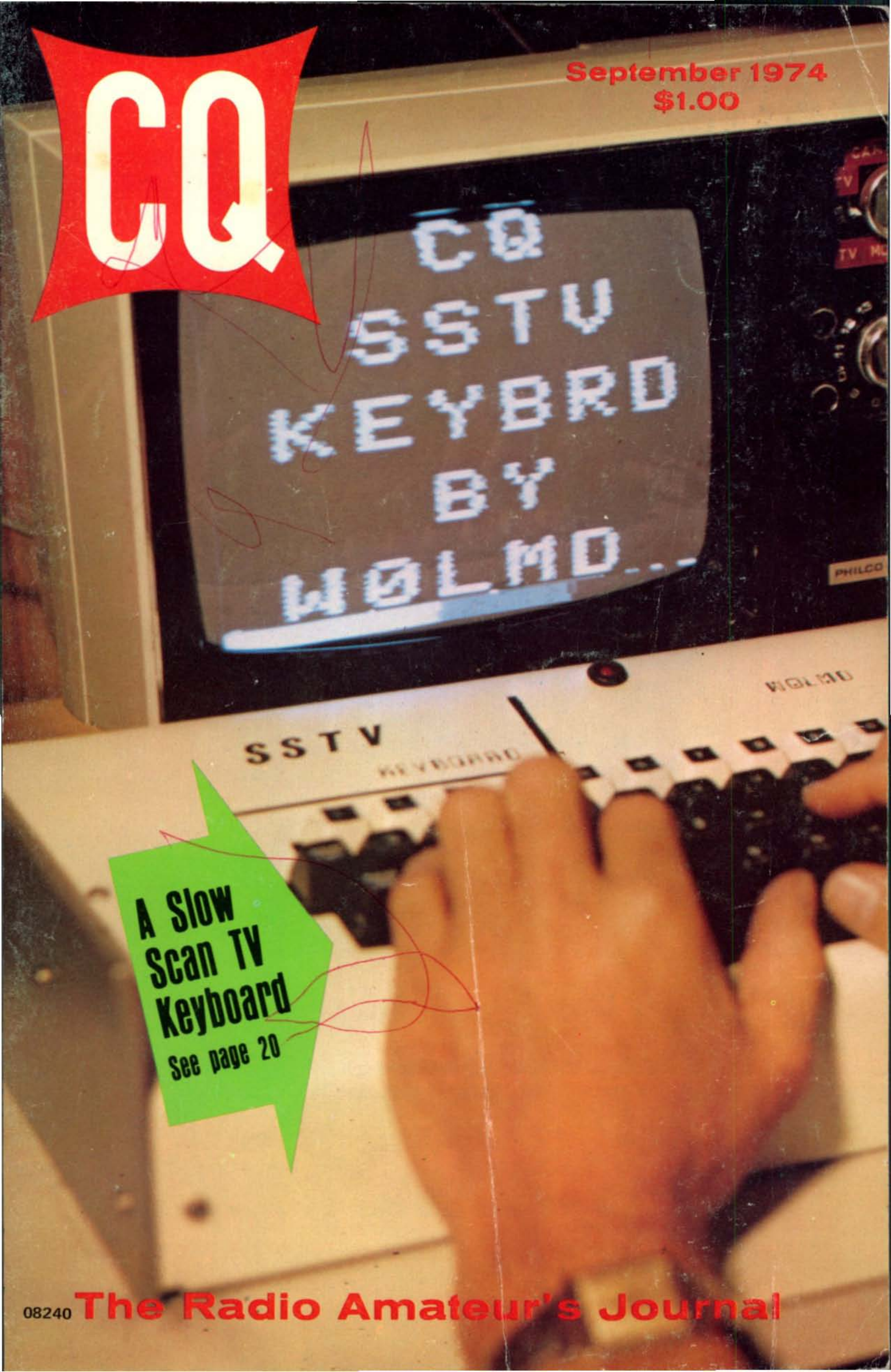
CQ

September 1974
$1.00



A Slow Scan TV Keyboard

See page 20

08240 The Radio Amateur's Journal

There's plenty of energy around.

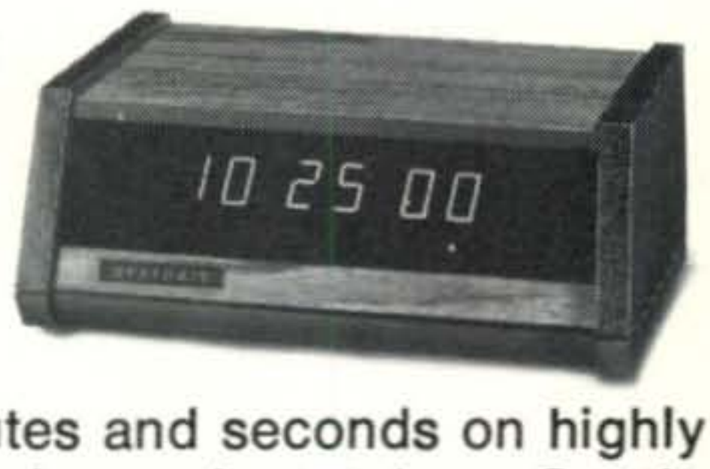
(Yours)

Do-it-yourself with Heathkit® Electronics

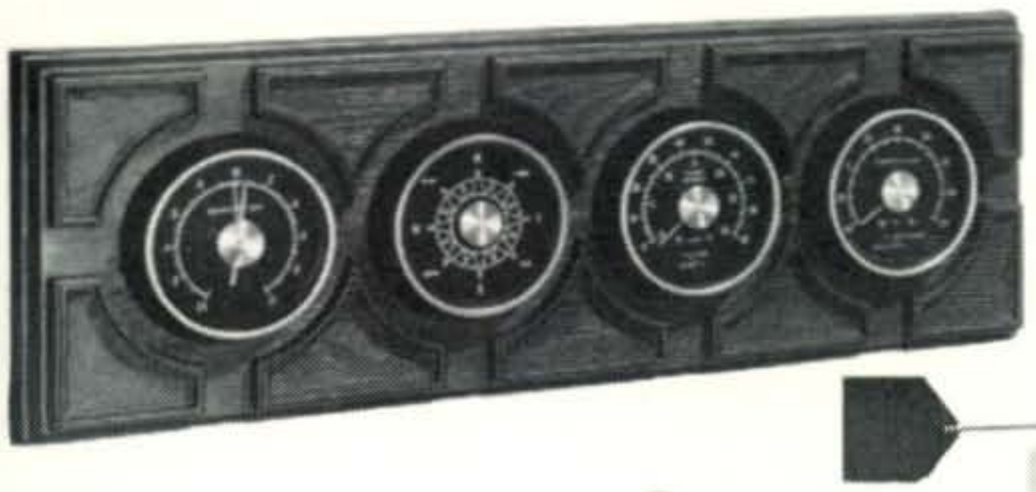
Heathkit SB-102 80-10 Meter SSB Transceiver proves you don't need gas to roam the world. With better than 0.35 μV sensitivity for 10 dB S + N/N; solid-state LMO with 1 kHz calibration; less than 100 Hz drift per hr. after 10 min. warmup; dial resettable to 200 Hz and bandspread equal to 10 ft. per MHz; switch selection of built-in 2.1 kHz SSB filter or optional 400 Hz filter, plus upper and lower sideband; built-in 100 kHz crystal calibrator; 180 watts PEP SSB input, 170 watts CW; built-in sidetone and VOX; 5-position metering facilities. 24 lbs., 385.00*

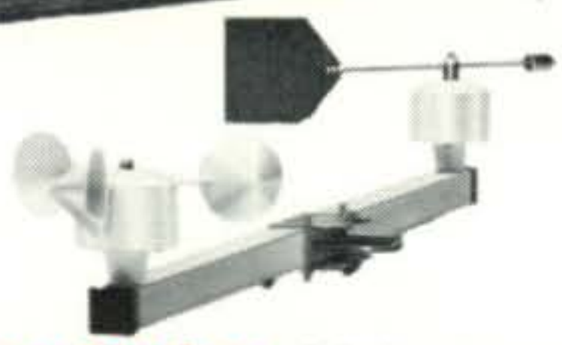
Heathkit ID-1390 Digital Thermometer. A solid-state device that monitors indoor and outdoor temperatures, helps you tailor your home heating system for maximum fuel conservation. Switches set thermometer for alternate display of indoor/outdoor temperature at 4-second intervals, for constant display, and for readout in either degrees Fahrenheit or degrees Centigrade. Includes 85′ cable and 2 sensors. $59.95*. Mailing weight, 5 lbs.

Heathkit SB-220 2 kW Linear gives you the long-distance mileage. With 2 Eimac 3-500Zs in grounded grid circuit delivering up to 2000 W PEP SSB or a full 1 kW on both CW & RTTY, requiring only 100 W of drive; broad-band pretuned pi input; solid-state 120/240 VAC power supply; circuit breaker; zener diode regulating operating bias; ALC; metered grid current, high voltage and relative power; big quiet fan. 70 lbs., 369.95*



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





Heathkit ID-1290 Weather Station. Make your own weather forecasts, and plan ahead for energy-efficient living. Unit has Uni/Mag® barometer for 2½ times greater pointer deflection; 8 wind-direction compass points that light-up in combination to give you 16-point resolution; wind speed indicator with 2 switch selectable ranges, 0-30 and 0-90 mph; dual-sensor thermometer with switch selection of indoor and outdoor temperatures. Includes weather cup and wind vane assembly, simulated walnut housing. $89.95*. Weight, 9 lbs., 50′ cable, 6.95*, 2 lbs.; 100′, 12.95*, 4 lbs.; 150′, 17.95*, 6 lbs.

Send for your

FREE '74 Heathkit Catalog

the world's largest selection of electronic kits

HEATHKIT ELECTRONIC CENTERS
Units of Schlumberger Products Corporation
Retail prices slightly higher

ARIZ.: Phoenix; CALIF.: Anaheim, El Cerrito, Los Angeles, Pomona, Redwood City, San Diego (La Mesa), Woodland Hills; COLO.: Denver; CONN.: Hartford (Avon); FLA.: Miami (Hialeah), Tampa; GA.: Atlanta; ILL.: Chicago, Downers Grove; IND.: Indianapolis; KANSAS: Kansas City (Mission); KY.: Louisville; LA.: New Orleans (Kenner); MD.: Baltimore, Rockville; MASS.: Boston (Wellesley); MICH.: Detroit; MINN.: Minneapolis (Hopkins); MO.: St. Louis; NEB.: Omaha; N.J.: Fair Lawn; N.Y.: Buffalo (Amherst), New York City, Jericho, L.I., Rochester, White Plains; OHIO: Cincinnati (Woodlawn), Cleveland, Columbus; PA.: Philadelphia, Pittsburgh; R.I.: Providence (Warwick); TEXAS: Dallas, Houston; WASH.: Seattle; WIS.: Milwaukee.

HEATH COMPANY, Dept. 12-9
Benton Harbor, Michigan 49022

HEATH
Schlumberger

☐ Please send FREE Heathkit Catalog.
☐ Enclosed is $_____, plus shipping.

Please send model(s)_____

Name_____

Address_____

City_____ State_____ Zip_____

Prices & specifications subject to change without notice. CL-521
*Mail order prices; F.O.B. factory.

CQ BOOK SHOP

CQ Binders
Convenient and economical are the words for CQ's beautiful maroon and gold binders. Individual issues can be removed quickly and easily without damage to the magazine. Save precious time as reference copies are within immediate reach in this handy binder. $5.00

The New RTTY Handbook
A treasury of vital and "hard-to-get" information, this book is loaded with valuable equipment schematics, adjustment procedures, etc. A boon to beginner and pro. A special section on getting started, written by Byron Kretzman, W2JTP, a well-known authority in the field. $3.95

Antenna Roundup I
Edited by Art Seidman, a 160 page mass of antenna information directed at answering a multitude of questions surrounding the mysterious antenna. $3.00

Antenna Roundup II
Ten big theory articles backed up by 82 detailed and illustrated construction projects from VLF to microwave, long wires to 17 element beams and Sterba Curtain arrays. $4.00

Shop & Shack Shortcuts
A volume packed with hundreds of hints & shortcuts collected by Don Stoner, this will help anyone to dress up his shack, improve shop techniques and increase efficiency and equipment. $3.95

Antenna Handbook I
All new information on transmission line theory, Attenuation, Impedance, Standing waves, Resonant and nonresonant lines, current distribution, free space 3 dimensional patterns of long wires of all practical length and much, much more by Ken Glanzer. $4.00

The New DX Handbook
Don Miller's 200 pages of valuable technical information and operating aids, most of which has never been published before and can be found in no other volume contains Great Circle Bearing Charts. $5.00

CQ Anthology II
1952-1959 250 pages of more recent but still hard-to-get important articles from glorious yesteryear. $3.00

Surplus Conversion Handbook
Compiled by Tom Kneitel, WB2AAI, this contains 192 pages of conversion articles, covering almost every piece of surplus gear worth the effort to convert to ham use. $4.50

Electronic Circuit Handbook I
Written by Tom Kneitel, WB2AAI, this details 150 of the most often needed circuits in 11 great chapters. Invaluable for beginners and old-timers alike. $3.00

Electronic Circuit Handbook II
Tom Kneitel's own sequel to Vol 1, this volume delivers 159 additional circuits that will appeal to all amateurs. Each circuit is fully described in text with complete schematics. $3.00

RTTY From A To Z
This new RTTY Classic has been produced to fill the gaps in RTTY knowledge among amateurs and professionals alike. 16 chapters and 224 pages. This book is a must in your technical library. $5.00

USA-CA Record Book
The official application and Record book for the coveted United States of America Counties Award issued by CQ. Contains room for simple entry of all data required to apply, plus rules and endorsement application. Two copies recommended: one for application, one for your records.Per copy price: $1.00.

DX Country Chart
Handsome wall-size chart (25" x 31") listing every amateur radio country in the world alphabetically by prefix, and giving continent, form of government, area, population, zone and class of country. A must for every active amateur and a bargain at $1.25.

☐ CQ Anthology II	$3.00	☐ Shop & Shack Shortcuts	$3.95
☐ CQ Binders	$5.00	☐ Electronic Circuits Handbook I	$3.00
☐ New RTTY Handbook	$3.95	☐ Electronic Circuits Handbook II	$3.00
☐ Antenna Roundup I	$3.00	☐ Surplus Conversion Handbook	$4.50
☐ Antenna Roundup II	$4.00	☐ Antenna Handbook I	$4.00
☐ USA-CA Record Book	$1.00	☐ New DX Handbook	$5.00
☐ DX Country Chart	$1.25	☐ RTTY From A To Z	$5.00

NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

New York City and State residents must add sales tax applicable to your area.

COWAN PUBLISHING CORP. Book Div.
14 Vanderventer Avenue • Port Washington, L.I., N.Y: 11050

CQ

SEPTEMBER, 1974 VOL. 30, NO. 9

The Radio Amateur's Journal

FEATURES

DEPARTMENTS

Offices: 14 Vanderventer Avenue, Port Washington, L.I., N.Y. 11050. Telephone: 516-883-6200.

CQ (Title registered U.S. Post Office) is published monthly by Cowan Publishing Corp. Second Class postage paid at Port Washington, N.Y. and Miami Florida. Subscription Prices one year, $6.00; two years, $11.00; three years, $15.00. Allow six weeks for change of address. Printed in the United States of America.

Postmaster: Please send form 3579 to CQ Magazine, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050

We're
overwhelmed!
...but not surprised by your acceptance of the new
TS-520

WE KNEW THIS NO-COMPROMISE, DO EVERYTHING, GO EVERYWHERE TRANSCEIVER WOULD BE POPULAR. NOW WE ARE DELIVERING THEM IN RECORD NUMBERS. PLEASE BE PATIENT...WE HAVE ONE FOR YOU.

Here are 30 special reasons you will want to own a TS-520. After you have operated one, you will doubtless give us 30 more why you're glad you own one.

