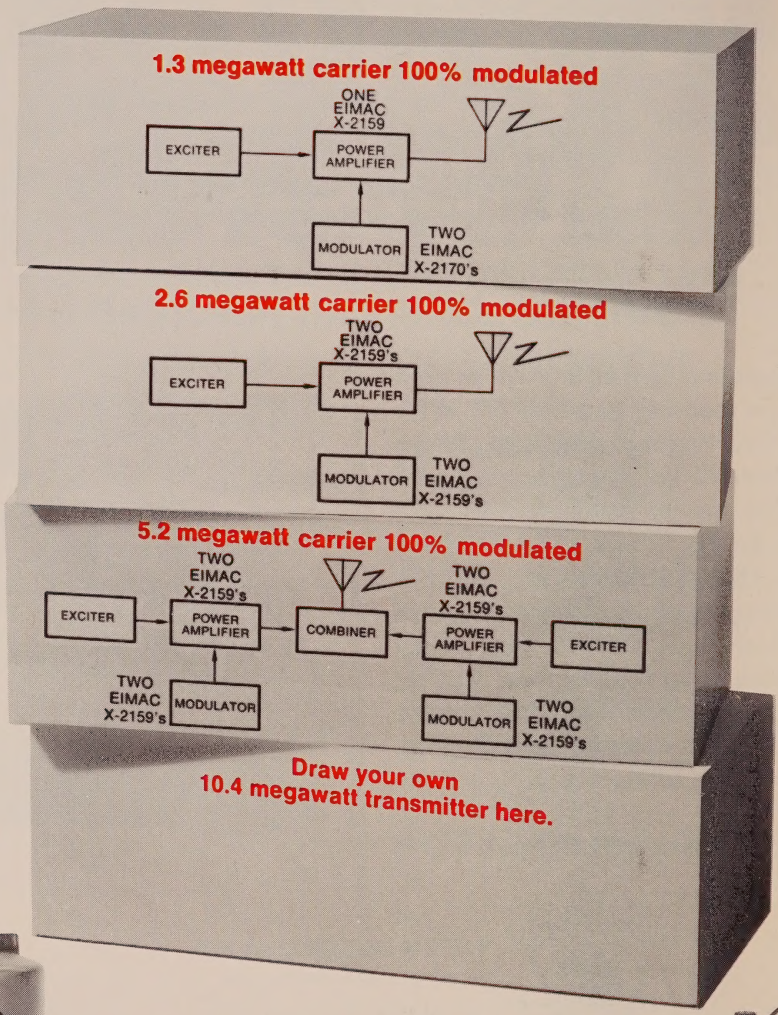
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