1. **Built-in AC power supply**
2. **Built-in 12 volt DC power supply**
3. Built-in VOX with adjustable gain, delay and anti VOX
4. 1 KHz dial readout
5. Ultra stable FET linear VFO
6. Built-in noise blanker
7. Built-in RIT circuit and RIT indicator light
8. 8 pole crystal filter
9. Built-in 25 KHz crystal oscillator
10. Provisions for optional CW filter
11. Break-in CW with sidetone
12. Completely soiid state except final section. Compact, low current, reliable with heater switch for mobile receive-only operation
13. Built-in cooling fan
14. Accessory external VFO & accessory external speaker
15. Built-in speaker
16. Modern styling & functional design. Modular construction.
17. Amplified ALC
18. TUNE position increases tube life
19. Maximum TVI protection
20. Built-in fixed channel operation (4 channels) with indicator light
21. Provisions for use with a VHF transverter
22. Full metering
23. Selectable SSB
24. Selectable AGC operation for different modes
25. VFO indicator light
26. Built-in selectable ALC action for speech processing
27. Carrying handle
28. Rugged 6146 type final tubes
29. Internal cross-channel operation.
30. Push button WWV reception

Proven Kenwood quality and reliability

The price..$629.00

subject to change without notice.

Accessories: External VFO-(VFO-520), External speaker - (SP-520), CW Filter - (CW-520)

Available from Kenwood dealers throughout the U.S.

Henry Radio

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

ZERO BIAS

The fellows down at the Amateur and Citizen's Division of the FCC must be working overtime these days judging from the unusually large volume of documents pouring forth from the commission. No less than six notices of proposed rule making were released in the period from July 24 through July 31, 1974, three pertaining specifically to the amateur service and three to CB. Although the amateur NPRM's may well be general knowledge by this time, we'll capsulize them here and add a few opinions of our own.

The first docket, no. 20111, entitled "Authorization of commemorative stations in the Amateur Radio Service," seeks to delineate the conditions under which a commemorative station license may be issued. It is proposed that a new class of station license be issued for "any celebration that is either unique, distinct and of general interest to the public or amateur operators." We feel that this liberalization is healthy for amateur radio at this time. However, the same hand that gives also seeks to take away. The proposal would prohibit portable or mobile operation, and operation of a commemorative station for any amateur operating contest.

We find these limitations unnecessary and in conflict with the stated purpose of the proposal which is "to bring public notice to the amateur radio service by allowing an amateur station with a distinctive call sign to be operated at an event or celebration so as to help attract more contacts." We further feel that singling out a whole area of amateur interest for special (restrictive) treatment, as has been proposed for contests, invites additional limitations on lawful and traditional amateur activities for no justifiable reason. We vigorously oppose this portion of Docket 20111. Filing date for comments is on or before Oct. 30, 1974.

The second docket, no. 20112, pertains to automatic control of repeater stations. Docket 18803 in 1972 prohibited automatic unattended control of a repeater. Since Docket 18803, it has been necessary for a designated control operator to monitor the functions of a repeater on a real-time basis either locally or by remote control. A repeater may not operate while un-attended either at the repeater site or at an authorized remote control location. The intent is clear: the control operator bears the responsibility of ensuring that the repeater operates in compliance with the rules, and in the event of a malfunction or inadvertent interference with another station already using the output frequency of the repeater, the control operator is obliged to shut down the repeater until the situation is corrected.

The Commission now feels that sufficient experience has been gained and techniques developed to permit the control of a repeater by automatic means. Roughly, automatic control may be used if:

1- Devices and procedures have been implemented which allow compliance with the rules without a control operator being present.

2- All repeater transmissions are reviewed for violations either in real time or within 72 hours.

3- All repeater transmissions are recorded and preserved for 30 days.

4- Names and appropriate information about the repeater licensee and control operators is filed with the FCC Engineer -In-Charge in the event a shutdown is necessary.

5- In the event a shutdown is called for, automatic control may not be resumed until all deficiencies have been corrected.

It sounds rather demanding to us, particularly taping, reviewing and retaining all repeater transmissions for 30 days. We forsee a run on surplus airport tower communication recorders and aircraft flight recorders. At a tape speed of 1 7/8 i.p.s., a 3600 foot roll of recording tape will play about 27 hours using four tape channels and automatic reversal. Thus using conventional tape equipment on a busy repeater would require a tape change probably every other day and a sizeable cash investment, not to mention the monumental burden of listening to all that stale chatter for violations.

We suggest that the NPRM be altered to permit spot checking or sampling of automatic repeater outputs rather than continous monitoring. As with the commemorative licenses there seems to be a conflict of direction in FCC actions indicated here. Only a few weeks earlier the Commission effectively eliminated all logging requirements for amateurs stating that "the logs.....do not, in fact, play a major role in the Commission's enforcement efforts....." To now require total logging (taping) is inconsistant and unreasonable. The filing date for comments is on or before Oct. 30, 1974.

The third Proposed Rule Making no. 20113, is entitled, "Amendment of Part 97 of the Commision's Rules to permit crossband operation of repeater stations." Based on an ARRL petition, RM-2337, the Docket proposes to permit a repeater to concurrently retransmit on more than one authorized repeater frequency band, but on no more than one frequency within a single band.

We endorse this proposal without reservation.

While the three new CB proposals are generally of no particular import to amateurs, at least one point warrants comment. Docket 20118 (prohibiting the use or sale of CB linear amplifiers) dictates that it will be illegal to sell or lease an r.f. power amplifier capable of use in the 11 meter band which requires 20 watts c.w. or 80 watts p.e.p. drive or less to deliver its rated power output. Any amplifier capable of operating in the 20 to 40 MHz range with these low drive requirements will be illegal. The docket goes on to make exceptions for amateur gear for 15 and 10 meters which utilizes a built-in amplifier, or also covers 40 and 20 meters and requires more than the 20/80 watts drive. In addition, single band one-of-a-kind home-brew amplifiers would be permitted for amateur use and sale.

We recognize the difficulty in writing restrictive equipment rules for a service situated between two amateur bands, and appreciate the lengths to which FCC has gone to protect the amateur. But we lament the fact that the Commission has addressed itself to only this one phase of the problem. Our suspicion is that the real solution to the linear problem lies elsewhere, within a more far-reaching solution to the problem of illegal use and sale of all transmitting equipment. We welcome your views on such control.

73, Dick, K2MGA

new

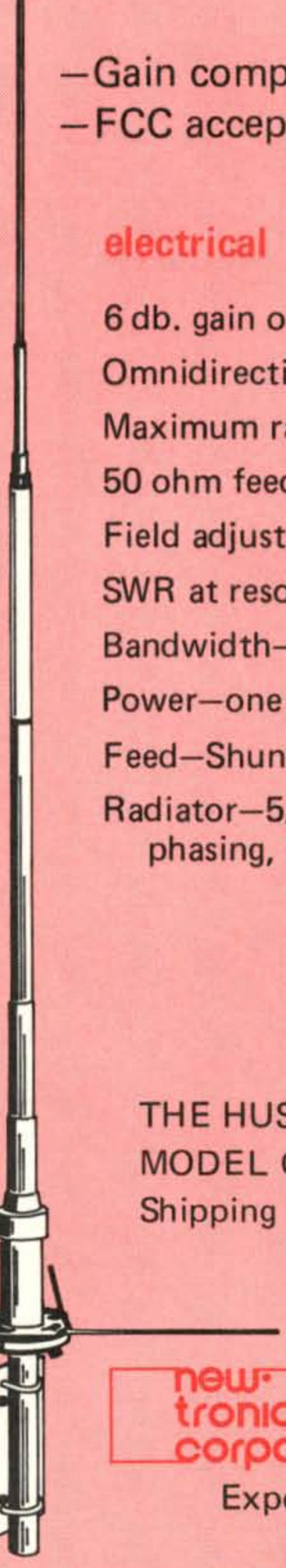
HUSTLER®

the real performer! specifically for repeater

...or any TWO-METER FIXED STATION OPERATION

With **6** db—
db—

—Gain compared to ½ wave dipole
—FCC accepted for repeater application



mechanical

Vertical element—117" long, 1-1/8" telescopic to 3/8" OD high strength aluminum

Radials—four, 21" x 3/16" OD aluminum rod

Connector—SO-239

Wind load—26 pounds at 100 mph.

Wind survival—100 mph.

Completely self-supporting

Mounting—fits vertical pipe up to 1-3/4" OD

The gain you gain—you gain transmitting and receiving—get both with Hustler!

Available from all distributors who recognize the best!

electrical

6 db. gain over ½ wave dipole

Omnidirectional radiation pattern

Maximum radiation—at horizon

50 ohm feed impedance

Field adjustable—140-150 MHz

SWR at resonance—1.2:1 measured at antenna

Bandwidth—6 MHz for 2:1 or better SWR

Power—one kilowatt FM

Feed—Shunt with D.C. grounding

Radiator—5/8 wave lower section, ¼ wave phasing, 5/8 wave upper section

THE HUSTLER MASTER GAINER
MODEL G6-144-A
Shipping Wt.: 6.8 lbs. Price: $52.95

new-tronics corporation
15800 commerce park drive,
brook park, ohio 44142

Exporter: Roburn Agencies, Inc.,
New York, N.Y.

OUR READERS SAY

Red Face for a Red Ensign

Editor, *CQ*:

Received my July issue of *CQ* yesterday and noticed that your cover design featured the DX fone contest & various national flags.

Imagine my horror in discovering that you had shown Canada's flag as "The Red Ensign". We have had a national flag since 1964, a design of a red maple leaf on a white background.

Please inform your readers in the next issue that we do have a new flag as I'm sure all the VE's have noticed your unintentional error.

Glenn F. McMichael
Godrich, Ontario

Editor, *CQ*:

On the July '74 cover of *CQ*, you have a grave error. The flag shown is not the flag of Canada! I'm proud of my flag as you are proud of your flag and I hope at some later date when flags of nations are displayed, the error will be corrected.

Bruce Balla, VE2QO
Montreal, Canada

We offer our sincerest apologies to our Canadian friends for the unforgivable error of displaying a long-since-outdated Canadian flag on our July cover. Reproduced below is the familiar red maple leaf flag adopted in 1964 as the Canadian standard.
—K2MGA

Pro-QSL

Editor, *CQ*:

KZ5VV's remarks in the "Our Readers Say" column for August 1974 disturbed me quite a bit. I would have to say that Mr. Herman's attitude reflects just plain laziness! As has been said so many times, the final courtesy of a QSO is the QSL card.

I appreciate that Mr. Herman is a DX station and he receives many QSL requests, but with little or no difficulty he could get himself a stateside DX manager. A DX station does not have to "afford" a QSL manager - they are free. The only expense is the QSL cards and the postage to mail a log every so often. You can purchase enough QSL's to last a lifetime for under $75!

Phooey! I hope guys like KZ5VV are in the minority. As for me (and most amateurs), "Glad to QSL, OM!"

Robert A. Sullivan, WØYVA/4
Arlington, VA

Editor, *CQ*:

I can sympathize with KZ5VV for getting bored with QSLs. But the solution is so simple!: get a QSL manager. I got one myself for my operations as VX1KE. Sure, I've heard a few grumbles about a Canadian having a manager, but then anybody who dosen't want to QSL via a manager always has the choice to not QSL at all if he doesn't really want a VX1KE card.

When I made my request for a manager I got an even dozen volunteers, so there is no shortage of people willing to undertake the task. All that's required of the DX op is to make a copy of his logs by photocopy or carbon paper, and to periodically mail them to the manager.

Any operator in a choice DX QTH or with a rare-prefix call has no real excuse for not QSLing. The development of the practice of using QSL managers has been of great help to DX ops and chasers alike, and to KZ5VV and others who dislike the chores I strongly recommend the manager system as by far the best way to keep everybody happy.

Mike Muench, VO7KE
Witless Bay, Newfoundland

Editor, *CQ*:

KZ5VV *CQ* Aug 74, I am sure is not the only amateur who has grown tired, or never did enjoy QSLing. The QSL has grown to become a very great part of the hobby. Some amateurs terminate a QSO in a hurry to get to the part they enjoy, filling out and sending the QSL.

For those who do not enjoy this part of the hobby, the solution is to get a QSL manager. Not try to devise some way to enjoy their own selfish part of the hobby and ignore the desires of their fellow amateurs.

It only takes a few minutes to find a QSL manager. The last time my manager of over half score years decided to go to college and give up the job. I fired up on 40 cw and worked a pileup advising everyone that I would QSL as soon as I lined up a new manager. I soon had several volunteers. I made phone skeds with them and after talking to them I picked my present manager who has been doing the job for many years.

Although I pay expenses this would not have been necessary. Even with a low key DX call like KP4 I had two volunteers who would pay all expenses, Expenses are minimal, when there is a manager, about 50% of the W stations send sase. About 100% or the overseas stations send IRC, or sase. If there is a DX club nearby the manager can discount the IRC to the members and realize more return from them, and the members can get IRCs at a discount.

All I do is put a carbon, a sheet of onion skin, and a sheet of .031 aluminum under each log page as I am keeping my log. When several pages arecomplete, I put them in an envelope along with the cards that have been inadvertently sent to me, and mail it to my manager. Anyone who cannot do this much for his fellow amateur ought to switch to solitare.

Most QSL managers are also stamp collectors, and a much larger percentage of QSLs are sent direct to the manager than would be to an individual station, as managers are 99% sure of sending a reply. Thus they get a lot more stamps than they would as an individual amateur.

A solution where everyone gains and no one looses should be the best.

Bruce G. Hosmer, KP4BCL
San Juan, P.R.

Announcements

Uniontown, Pennsylvania

The Annual Gabfest of the Uniontown Amateur Radio Club, will be held on the Club Grounds, on the Old Pittsburgh Rd., Uniontown, PA, on September 7th, 1974.

Wichita, Kansas

The Wichita Amateur Radio Club's Annual Hamfest will be September 8 at the Sedwick County 4-H Building, (located on the N.W. corner of West St. and Central, in Wichita). Admission, $1.75. For more information write: Clarence E. Reid, Fr., K0BHJ, 1520 W. 16th St., Wichita, KS, 67203.

Cincinnati, Ohio

The 37th Annual Cincinnati Hamfest will be held on Sunday, September 15, 1974, at the new Stricker's Grove located on State Route 128, two miles west of Ross, (Venice), OH. Contact: Elmer H. Schubert, Chairman, c/o Ross Printing Co., 519 West Third St., Cincinnati, OH 45202.

Richmond, Virginia

The Richmond Amateur Telecommunications Society will sponsor a booth at the Atlantic Rural Exposition, Richmond, VA, from September 19 thru September 29, 1974. The Atlantic Rural Exposition is one of the largest state fairs on the east coast. For more information contact: A. Carter Cogle, P.O. Box 842, Richmond, VA 23207, (804)-949-2411, ext. 30.

Glenview, Illinois

On September 21, 1974, the 22nd Annual Meeting of the W9 Central Division Century Club will convene at the Holiday Inn of Itasca, in Itasca, IL. It will be an afternoon and evening affair with an expected attendance of over 200. The mailing list has 800 W9DXCC calls. Contact: Curtis Hammond, Co-Chairman, 818 Solar Lane, Glenview, IL 60025.

Walla Walla, Washington

The Walla Walla Valley Radio Amateur Club's 28th Annual all family picnic and hamfest is September 21-22 at the Milton-Freewater, OR, Community Building. Swap n'shop, bingo and contests. Write Pat Stewart, 1404 Ruth Ave., Walla Walla, WA 99362.

Aurora, Illinois

The Fox River Radio League Hamfest will be held on September 22, 1974 at Phillipa Park, in Aurora, IL. Picnicing, for the whole family. For more information contact: WB9HYH, Pres. 1888D Carnation Ct., Aurora, IL 60506.

Marion, Indiana

On September 29, 1974 at the 4-H Fairgrounds in Marion, IN, the Grant County Amateur Radio Club will hold it's Annual Hamfest. For more information write: W9WBN, Grant Co. Amateur Radio Club, P.O. Box 815, Marion, IN 46952.

Hamburg, New York

On September 21, 1974, The Hamburg Inter-

[*Continued on page 77*]

Collins Radio has joined forces with another great company:

Rockwell International.

Collins is now part of Rockwell International, a multi-industry, high-technology company.

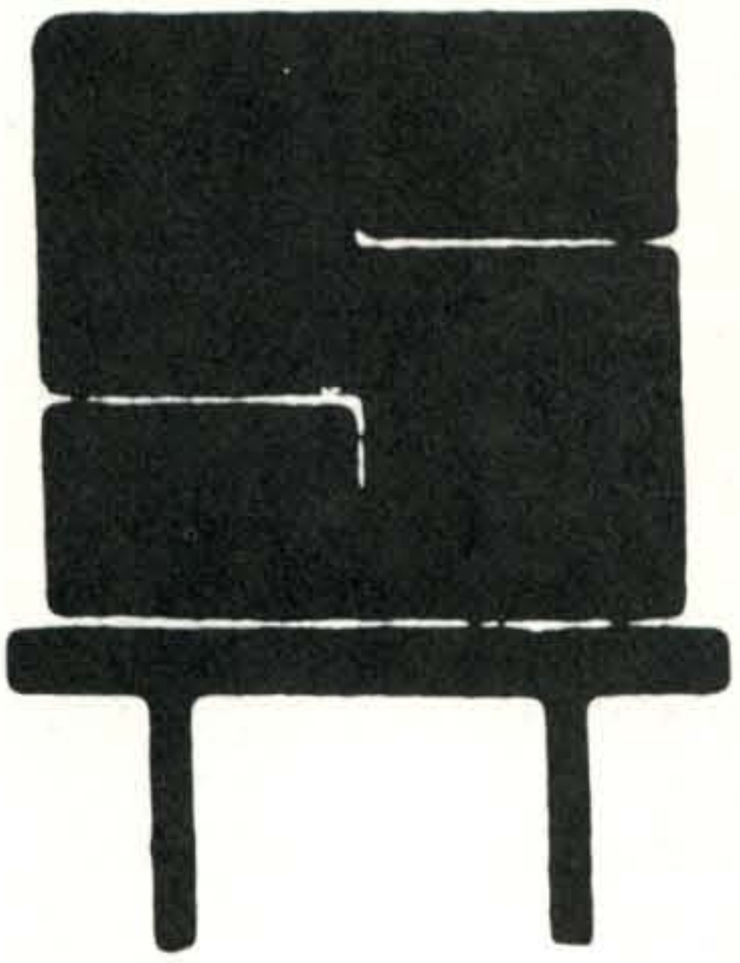
But nothing else has changed. The quality and reliability that you expect in our ham radio gear remain the same.

Because the same engineers will still be designing the products. The same experienced production workers will be manufacturing them. The same rigorous testing programs will still be applied. And the same fine dealer organization will serve you.

In the years ahead, we intend to maintain the kind of leadership that has made Collins the most respected name in amateur radio. And we will continue to look for better ways to serve you—ways that will keep you enjoying your Collins equipment to the fullest.

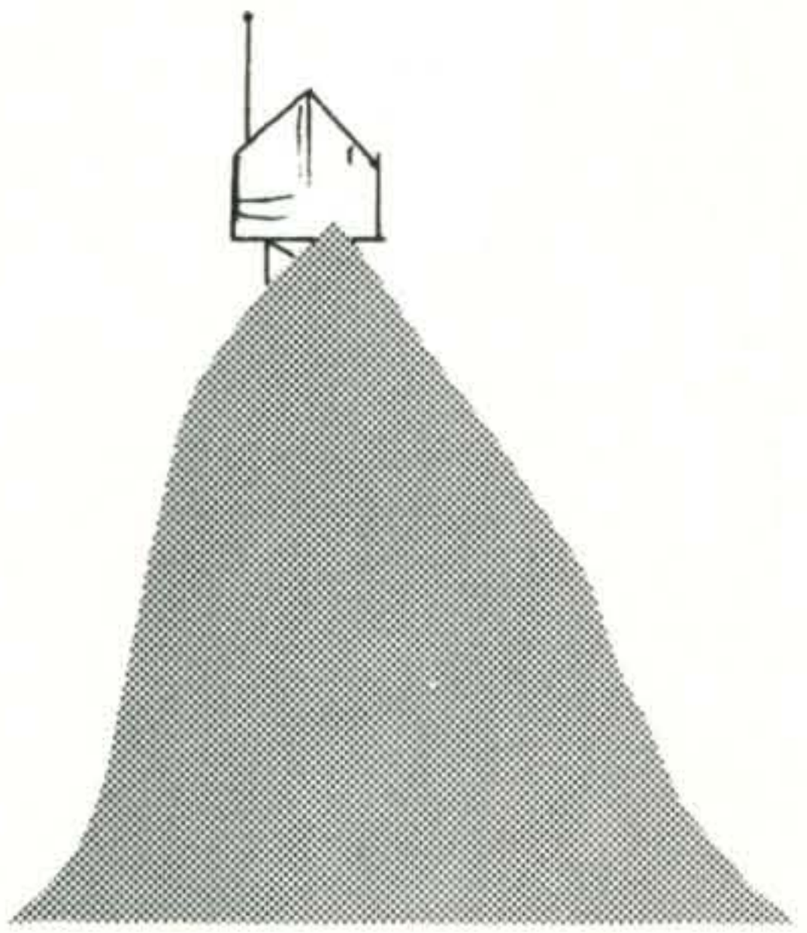
For more information, contact Amateur Radio Marketing, Collins Radio Group, Rockwell International, Cedar Rapids, Iowa 52406. Phone 319/395-4507.

Rockwell International



REPEATER OWNERS

Don't Take Chances. SENTRY offers custom made crystals made exactly to your specifications. When it comes to crystals for your repeater, BUY THE BEST – SENTRY.



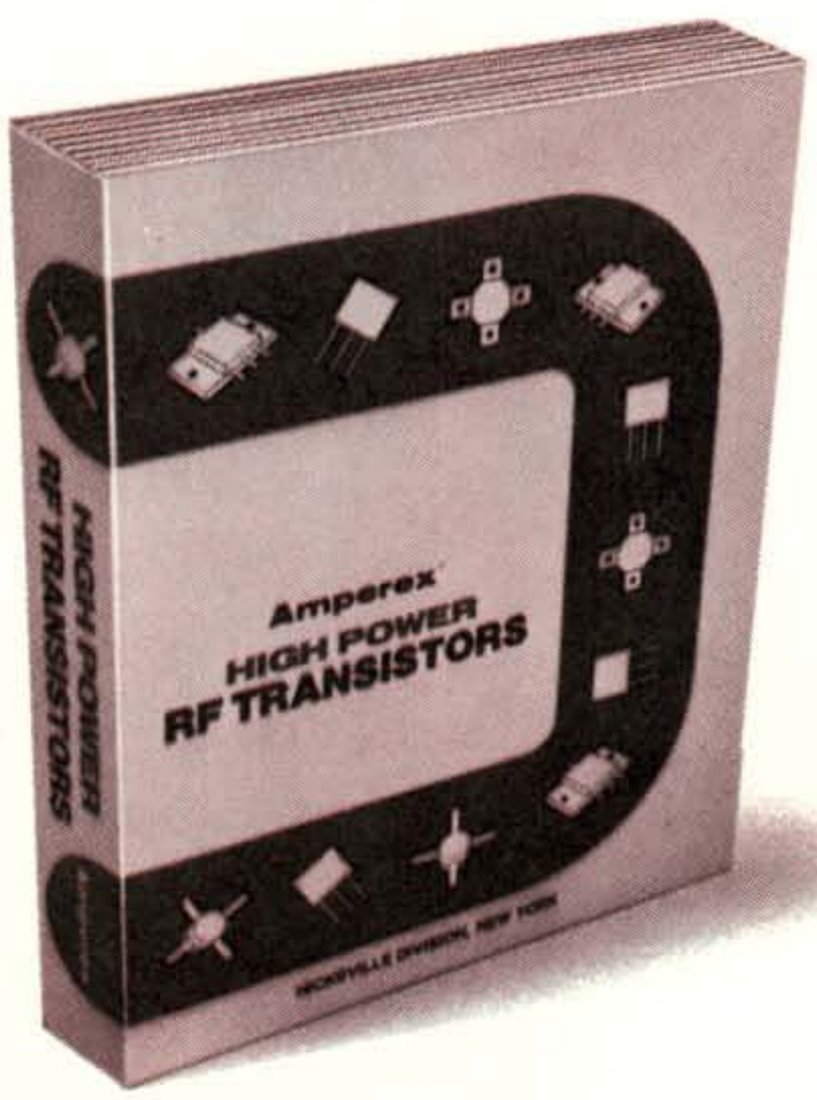
REPEATER USERS

If you want reliable access to the repeaters in your area, you want and need SENTRY CRYSTALS. SENTRY CRYSTALS are custom made for your rig. We don't stock a large quantity of crystals for a certain frequency and hope you can tweak them to frequency in your rig. We do offer FAST service on crystals made especially for you and your rig. If you want reliable, on-frequency operation, INSIST ON SENTRY.

SENTRY MANUFACTURING COMPANY
Crystal Park, Chickasha, Oklahoma 73018

PHONE: (405) 224-6780
TWX-910-830-6425

AMPEREX
HAS WHAT IT TAKES TO BE
NUMBER ONE
IN RF POWER SEMICONDUCTORS...
THE LINE – THE BOOK – THE BOARDS.



Amperex is going all out to support its state-of-the-art line of RF power semiconductors with a state-of-the-art program of applications engineering assistance.

The line is a broad one with an RF power semiconductor to fill virtually any RF amplification need in fixed and mobile transmitting equipment—from 30 MHz single sideband through 960 MHz UHF FM.

At the heart of the program is a 640-page applications manual containing 24 detailed engineering reports. This manual, available to communications design engineers, will cut RF power amplifier design time and cost to a fraction of that normally required between the drawing board and the production line.

The engineering assistance doesn't end with the applications manual—it only starts there. You won't even have to build the prototypes to get these circuits into production! We will supply sample boards, built for you, here in the Amperex applications laboratory. Use them to test, to evaluate, to demonstrate your system. Typical of the sample boards now being made available to Amperex customers, is a 25 watt, 225 MHz Class E Citizens Band Amplifier (illustrated at left) with 50 mV input power and 12.5 V operation.

For more information...on the line, the book, the boards; for data, write to Marty Burden, Group Product Mgr., Amperex Electronic Corporation, Hicksville Division, Hicksville, N.Y. 11802. Telephone: (516) 931-6200.

CLASS E,
CITIZENS BAND AMPLIFIER
25 W output, 225 MHz,
50 mV input power, 12.5 V operation

P out (watts)	SSB	VHF		UHF	
	30 MHz	175 MHz FM		470 MHz FM	
	28 V	13.5 V	28 V	13.5 V Ampl. Modules	28 V
2.0				BLX65	
2.5			2N3553	BLX66	
3.0		2N3924		BLX67	BLX92
4.0		BFS22A	BFS23A	BGY22	
6.0			2N3375		
7.0		2N3926		BLX68 BGY23	BLX93
8.0	BLX13	BLY87A	BLY91A		
12.0		2N3927			
13.0			2N3632		
15.0		BLY88A	BLY92A	BGY24	
20.0				BLX69	BLX94
25.0		BLY89A	BLY93A		
40.0					BLX95
50.0	BLX14	BLY90	BLY94		
150.0	BLX15				

Amperex®

TOMORROW'S THINKING IN TODAY'S PRODUCTS

Sold through
North American Philips Electronic Component Corporation

It's here...full line
HF SSB/ISB

OFF-THE-SHELF SERVICE

Whether for defense or commercial, Scientific Radio Systems is your best single-source for all HF SSB/ISB applications. Why? Because SRS engineers can and will customize your HF SSB/ISB communication system from their off-the-shelf full-line inventory.

That kind of service keeps your cost lower than you would expect. And it also keeps us number one for reliable trouble-free HF SSB/ISB systems being used the world over. Write to us now about HF SSB/ISB for:

- ☐ Point-To-Point
- ☐ Ground-To-Air
- ☐ Area Broadcast

FEATURES

- ☐ Up to 10 Channels (Frequencies)
- ☐ Telephone and Cable Remote Controls
- ☐ Simultaneous Voice and Data
- ☐ 1.6-30 MHz, 150W/1KW/10KW
- ☐ Multichannel TTY (±35, ±42.5, ±85, ±425)

Users include: U.S. ARMY, NAVY, AIR FORCE, COAST GUARD, ATOMIC ENERGY COMMISSION, NATIONAL WEATHER SERVICE, NASA, FAA, FCC, etc.

. . . with plug-in modular construction!

SR SYSTEMS

Take your pick.

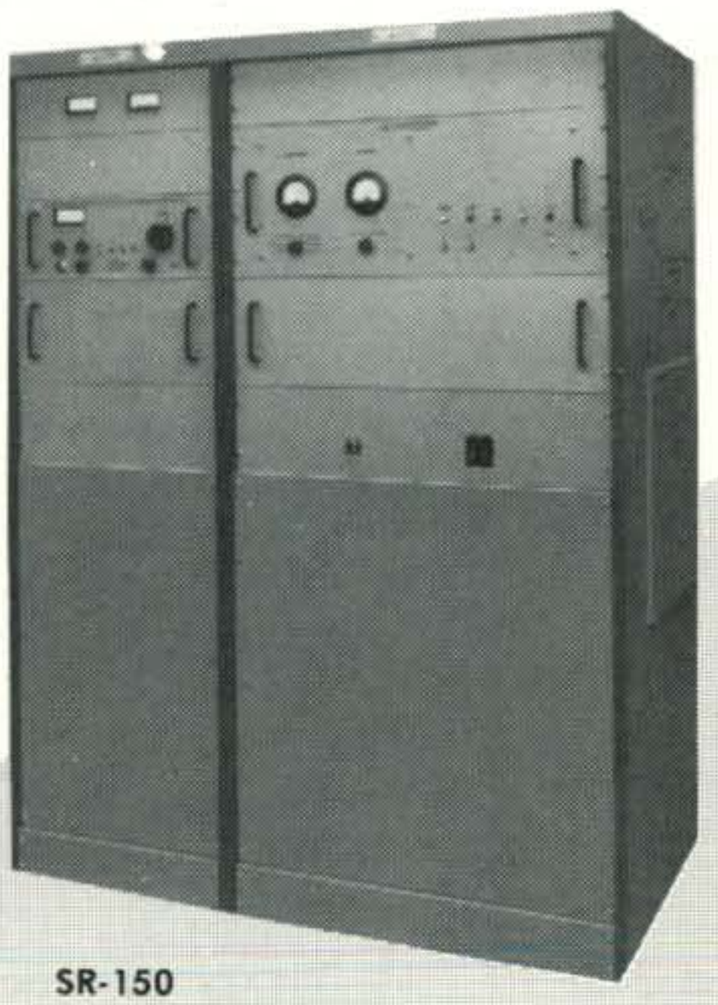
- ☐ **THIS EQUIPMENT IS ON THE GSA FEDERAL SUPPLY SCHEDULE**
- ☐ **MILITARY NOMENCLATURE & FSN'S EXIST FOR OUR ENTIRE LINE**

Scientific Radio Systems

367 ORCHARD STREET
ROCHESTER, N.Y. 14606

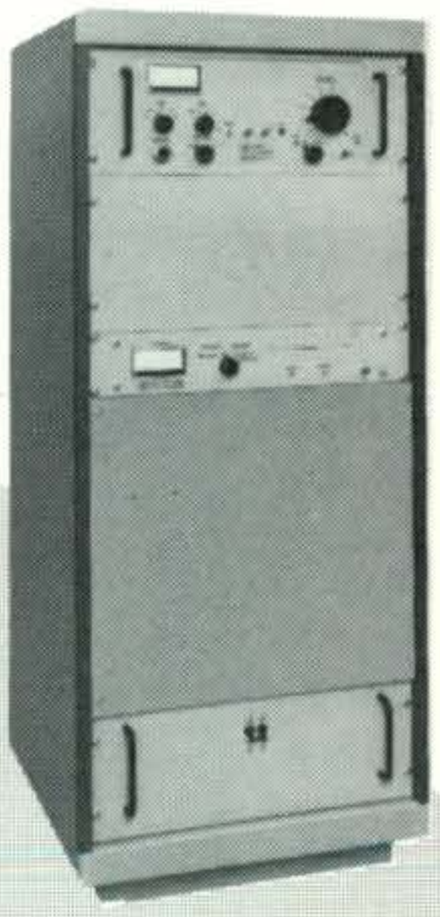
CABLE SIRAD
TELEX 978-368
PHONE (716) 458-3733

SSB RECEIVER
FSN 5820-971-8531



SR-150
10KW SSB/ISB
TRANSMITTER

AN/URC-79
1KW SSB
TRANSCEIVER



AN/FRT-91
1KW ISB TRANSMITTER

SR-808
SELECTIVE CALL

R-1883/URR ISB RECEIVER

SR-1650
DIGITAL TELEPHONE LINE
REMOTE CONTROL

AN/URC-77
150W SSB TRANSCEIVER

Savoy

$3.75
Postpaid in U.S.A.

TYPE 900 A

TYPE 901

BASSETT

High efficiency mobile and portable antennas for all amateur bands, CAP, MARS, CB, SECURITY, PUBLIC SERVICE, MARINE, AND GOVERNMENT USE.

- 2-6-10-15-20-40-75
- Identical size, cost, and appearance
- FULLY ADJUSTABLE TO FREQUENCY IN FIELD
- Low weight, low drag, high strength fiberglass
- Polished chrome brass standard ⅜-24 thread
- High gain collinear on 2 meters

MODEL DGA-2M

$29.50 postpaid in U.S.A.

HIGH ACCURACY CRYSTALS
FOR OVER 30 YEARS

Either type for amateur VHF in Regency, Swan, Standard, Drake, Varitronics, Tempo, Yaesu, Galaxy, Trio, Sonar, Clegg, SBE, Genave.

Quotes on request for amateur or commercial crystals for use in all other equipments.

Specify crystal type, frequency, make of equipment and whether transmit or receive when ordering.

BASSETT VACUUM TRAP ANTENNA SYSTEM

Complete packaged multi-band antenna systems employing the famous Bassett Sealed Resonators and Balun from which air has been removed and replaced with pure helium at one atmosphere. Operating bands are indicated by model designation.

MODEL DGA-4075	$59.50
MODEL DGA-204075	$79.50
MODEL DGA-2040	$59.50
MODEL DGA-152040	$79.50

BASSETT VACUUM BALUN

The famous sealed helium filled Balun . . . employed with the DGA Series Antenna Systems. Solderless center insulator and easily handles more than full legal power while reducing unwanted coax radiation. Equipped with a special SO-239 type coax connector and available either 1:1 or 4:1.

MODEL DGA-2000-B . . . $12.95
Postpaid in U.S.A.

CONTACT YOUR DISTRIBUTOR OR WRITE FOR DATA

Savoy Electronics, Inc.

P.O. Box 5727 - Fort Lauderdale, Florida - 33310

Tel: 305-563-1333 or 305-947-9925

4 GOOD REASONS WHY YOU
SHOULD BUY YOUR VOM FROM "THE BIG T"

1 TUCKER SELLS **THE WORLD'S FINEST VOM** - The Weston 660 series VOM are completely drop-proofed, custom ruggedized with self-storing carrying handle, pluggable circuit boards, external calibration and the highest quality components. Six models to choose from, all temperature compensated.

MODEL 660

2 **YOU CAN TRADE-UP** at a later date - or use your surplus instruments as trade-ins.

Model 666 VOM Solid-state circuit tester designed specifically for semiconductor circuit trouble shooting.

3 **IT'S EASY.** At Tucker one letter or phone call (on our special toll-free number) allows you to complete the deal. You can use your Bank Americard, Master Charge or American Express. Tucker will ship on P.O.'s, M.O., checks or COD.

4 **IT'S SAFE.** If for any reason you change your mind within 30 days, return your purchase and get your money back. This guarantee does not affect the normal WESTON guarantee of quality.

DC HIGH-VOLTAGE PROBE extends voltage range as high as 50KV. OPTIONAL $23.75

OPTIONS
Protective meter flap $4.50
Leather Carrying Case $19.50

RF PROBE
allows measurements to 50 MHz. OPTIONAL **$19.50**

RANGES FOR 660, 661, 662, 663: DC Millivolts 0-250; AC/DC volts 0-2, 5/10/50/250/500/1000/5000; VAC output 0-2.5/10/50 and 250; DC microamps 0-50; DC Milliamps 0-1/10/100/500; DC Amps 0-10; Ohms Rx1 (0-2K) 20Ω center, Rx10 (0-20K) 200Ω center, Rx100 (0-200K) 2000Ω center, Rx1000 (0-2 Meg) 20KΩ center and Rx10K (0-20 Meg) 200KΩ center; dB scales −10 to +10/+2 to +22/+16 to +36/+30 to +50/+36 to +56,

PRICES:	**660** (2% DC & 3% AC accuracy)	**$ 68.00**
	661 (1% DC & 2% AC accuracy)	**$ 76.50**
	662 (overload protection version of 660)	**$101.50**
	663 (overload protection version of 661)	**$110.00**
	666 (VOM solid state circuit tester)	**$139.00**

Send your Check, M.O., Bank Americard No., Master Charge No., American Express No. to the address below. Add $2.75 for shipping. Residents of California, New Jersey, Illinois and Texas add 5% sales tax. Call or write for your **Free** Weston 660 series brochure.

TUCKER
ELECTRONICS · COMPANY

P.O. Box No. 1050
Garland, Texas 75040

FOR RUSH ORDERS CALL TOLL-FREE 800-527-4642 (In Texas call 214-348-8800)

hy-gain

REPEATER LINE

All you need to know about 2 meter mobile antennas!

263 Special no-hole trunk lip mount. 3 db gain. 130-174 MHz. 5/8 wave. 16′ coax. DC ground. Base matching coil for 52 ohm match. 17-7 ph stainless steel whip.

264 High efficiency, vertically polarized omnidirectional roof top whip. 3 db gain. Base matching coil for perfect 52 ohm match. DC ground. Coax and connector furnished.

265 Special magnetic mount. 3 db gain. Performance equal to permanent mounts. 12′ coax and connector. Base matching coil for 52 ohm match. 17-7 ph stainless steel whip. DC ground.

Rugged, continuously loaded, flexible VHF portable antennas. Completely insulated with vinyl coating. Bend at all angles without cracking or breaking. Cannot be accidentally shorted out.

723N With UHF connector.

269 With 5/16-32 base for Motorola HT; Johnson; RCA Personalfone; Federal Sign & Signal; and certain KAAR, Aerotron, Comco and Repco units.

723A With BNC connector.

260 Commercial duty, 1/4 wave, claw mount, roof top whip. Precision tunable to any discrete frequency 108-470 MHz.

261 Same as above, with 18′ coax and connector.

262 Magnetic mount whip, 108-470 MHz. 52 ohm match. Complete with coax and connector.

263

264

265

723N

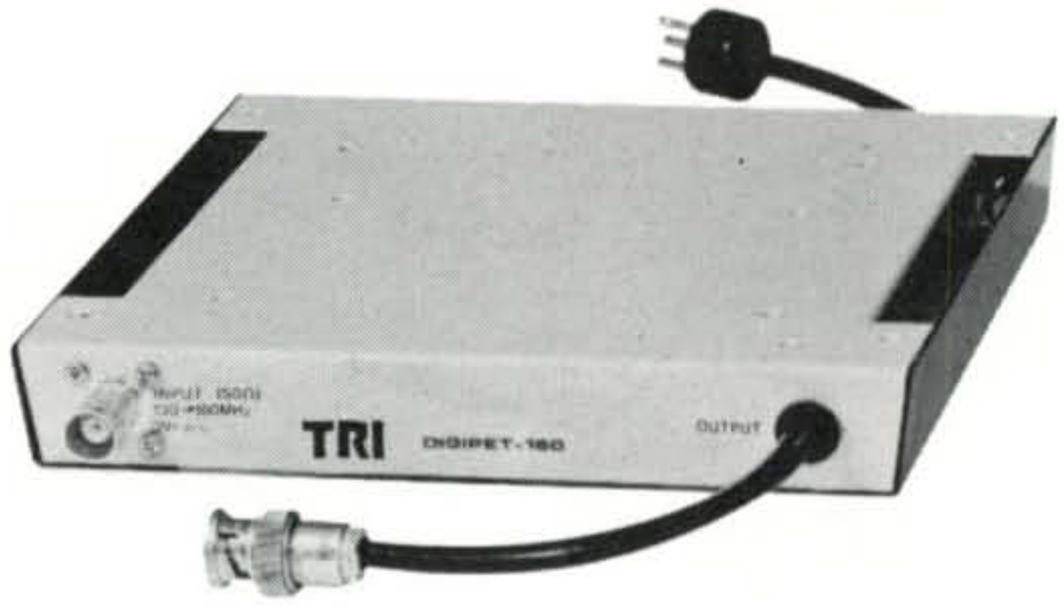
For prices and information, contact your local Hy-Gain distributor or write Hy-Gain.

hy-gain

Hy-Gain Electronics Corporation; 8601 Northeast Highway Six; Lincoln, NE; 68507; 402/464-9151; Telex 48-6424
Branch Office and Warehouse; 6100 Sepulveda Blvd.; #322; Van Nuys, CA; 91401; 213/785-4532; Telex 65-1359
Distributed in Canada by Lectron Radio Sales, Ltd.; 211 Hunter Street West; Peterborough, Ontario

OUR DIGIPET 60 IS A GENERAL-PURPOSE FREQUENCY COUNTER WITH A RATING OF 1 kHz TO 60 MHz.

(PLUS 130 MHz TO 160 MHz)



Perfectly designed for the radio amateur who wants quality, accuracy *and* economy.

If you operate around the 50 MHz band, we can offer you the Digipet 60—it measures a range of 1 kHz to 60 MHz—and it costs less than $300.

However, if you operate up around 140 MHz, you'll want the Digipet 160 converter. It costs an additional $50 and, mated-up with the Digipet 60, measures the critical range from 130 MHz to 160 MHz.

Its AC or DC operable with complete overload protection, plus being stable (aging rate: 1 part in 10^6/week), small (7" deep x 2½" high), sensitive (50 mVm's), flexible (five numerical-tube digits) and accurate (resolves to 1 kHz or 1 Hz, depending on gate time selected).

Write *immediately* for more information.

T.R.I. CORPORATION
505 West Olive Avenue • Sunnyvale, CA. 94086 • (408) 733-9080

How to win the fist fight... with CW equipment from HAL.

The economical HAL 1550 keyer.

The easy-to-use 1550 keyer is your answer if you're looking for an electronic keyer that lets you send accurate CW effortlessly. Send from 8 to 60 WPM with conventional, iambic, and dot memory operation. Operates with dual or single lever keys. The optional 1550/ID automatically sends "DE" followed by your station call. For fast, accurate CW, order the HAL 1550/ID or 1550 today.

Price: 1550/ID, $95; 1550, $75; ppd USA. Air shipment, add $3.

ID-1A repeater identifier. Commercial quality, low price.

The HAL ID-1A brings the radio amateur a commercial-quality repeater identifier that complies with FCC ID requirements. It has a unique read-only-memory that you can easily reprogram yourself. Capacity of the ROM is 39 dots, dashes and spaces. TTL IC's assure immunity from noise and temperature. ID intervals available: 3, 6, 12 or 24 min. Specify call.

Price: $115, ppd USA. Air shipment, $3.

Send perfect CW every time with the MKB-1.

A complete Morse keyboard. Code speed variable from 10-60 WPM with variable dot-to-space ratio (weight). All solid-state, featuring computer-grade components. Complete alphanumeric and punctuation keys, plus an optional "DE-call sign" key factory programmed for you. Includes built-in speaker/oscillator monitor.

Price: $290 Assembled, $199 Kit, ppd USA. Without ID, $250 Assembled, $170 Kit. Air shipment, $5.

CW—and RTTY on one keyboard! The HAL DKB-2010.

All solid-state. Type out CW at 8-60 WPM. Adjustable dot-to-space ratio (weight). Complete alphanumeric keys, plus 11 punctuation marks. Five standard two-character keys, 2 shift keys, break-for-tuning key, 2 three-character function keys, and a "DE-call sign" key. We'll program your call right into the DKB-2010. Plus complete RTTY capabilities. Built-in three-character buffer. Optional 64 or 128 key buffer also available.

Price: $425 Assembled, $325 Kit, ppd USA. 64 key buffer $100, 128 key buffer $150. Air shipment, $10.

HAL Communications Corp.
Box 365, Urbana, Illinois 61801
Telephone: (217) 359-7373

Enclosed is $_____ for: ☐ DKB-2010 ☐ MKB-1 ☐ 1550 ☐ ID-1A
Please specify ☐ Assembled ☐ Kit ☐ Options _____
Please send me more information on the following HAL products . . .
☐ DKB-2010 ☐ MKB-1 ☐ 1550/1550 ID ☐ ID-1A
☐ Complete HAL catalog

Name _____ Address _____ Call Sign _____

City/State/Zip _____

Illinois residents add 5% sales tax. C

save $50 to $500

on a "design-it-yourself" antenna package from Henry Radio. Simply put together the package you want . . . consisting of an antenna, a rotator, a tower, 100 feet of rotator control cable and 100 feet of coax cable. We will quote you a money saving price that's sure to please. Thousands have benefited from this program since it was started five years ago. You can also!

The Tristao MM-40 with accessories shown

For many years Henry Radio has been providing a beam-antenna tower program for amateurs who wanted an efficient but economical package. Thousands have benefited from this offer in the past. Now Henry Radio has restyled and updated its program to allow the amateur to design his own package at savings even greater than in the past!

WHY BUY FROM HENRY RADIO? Over 40 years experience. No finance charges if paid with-in 90 days. Low interest contracts-8%/yr add on (14% annual rate) - as long as 24 months 10% down or trade-in down payments. Good used equipment. Nearly all makes and models of amateur radio equipment. Our used equipment carries a 15 day trial, 90 day warranty and may be traded back within 90 days for full credit towards the purchase of NEW equipment. Also GREATER SAVINGS!!! Write for information. We export all over the world so inquiries are invited.

ANTENNAS			
HYGAIN	TH2 Mk3	2 element, 3-band beam	109.95
	TH3 Jr.	3 element, 3-band beam	119.95
	DB10-15A	10 and 15 meter beam	129.95
	HyQuad	2 element, 3-band Quad	169.95
	203BA	3 element, 20 meter beam	149.95
	TH3 Mk3	3 element, 3-band beam	169.95
	204BA	4 element, 20 meter beam	169.95
	TH6 DXX	6 element, 3-band beam	199.95
MINI	B-24	2 element, 4-band beam	62.95
	RK-3	Third element for B-24	36.95
	HQ-1	Hybrid 4-band Quad	79.95
MOSLEY	TA-32 Jr	2 element, 3-band, Low power	73.15
	TA-33 Jr	3 element, 3-band, Low power	115.30
	TA-32	2 element, 3-band beam	103.00
	MP-33	3 element, 3-band, medium power	111.95
	TA-33	3 element, 3-band beam	164.95
	CL-33	3 element, 3-band beam	176.90
	TA-36	6 element, 3-band beam	213.10
	CL-36	6 element, 3-band beam	216.45
	CL-20	5 element, 20 meter beam	306.00
SWAN	TB-2A	2 element, 3-band beam	119.95
	TB-3HA	Heavy duty TB-3A	159.95
	TB-4HA	Heavy duty, 4 element, 3-band beam	189.95
	MB-40H	2 element, 40 meter beam	179.95
WILSON	M510	5 element, 10 meter beam	130.00
	DB-32	3E/20M, 2E/15M beam	157.00
	M-420	4 element, 20 meter beam	187.00
	M-615	6 element, 15 meter beam	163.00
	M-240	2 element, 40 meter beam	297.00
	DB-65	6E/15M, 5E/20M beam	257.00
	DB-54	5E/20M, 4E/15M beam	299.00
	M-620	6 element, 20 meter beam	387.00
	DB-52	5E/20M, 2E/40M beam	520.00
ROTATORS			
CDR		AR-22R Rotator	44.95
CDR		CD-44 Rotator	89.95
CDR		HAM-II Rotator	149.95
HyGain		400 Rotator	229.95
TOWERS		Free Standing Aluminum Towers	
ASCOM	7-40	7 square foot load, 40 foot tower	252.00
	7-50	7 square foot load, 50 foot tower	362.00
	9-60	9 square foot load, 60 foot tower	561.00
	12-40	12 square foot load, 40 foot tower	332.00
	15-50	15 square foot load, 50 foot tower	532.00
TRIEX	MW-35	35' Self supporting, crank-up tower	224.00
	W-51	51' free standing, crank-up tower	591.00
	TM-240	40' crank-up sky needle tower	672.00
	TM-358	58' crank-up sky needle tower	1186.00
	LM-470D	70' Self supporting, crank-up tower	2297.50
	TM-370	70' motorized sky needle tower	2848.00
TRISTAO	MM-40	40' crank-up tubular tower	219.95
	MB-10	Optional free standing base	55.95
	MF-50	Optional raising fixture	69.95
	MRB-80	Optional rotor base	129.95
	MA-490	49' crank-up tubular tower	411.10
	MAF-40	Optional raising fixture	134.95
	MARB-40	Optional rotor base	281.80
	MA-660	66' crank-up tubular tower	1218.95
	MAF-60	Optional raising fixture	159.95
	MARB-66	Optional rotor base	545.95
	CZ-454-FS	54' free standing crank-up tower	534.95
	CZ-471-FS	71' free standing crank-up tower	1043.95
CABLE			
	4 conductor rotator cable (AR-22R only)		.10/ft
	8 conductor rotator cable		.25/ft
	RG-58 A/U Coax		.07/ft
	RG-8/U Coax		.25/ft
ACCESSORIES			
	HyGain BN-86 Balun		15.95
	Triex TB-2 Thrust Bearing		24.75
	Unadilla W2AU Balun		12.95

Literature on the above items is available on request.
All prices will be quoted FOB Los Angeles, California
All prices are subject to change without notice.

Henry Radio

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

For the best RTTY, you need all the help you can get.

It's all right here.

The HAL ST-6 terminal unit has been hailed by experienced RTTY amateurs. Its immunity to interference and noise is the talk of the RTTY world as the best in the business. In fact, we built it to highest standards — but kept the price in a range that you can afford.

The features of this unit tell the story of why it's so popular: Auto-start operation, separate input filters for each shift, an antispace feature, and switch selection of 850 and 170 Hz shifts are standard. An extra discriminator for a 425 Hz shift is available as an option. A space-saving special power transformer is part of the package; it includes windings for low voltage and loop supplies, and a 115/230 VAC primary. Dual-in-line IC's are mounted in sockets for ease of testing and replacement. Seven G10 epoxy glass boards with reliable wiping contacts hold all circuitry. Tuning is read from a 1 ma. panel meter which, at the flick of a switch, serves as a loop current readout. Other visual indicators display AC power on, Mark, and Space conditions. Two other lamps indicate whether the ST-6 is in the receive or standby mode. For maximum safety, a three-wire grounding cord and grounding outlet for the printer are included. The power supply card contains easy-to-replace clip-in fuses. The ST-6 is available factory assembled and aligned, or in kit form. The PC boards and cabinet only are also available.

A popular option designed to plug right in to the ST-6 is HAL's AK-1 AFSK oscillator. Available assembled or in kit form, the AK-1 is an AFSK oscillator that demonstrates stability and reliability. It provides switch selection of 170 Hz and 850 Hz shift using standard AFSK tones. The AK-1 may also be mounted in its own cabinet for use as an independent unit. Frequencies are set by 15-turn trimmers for ease of accurate tone adjustment. The AK-1 operates on 12 VDC, or directly from the ST-6 power supply.

If you're ready for the very best RTTY at an attractive price, look into the HAL ST-6 TU, the 425 Hz discriminator, and the AK-1 AFSK oscillator. They'll give you all the help you need. Order yours today!

Prices:

Assembled:
$310 — ST-6 Terminal Unit
$350 — ST-6/425 Hz Disc.
$350 — ST-6/AK-1
$390 — ST-6/425 Hz Disc/AK-1

Kit Form:
$147.50 — ST-6 Terminal Unit
$ 35.00 — ST-6 Table or Rack Cabinet
$ 29.00 — 425 Hz Discriminator
$ 29.00 — AK-1 AFSK Unit

All prices postpaid, USA. For air shipment add $4 for the ST-6 kit or cabinet, $1 each for the 425 Hz kit or the AK-1 kit, $10 for the assembled ST-6 with any options.

HAL Communications Corp.
Box 365, Urbana, Ill. 61801
Telephone: (217) 359-7373

☐ Enclosed is $_____ for the following items: ☐ ST-6 Assembled, ☐ With all options; ☐ ST-6/425 Hz Disc; ☐ ST-6/AK-1; ☐ ST-6 kit; ☐ ST-6 Cabinet; ☐ 425 Hz Disc kit; ☐ AK-1 kit.

☐ Charge to my Master Charge

_____

BankAmericard # _____

Master Charge/Interbank # and Exp. date _____

☐ Please send me the HAL catalog.

_____
Name

_____
Address

_____
City/State/Zip

C

Illinois residents add 5% sales tax.

An SSTV Keyboard

BY DR. ROBERT SUDING,* WØLMD

THE SSTV Keyboard is a keyboard device used to generate alphameric information on an SSTV screen through a direct digital process. The SSTV operator merely types out the message into the keyboard's memory, and the keyboard's logic circuits scan out the message at the standard SSTV rates and output the picture to the SSTV monitor and/or transmitter.

General Design

The keyboard is a relatively complex mixture of logic elements. The unit consists of 7 main sections: keyboard, memory, write clock, read clock, character generator, D/A converter, and SSTV Voltage Controlled Oscillator. The basic block diagram is shown in fig. 1.

The central element in the SSTV keyboard is a single IC, the character generator, which is a Signetics 2513 ASCII encoded character generator. This IC contains the thousands of transistors needed to produce a dot pattern for 64 different characters when a given character is requested. It is called an ASCII character generator because characters are requested by using a standard Teletype and computer code called ASCII. The 64 characters are represented by a 2^6 code, or the logic levels of 6 bit lines. The ASCII code now becomes the determining element in selecting a keyboard.

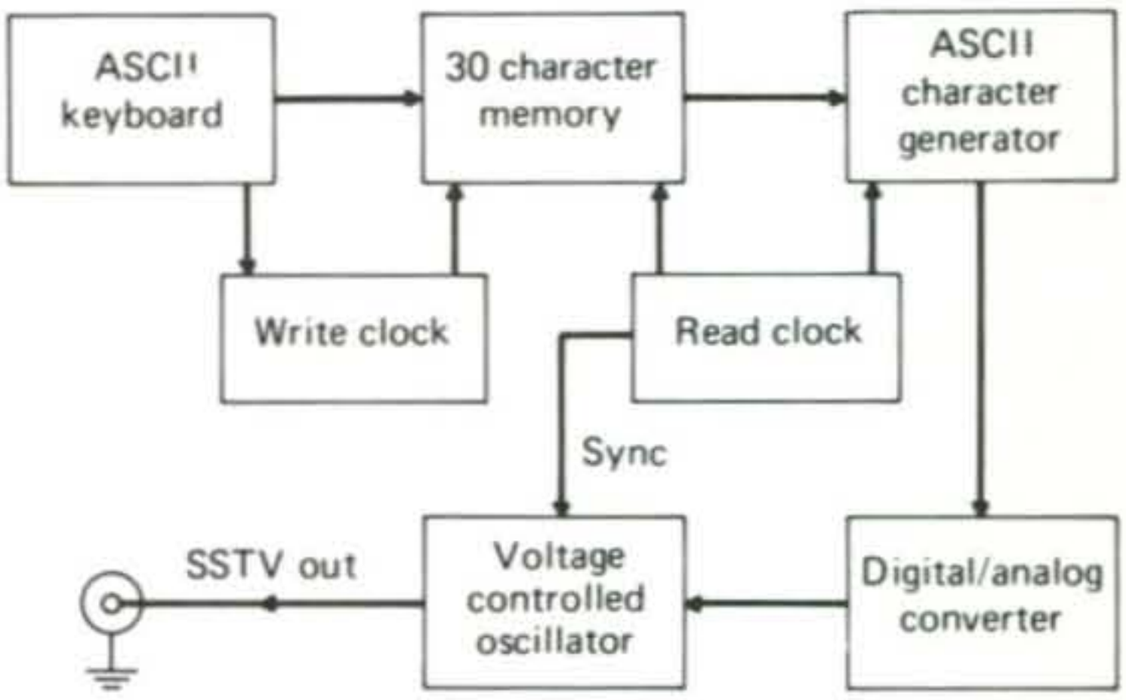


Fig. 1—Block diagram of the WØLMD SSTV keyboard.

The screen character format has been organized so that 30 characters are shown on the screen. More characters could be shown, as well as less, but 30 fits very well into the 120-lines-per-SSTV frame format. More characters would make the letters smaller and more difficult to see. Fewer characters will restrict the informational content of the screen. The character aspect ratio of 5 × 7 (width to height) should also be maintained to give the viewer a head start in character recogniton. Finally, an analysis of the maximum call sign length set the constraint that each line should be 6 characters

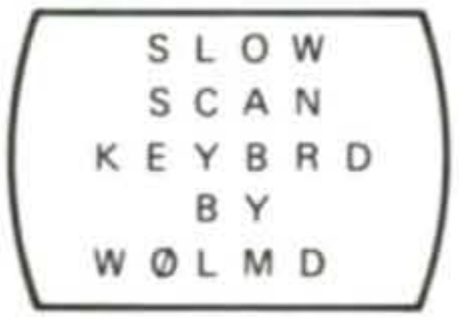


Fig. 2—Screen format is five rows of six characters per row.

long. With an approximately 5 × 7 aspect ratio, the result was 5 rows of 6 characters per row, as shown in fig. 2.

The characters are made by lightening, or darkening, the desired spots as the beam

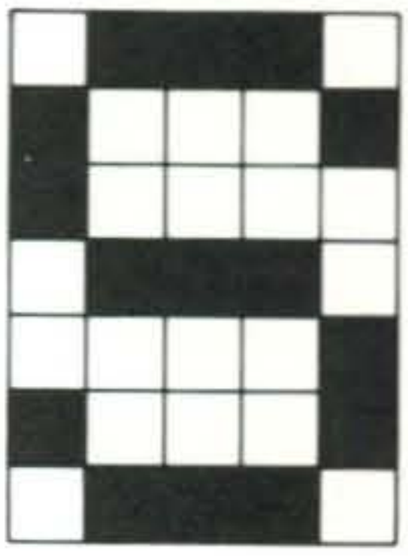
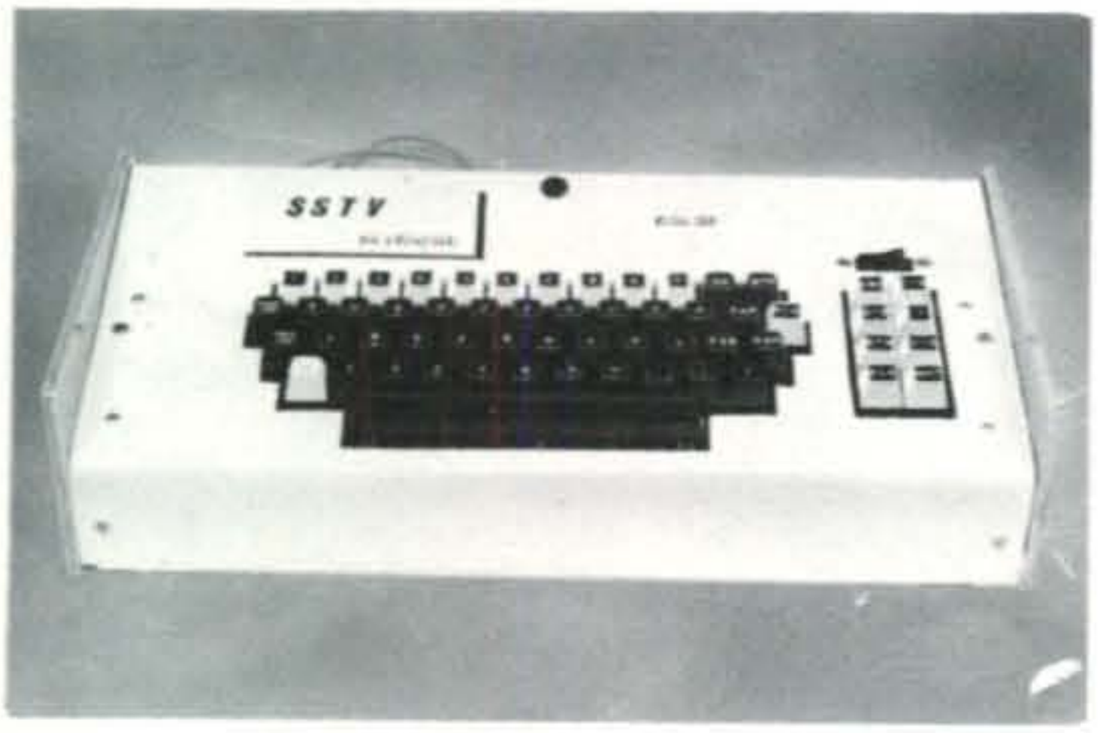


Fig. 3—"5 × 7" dot matrix used in character display.

*370 South Queen St., Lakewood, CO 80226.



Prototype WØLMD SSTV keyboard.

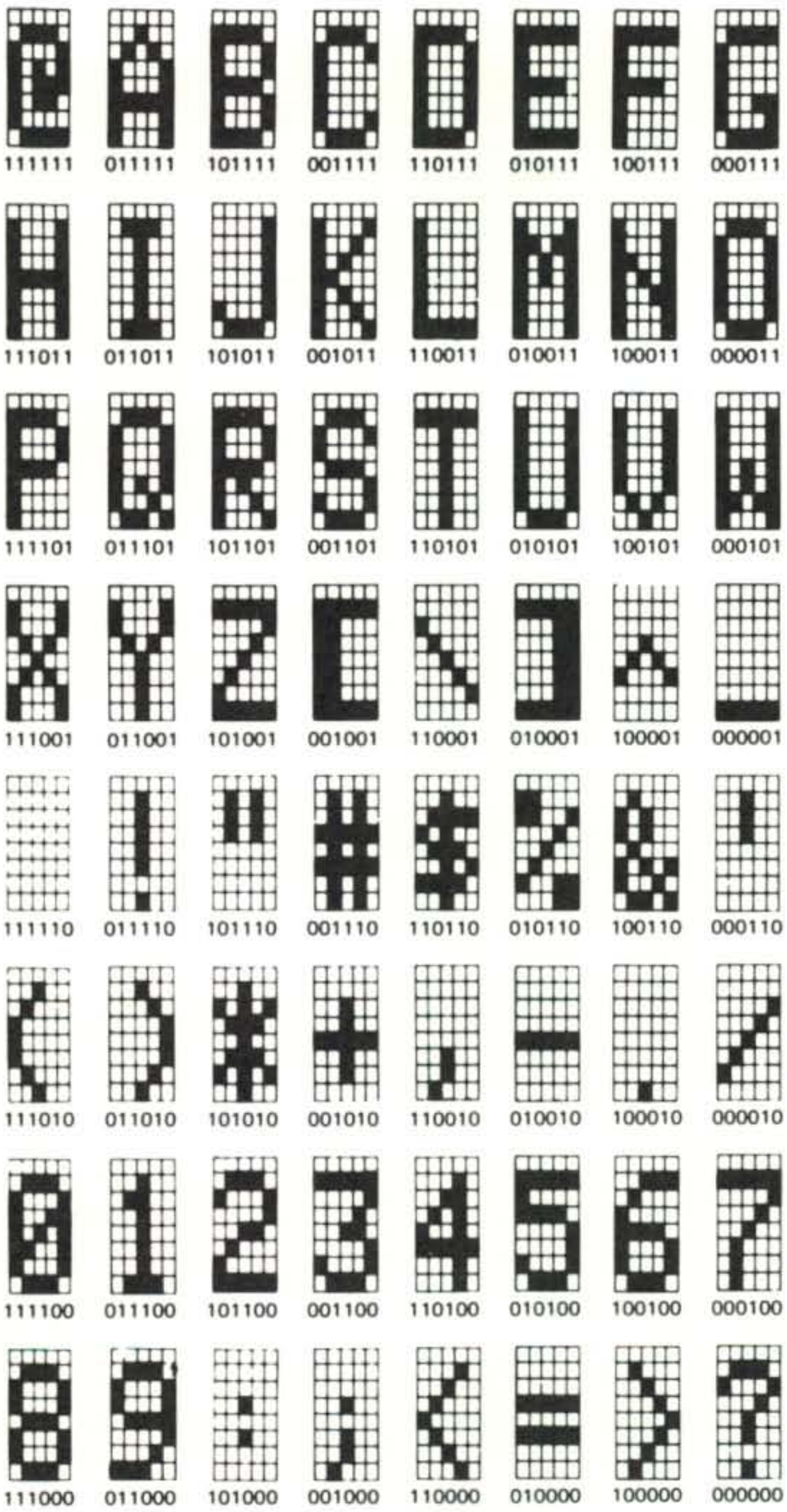
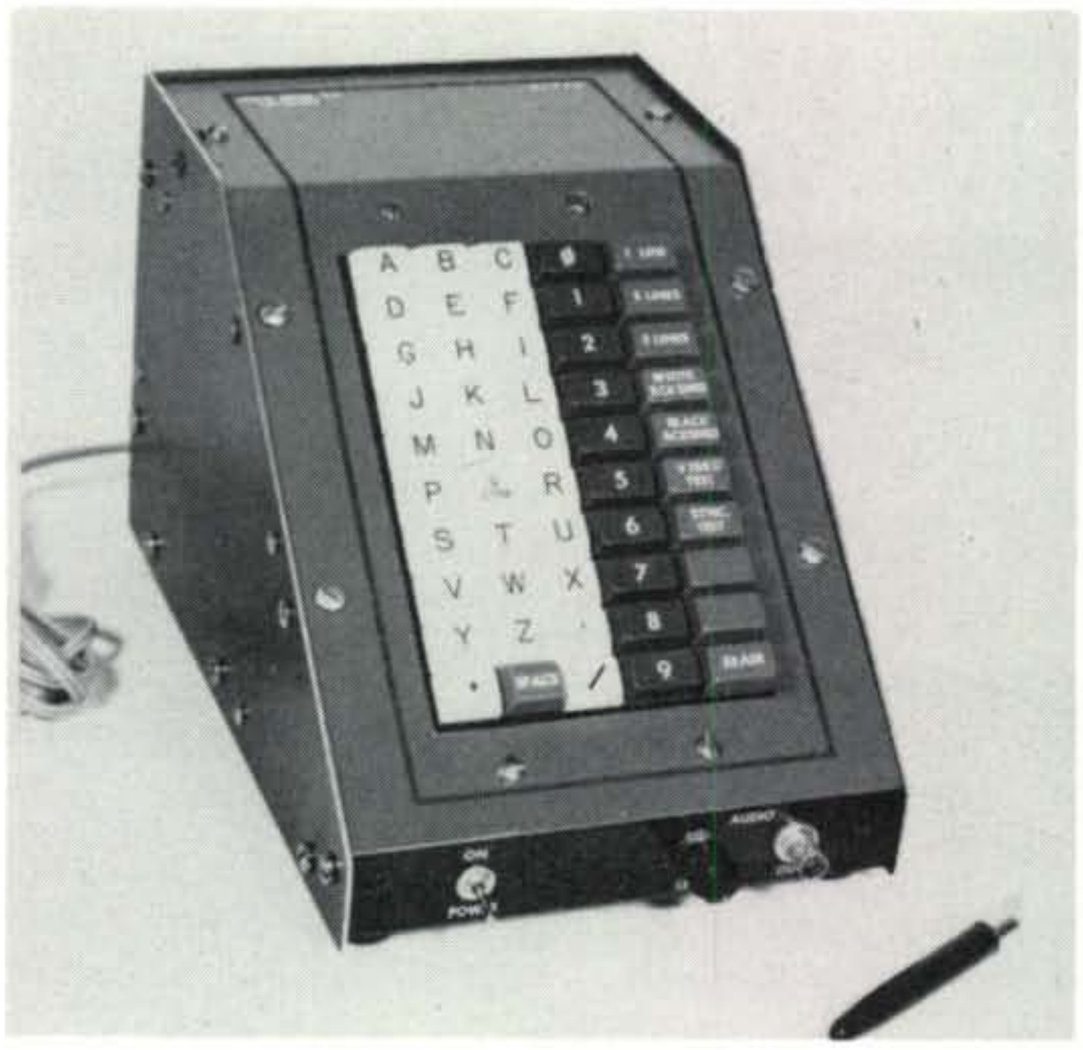


Fig. 4—Character dot patterns with required digital encoding.

traces over each spot. Figure 3 shows the letter "S" built by darkening the appropriate dots in a 5 × 7 dot martix. Spacing between character columns and rows must also be considered. The scan blocking, the 30 character count, and the SSTV line and frame timings determine the read clock design.

This project is designed to present the constructor with different options such as what style keyboard to use and even whether to operate on 60 Hz or 50 Hz SSTV standards. The keyboard that I used is a surplus unit with 57 Microswitch keys and came with an unknown code encoder. The keyboard construction is treated as two separate sections: the keyboard and ASCII encoder, and the other functional sections. Since the circuitry of the keyboard uses so many different logic circuits and many IC's that the builder may be unfamiliar with, I would suggest that the



SSTV keyboard built by K7YZZ using an old stock market keyboard.

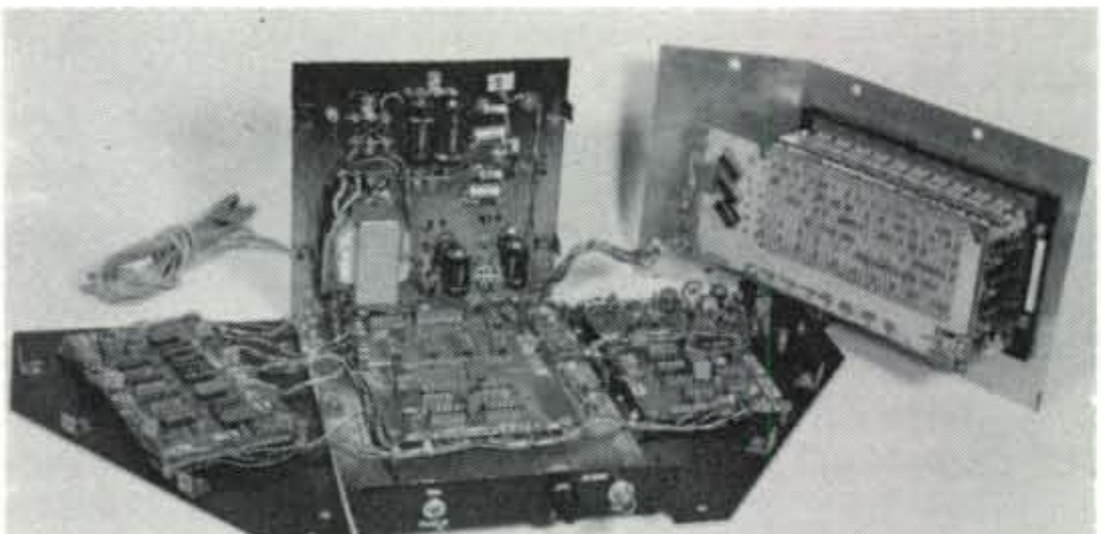
recommended PC boards be purchased. The keyboard may be handwired, however, as many have already done.

Keyboard

The ASCII keyboard is a set of 40 to 60 keyswitches attached to some kind of digital encoding scheme. This encoder produces the appropriate 6 bit ASCII character code as each character key is depressed, as shown in fig. 4.

The keyboard itself may take on many different designs. The easiest way to build this SSTV keyboard would be to get an already ASCII encoded keyboard and then couple this to the main PC board. However, each keyboard has its own peculiarities, and some interfacing problems will have to be solved by the builder.

A more reliable way to build this unit would be to obtain a "surplus" computer keyboard having normally open mechanical keyswitches, stripping the wiring, and rewiring utilizing the simple ASCII encoder scheme shown in fig. 5. I have done this with the keyboard offered "as is" for $7



Inside of K7YZZ's version of the keyboard.

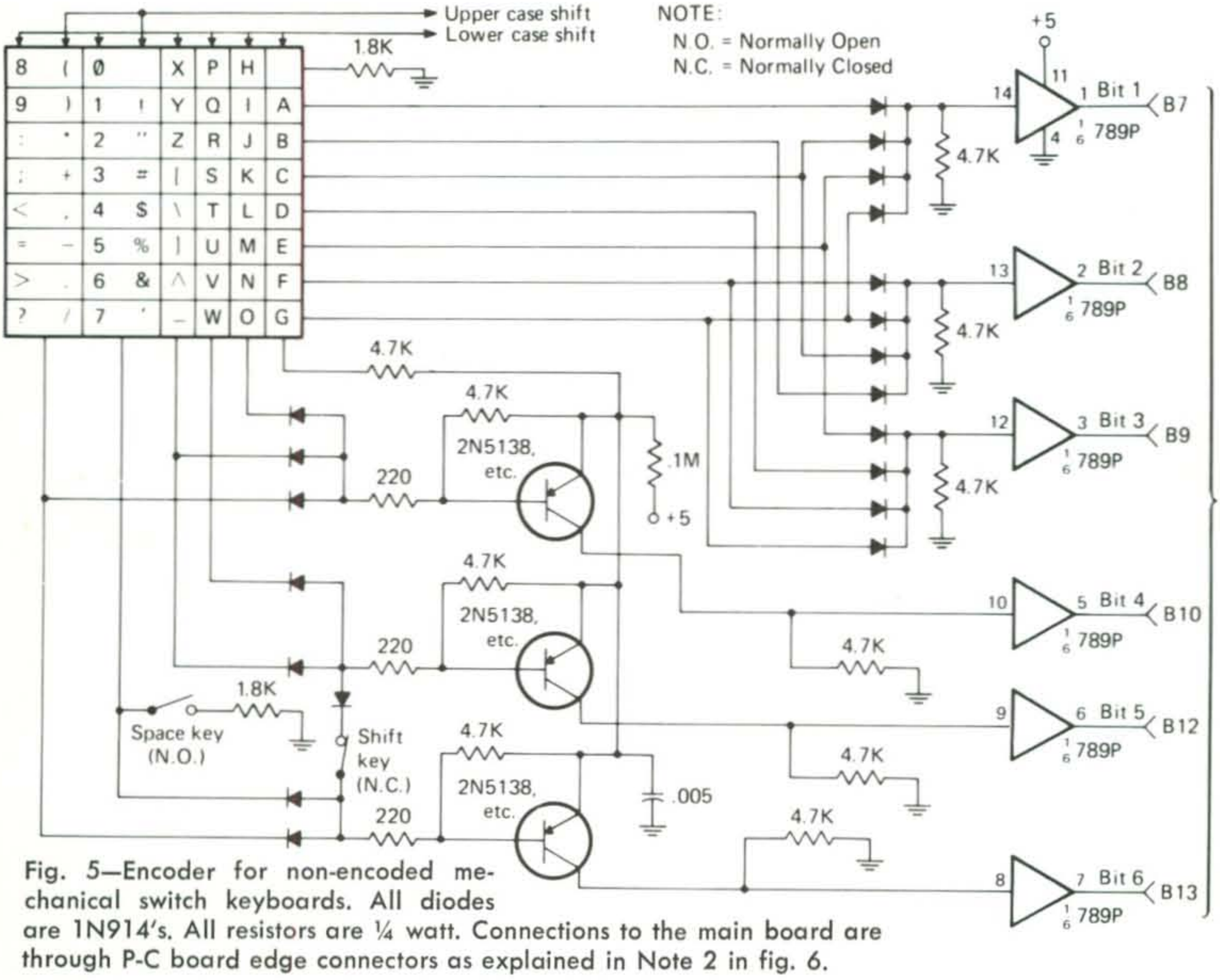


Fig. 5—Encoder for non-encoded mechanical switch keyboards. All diodes are 1N914's. All resistors are ¼ watt. Connections to the main board are through P-C board edge connectors as explained in Note 2 in fig. 6.

from Meshna with no problems.[1]

With the exception of the ASCII keyboard itself, and the power supply, the circuit of the SSTV Keyboard is shown in fig. 6.

Memory

The memory section consists of four IC's which are called RAM (Random Access Memory) IC's. These are 7489's, each containing 64 bits, arranged in 16 addresses, 4 bits to each address. Since the screen design of the keyboard calls for 30 characters, each character consisting of a 6 bit ASCII code; a "series- parallel" connection of the four 7489's results in 32 potential RAM addresses, 8 bits wide; 30 by 6 of which are used.

The RAM's have the ability to be written to (have bits set on or off) and to be read from without destroying the setting of the bits being read. The addresses being written to or read from may be in any order, hence the title "random access."

[1]Those requiring assistance in making already encoded ASCII keyboards operational are invited to write to Gordon P. (Phil) Howlett, WA9-UHV, 4012 Carmelita Blvd., Kokomo, Ind. 46901. Include as much detailed information as possible, and a business sized s.a.s.e.

Write Clock

The write clock is a functional set of IC's which controls the sequence of operations involved in entering the desired set of 30 characters into the keyboard's character memory. The write clock keeps track of the next character slot which may be written to, and controls the "erase" sequence such that all blanks are produced on the screen. Writing (or entering a new character) takes place without visibly interrupting the constantly reading sequence. The write clock uses a scheme of "write time priority interrupt" which allows the write clock to take over addressing control of the memory for about 30 μs whenever a character is entered on the keyboard. The action is so fast that a message may be constantly entered without interrupting output except that new sets of characters will appear as their character slots are subsequently scanned.

Read Clock

The read clock is another functional set of IC's which controls the selection of the correct character as the scanning beam crosses the screen, as well as the appropriate dot

selection as the various characters are requested. The design of the read clock must ultimately result in the frame rate and line rate of the SSTV station, so both 50 and 60 Hz read clocking operation has been designed into the system. The keyboard can be used for fast scan by changing the read clock to a much faster rate, and changing the output circuitry.

D/A and VCO

The output of the character generator logic is a group of 0 or 1 (0 volts or +5 volts) pulses. These pulses then pass through a simple digital to analog converter and a voltage controlled oscillator so that the SSTV horizontal and vertical sync pulses are derived from the read clock timings to produce the desired 7 ms and 50 ms bursts of 1200 Hz SSTV sync. A simple grey scale generator may be mixed with the character generator sections by using selected read clock timings.

Detailed Theory of Operation

A complete explanation of the design theory involved in the SSTV keyboard is going to obviously be rather extensive. For most people, even many who are interested in building the unit, it is unneeded. The design utilizes complex components, yet there are very few adjustments, and a complete frequency alignment (the only adjustments) can be accomplished in a few minutes.

I feel that the best technique to be utilized with this article would be to demonstrate the utilization of the SSTV keyboard, give the general design details and the various schematics, and show adjustments and operation. Those who wish to build the keyboard may write to me for a complete theory of operation printup, or they may order the PC boards, with which a printup will be included. The reproduction and mailing cost of the detailed theory of operation alone will be $1.00. While the additional information is not necessary for successful completion, it should prove invaluable in case of trouble.

Construction

The PC board design is quite complex in itself. Since the board was to be "single sided," a number of jumpers (or 0 ohm resistors) were required. All required jumpers must be put into the correct spots, obviously.

Another problem which seems to be afflicting the IC art is bad IC's, even from "reputable sources". I would recommend that you analyze your construction capabilities and then order parts according to one of the appropriate following plans.

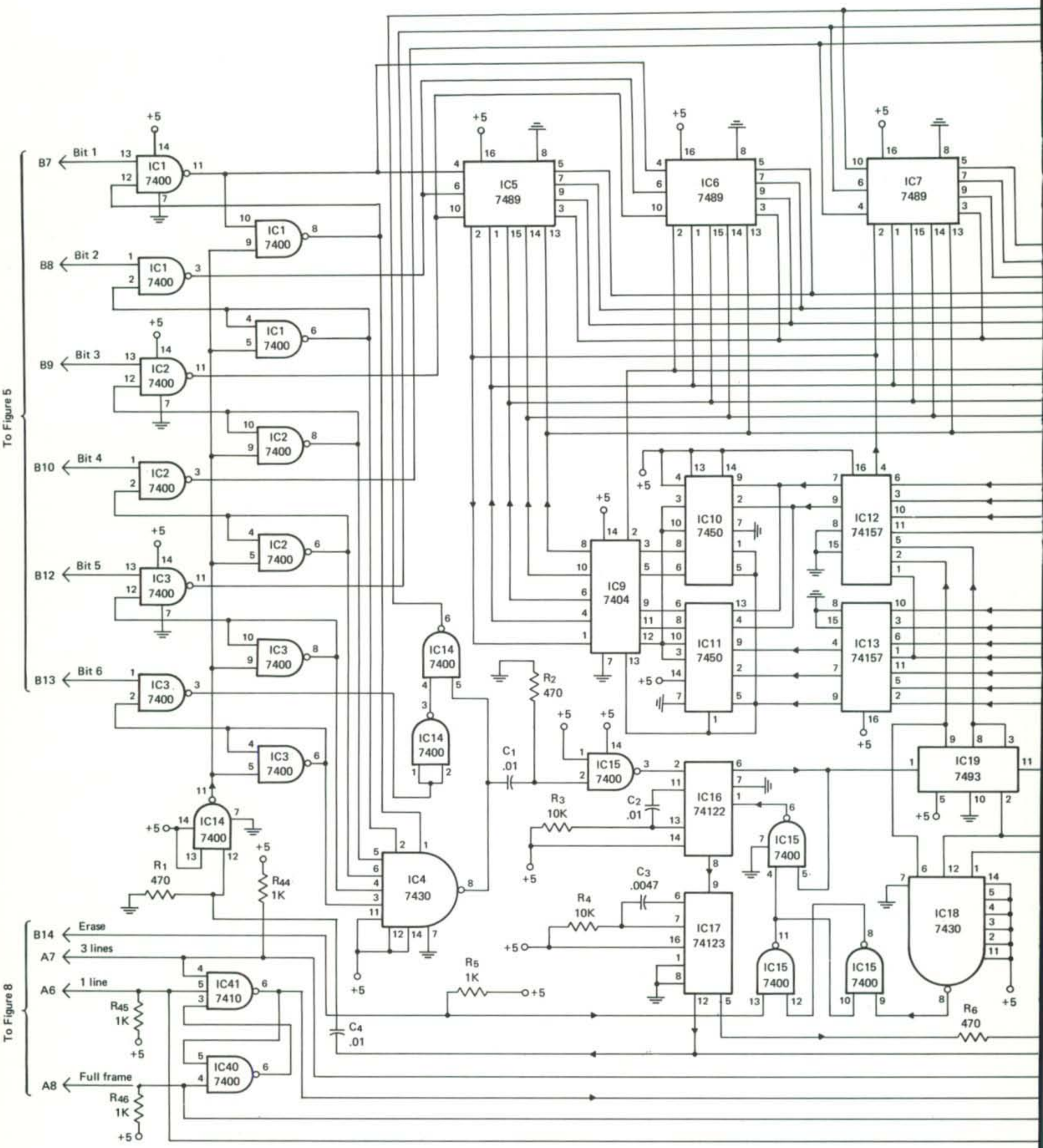
If you are totally unfamiliar with IC theory and operation, use IC sockets on all IC's, order "tested" IC's and even spares, and be sure to use the recommended cut and drilled PC boards. Find a knowledgeable friend to help you.

Those who have some degree of IC experience can get standard IC's with spares,

Keyboard has just been powered up. Erase key has been depressed, and the SSTV screen is clearing.

18 characters (including blanks) have been entered into the SSTV keyboard memory so far.

All 30 characters have now been entered into memory. The characters will be continuously outputed until either the erase key is pressed or power is shut off.



NOTES:

1. This schematic drawing applies only to units built from circuit boards designed by K7OLO and W8OZA and may not be accurate for other versions of the circuit.

2. Leads leaving this schematic for connection to the keyboard power supply etc. are designated by the symbol ⟶. The letter and number contained therein indicate the connector and assigned pin number. The 22 and 15 pin edge connectors are designated A and B respectively.

3. On IC29 connect the jumper from pin 3 to pin 9 when operating from a 60Hz source of supply and from pin 3 to pin 8 when operating from a 50Hz source.

4. Capacitor values are in microfarads. Resistor values are in ohms unless otherwise indicated.

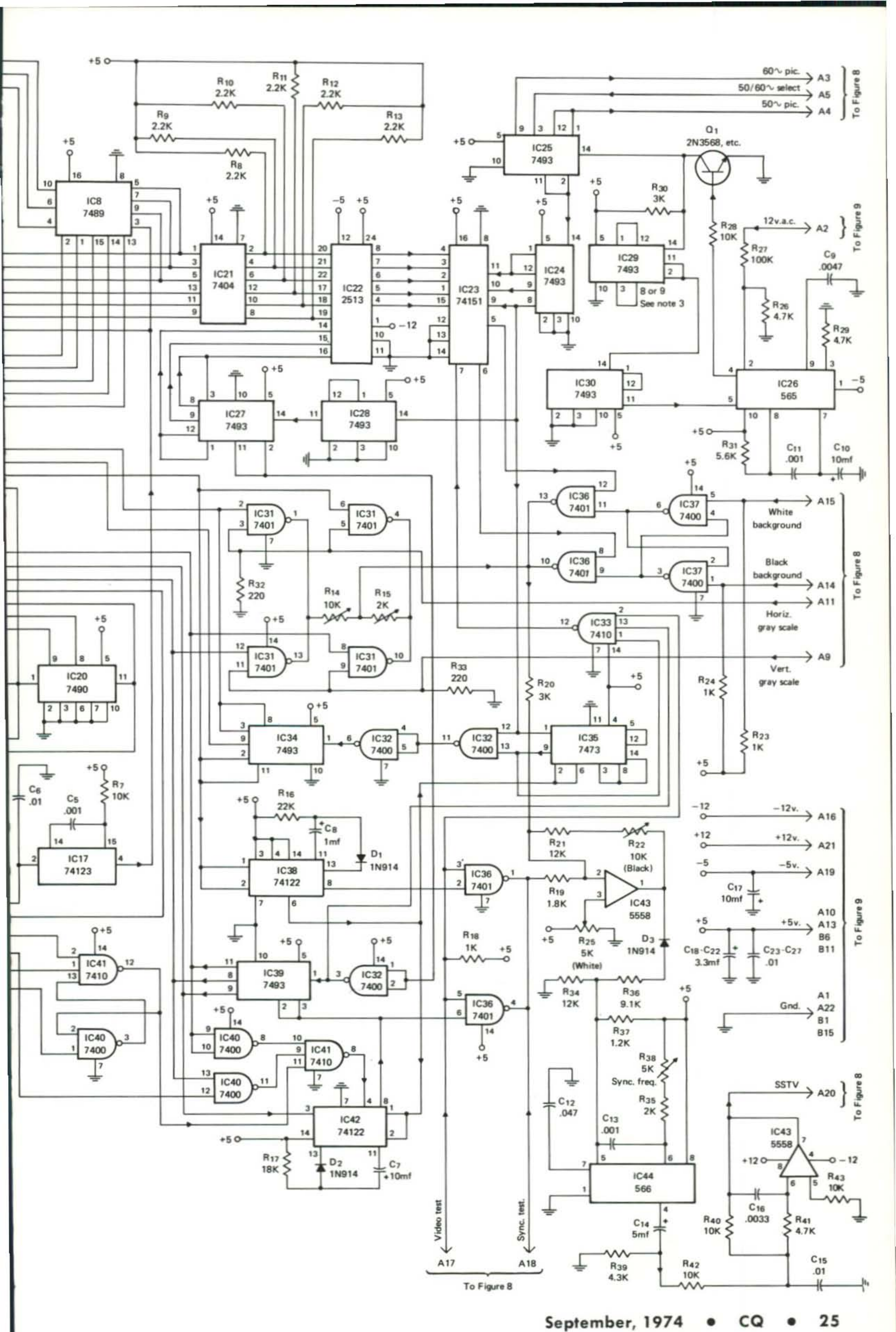
5. Capacitors C_{17} thru C_{27} are for the suppression of noise spikes and may be omitted if no difficulties are encountered.

6. Logic flow direction is denoted by the symbol ⟶.

7. Principal functions of various IC's in this circuit are as follows:

IC's 1, 2 and 3	= Catch registers
IC4	= Any bit OR
IC5, 6, 7, and 8	= Memory
IC9, 10 and 11	= 6 to 5 bit converter
IC12 and 13	= Read/Write multiplexer
IC14	= Catch register reset and 6 bit modifier
IC15	= Erase latch
IC16	= 30μs write clock
IC17	= Write time interrupt and strobe gen.
IC18	= Erase latch reset
IC19 and 20	= Write character counter
IC21	= Character generator driver
IC22	= Character generator
IC23	= Character generator dot multiplexer
IC24, 27 and 28	= Read character dot counters
IC25, 29 and 30	= Read clock countdowns
IC26	= Read clock PLL
IC31	= Gray scale gate
IC32	= Read clock holdoff gate
IC33	= Dot holdoff
IC34	= Read horizontal character counter
IC35	= Read clock holdoff
IC36	= D/A gates
IC37	= Backaround latch
IC38	=Horizontal sync singleshot
IC39	= Read vertical row counter
IC40 and 41	= Line select latch
IC42	= Vertical sync singleshot
IC43	= D/A and LPAF
IC44	= SSTV VCO

Fig. 6—Schematic of the WØLMD SSTV keyboard. All resistors are ¼ watt. This schematic and those of figs. 5, 8 and 9 have been drawn to match P-C boards available from W8OZA and K7OLO.


+5
R10 2.2K
R11 2.2K
R12 2.2K
R9 2.2K
R13 2.2K
R8 2.2K
IC8 7489
IC21 7404
IC22 2513
IC23 74151
IC24 7493
IC25 7493
IC27 7493
IC28 7493
IC29 7493
IC30 7493
IC26 565
Q1 2N3568, etc.
R30 3K
R28 10K
R27 100K
R26 4.7K
C9 .0047
R29 4.7K
R31 5.6K
C11 .001
C10 10mf
60~ pic.
50/60~ select
50~ pic.
A3
A5
A4
To Figure 8
12v.a.c.
A2
To Figure 9
8 or 9
See note 3
IC20 7490
IC31 7401
IC32 7400
IC33 7410
IC34 7493
IC35 7473
IC36 7401
IC37 7400
IC38 74122
IC39 7493
IC40 7400
IC41 7410
IC42 74122
IC43 5558
IC44 566
IC17 74123
R32 220
R14 10K
R15 2K
R33 220
R20 3K
R24 1K
R23 1K
R16 22K
C8 1mf
D1 1N914
R21 12K
R22 10K (Black)
R19 1.8K
R18 1K
R25 5K (White)
D3 1N914
R34 12K
R36 9.1K
R37 1.2K
R38 5K Sync. freq.
R35 2K
C12 .047
C13 .001
C6 .01
C5 .001
R7 10K
C18-C22 3.3mf
C23-C27 .01
C17 10mf
R17 18K
D2 1N914
C7 +10mf
C14 5mf
C16 .0033
C15 .01
R39 4.3K
R42 10K
R40 10K
R41 4.7K
R43 10K
-12
+12
-5
White background
Black background
Horiz. gray scale
Vert. gray scale
Gnd.
-12v.
+12v.
-5v.
+5v.
SSTV
A15
A14
A11
A9
A16
A21
A19
A10
A13
B6
B11
A1
A22
B1
B15
A20
A17
A18
Video test
Sync. test.
To Figure 8
To Figure 9

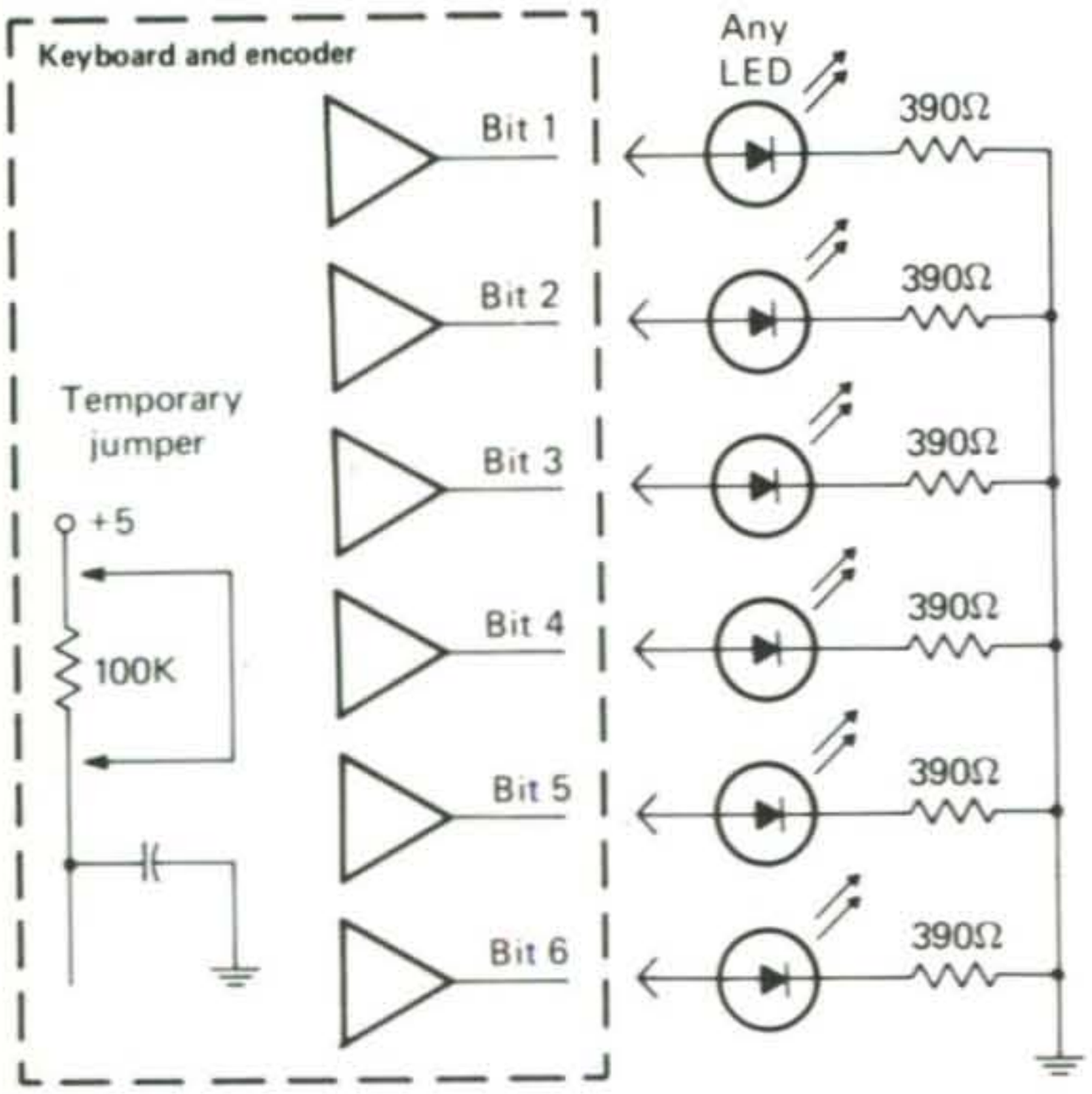


Fig. 7—Temporary keyboard and encoder test circuit.

and use the sockets and PC board route. A friend with a good triggered sweep d.c. oscilloscope will be helpful if a trouble spot arises.

People well versed in IC theory and design aren't going to listen to my advice anyway, so they can do whatever they want to do. There are many tricks and stunts that the serious designer can add to this basic unit, such as a different character generator IC, selectable screen character count and size, and complete station functional control from the keyboard. Those who know no fear can even get a character generator set that gives upper and lower case characters plus the Greek alphabet.

Seriously, the construction sequence is to complete the keyboard and case, then the power supply, and finally the IC sections. Be sure to make leads sufficiently long to allow easy access to everything in case of trouble. Keyboards are notoriously difficult to fix due to their usual extremely compact design. Unless you have a compelling need to miniaturize, do yourself a favor, keep it big!

Initial Operation

If you are like me, you'll ignore this section and power up the whole thing at once (often referred to as "the smoke test"). Those of you who are more cautious than I should test subsections for proper operation until everything works perfectly. Do not proceed until preceeding subsections are operating perfectly.

The first item to be made operational is the power supply. This unit has no adjustments. Measure the voltages and be sure that all voltages are within 10% or you may have a bad regulator IC. After this, make absolutely sure that power supply polarities and connections are correct, or you may wind up with quite a supply of dead 14 legged IC spiders.

SSTV Output Testing

If you have used IC sockets, plug in only the IC's for the sections sequentially listed in this section. The first section to make operational would be the D/A and VCO section, comprising IC's 23, 33, 36, 37, 43, and 44. Connect a frequency counter to the output, hold down the SYNC TEST key and adjust R_{38} for 1200 Hz output. Next, tap the WHITE BACKGROUND key and adjust R_{25} for 2300 Hz while holding down the VIDEO TEST key. Finally, to set the black limit, tap the BLACK BACKGROUND key and adjust R_{22}

[*Continued on page 79*]

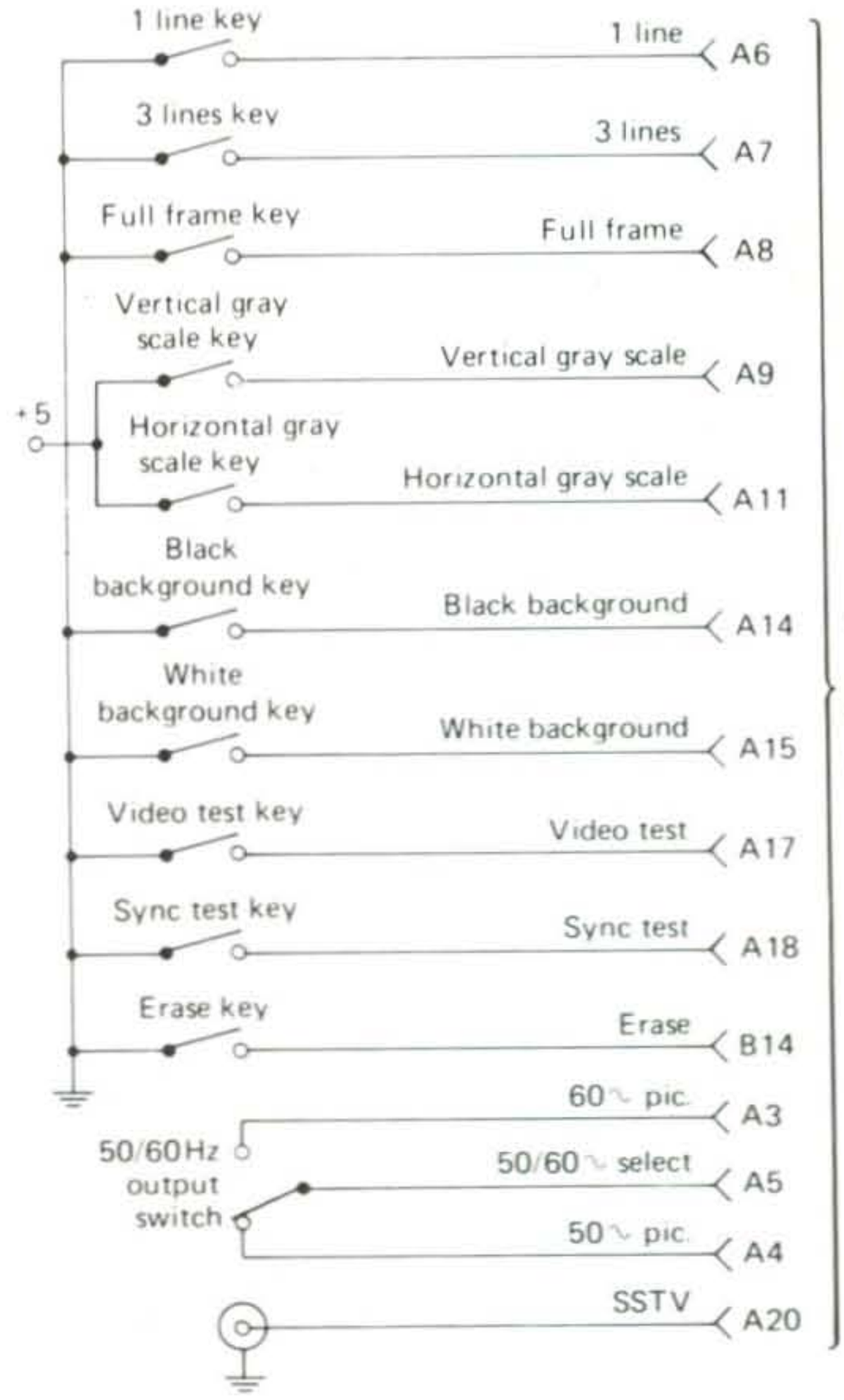


Fig. 8—Miscellaneous keyboard functions. Connections to the main board are through P-C board edge connectors as explained in Note 2 in Fig. 6.

Short-Term Predictions For Ionospheric Propagation

BY THEODORE J. COHEN,* W4UMF

AMONG the questions that I have been asked most often during my nearly twenty-five years as CQ's *Propagation Editor is "How can radio amateurs make their own day-to-day forecast of h.f. propagation conditions?" While there is still no convenient way to "do it yourself", this article by Ted Cohen discusses a method he uses with considerable success. He relies on daily observed values of solar flux and magnetic conditions which are available to the scientific community, but not yet available on a real time basis to the radio amateur or other users of the h.f. spectrum. Based on his success with this method, Ted urges that this and similar forecast data be broadcast daily on WWV so that it would be conveniently available. Incidently, the short-term prediction method described in this article is similar to the method used by this Editor in the preparation of the weekly MAIL-A-PROP and DIAL-A-PROP forecasts.*

—W3ASK

A RECENT article[1] indicated that the current sunspot cycle, Number 20, may exhibit a prolonged decay in sunspot activity, with the forthcoming sunspot minimum not expected until sometime after 1975, and possibly as late as the summer of 1977. While high-frequency DX propagation during the next several years of low solar activity is expected to be generally disappointing, short periods of high solar activity (lasting from one to several days) will occur; during these periods, conditions could improve immensely. Given this situation, then, the question is: "How will the radio amateur know when to expect improved band conditions?" Obviously, it is not desirable to have to monitor the bands constantly in an attempt to catch an occasional opening to an area of interest! What is needed is some method for making short-term ionospheric predictions.

In this paper we present a relatively simple method by which the individual radio operator can determine whether a particular path will open to a given area at a specified time of day and time of year. To be useful, however, the method requires that *timely* measurements of solar activity (solar flux) and magnetic field activity (solar particle radiation) be broadcast on WWV by the National Bureau of Standards.

While we will specifically examine 14 mHz short-path openings to specific areas of the world from the East Coast of the United States, it should be emphasized that the prediction method to be introduced can be applied to any band, and to any path, once the relationship between signal strength, and solar flux and solar particle radiation, is known.

The Ionosphere

Since this article is about ionospheric propagation, we begin by discussing the ionosphere. In our discussion, we draw from the work of Davies (1965), and Jacobs and Leinwoll (1969).

Region	*Altitude*	
D	30-55 miles	(50-90 km)
E	55-70 miles	(90-120 km)
F*	> 70 miles	(> 120 km)

*The F_2 layer, part of the F region, is found as high as 240 miles (400 km).

Table I — Regions of the Ionosphere

*8603 Conover Place, Alexandria, Va. 22308.

[1]Cohen, T. J., and Lintz, P. R., "The Sunspot Cycle—Analysis and Prediction," *CQ*, March '74, p. 24.

The ionosphere is that part of the atmosphere in which free ions exist in sufficient quantities to affect the propagation of radio waves. These ions are thought to be produced by solar ultraviolet light and soft X-rays. The degree of ionization, or "strength" of the ionosphere, is usually measured in terms of the electron density as a function of altitude. Table I shows the altitudes for the various regions of the ionosphere.

To the operator interested in contacting distant stations, the F_2 layer is most important, for it is this layer that controls the skip distance. For the F_2 layer, the electron density varies with the time of day, season, geographic position, and state of the 11-year (approximate) solar cycle. Perhaps most interesting is the relationship between the solar cycle and electron density. Wright (1962) has shown that with decreasing sunspot activity, the electron density decreases, and the maximum density is found at successively lower altitudes.

Also important to the DX'er is the D region, for to a first approximation, variations in electronic density in the D region control the ionospheric absorption, or weakening, of radio waves. The amount of absorption a wave undergoes in the D region is proportional to the length of the path in this region. Further, absorption appears to increase with increasing sunspot number.

Ionospheric Disturbances

Frequently there are periods during which the ionosphere is disturbed. The disturbances are due to solar flares which occur near some, but not all, sunspots. During flares, there is a sharp increase in the solar-ionizing radiation in the ultraviolet and soft X-ray portions of the spectrum. This produces greater electron densities in the D region, and hence, greater absorption.

Solar flares may also be accompanied by the emission of solar particles, or so-called "magnetic storm particles" (protons and electrons), which arrive at the earth some 20 to 40 hours after the occurance of the flare. The arrival of these particles results in ionospheric storms, magnetic storms and aurora borealis. The most prominent features of ionospheric storms are a reduction in the MUF (due to severe depressions in the electron density of the F_2 layer) and an increase in the D-region absorption; the overall effect is a narrowing of the usable radio spectrum. Magnetic storms, which accompany ionospheric storms, are disturbances in the earth's magnetic field which cause the field to fluctuate over wide limits. Magnetic disturbances, and their resultant effects on radio propagation, are most intense in the auroral zones. These zones are centered roughly around the north and south geomagnetic poles.

Ionospheric Predictions—Current Methods

Sudden changes in solar activity are extremely difficult to predict, as is the occurrence of a solar flare. To predict even the general conditions of the high-frequency bands at some point in the future, then, would seem difficult. It is to the credit of such investigators as Jacobs (monthly *CQ* predictions) that reasonably accurate predictions for ionospheric propagation can be made months in advance. It is also possible for Jacobs, using updated information (based primarily on the probable recurrence of geomagnetic and ionospheric conditions every 27-28 days, the approximate rotational period of the sun) to produce updated and more complete weekly forecasts which are available by telephone (Dial-A-Prop) or by mail (Mail-A-Prop). It should be noted, by the way, that these propagation forecasts

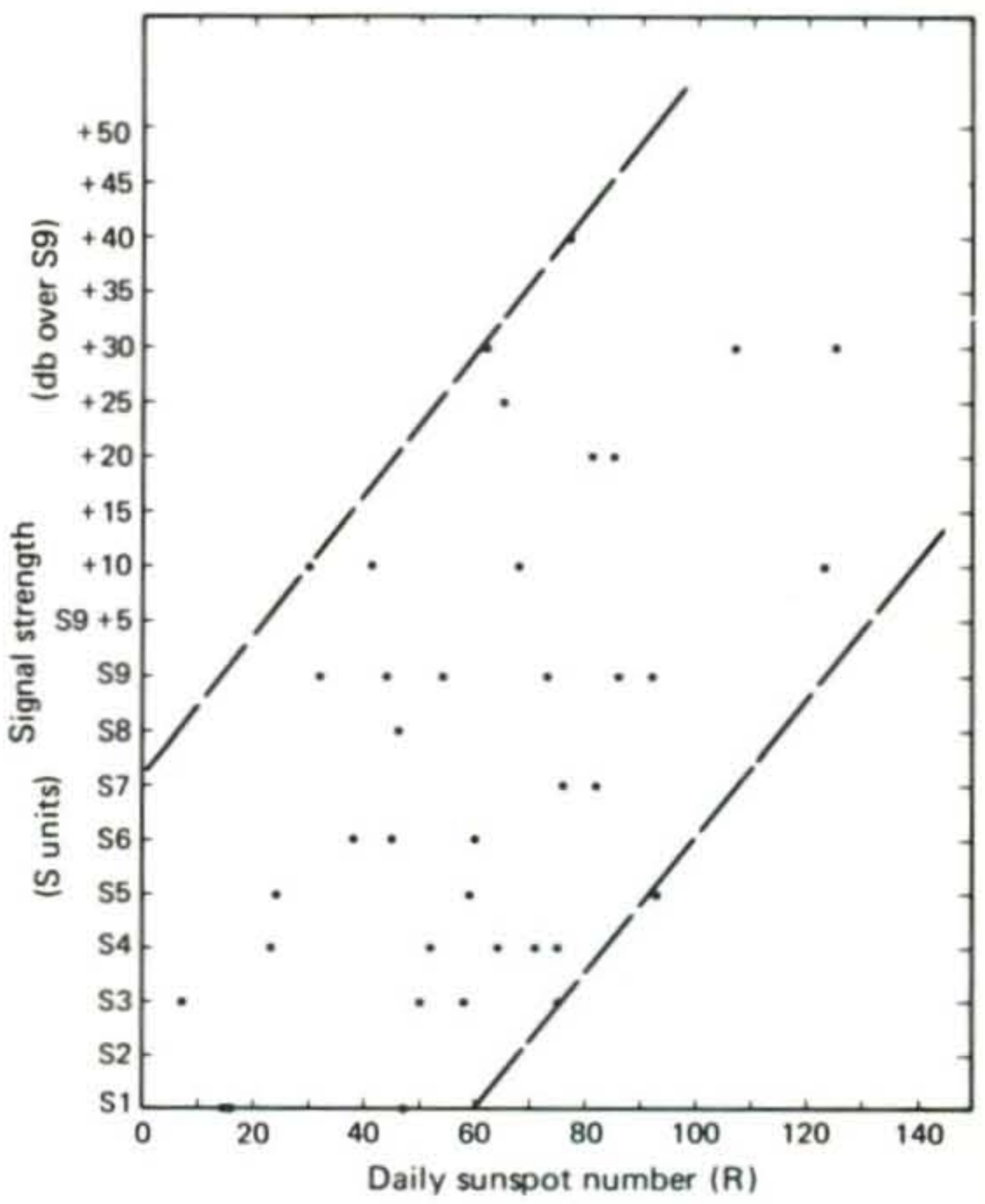


Fig. 1—Signal strength as a function of daily sunspot number *R*, Austrialia to East Coast USA (Virginia), 14 mHz short path, April/May 1972/1973, 1100-1300 GMT.

have been accurate better than 90% of the time! Finally, the most timely forecasts available to the radio operator today are those broadcast by WWV at 14 minutes after every hour on 2.5, 5.0, 10.0 and 20.0 mHz (Viezbicke, 1973). Unfortunately, these forecasts, while updated at six-hour intervals, refer only to the general quality of propagation along paths in the North Atlantic area. What is needed is some do-it-yourself method for determining if the 14 mHz band, for example, will open to Asiatic Russia (UA9) in the evening on a day in April, from information obtained early in the day *on that day in April*.

Band Conditions and the Daily Sunspot Number R

For some time, readers of the solar-observation column in the *West Coast DX Bulletin* (French, weekly publications) have observed the correlation between daily sunspot activity and propagation conditions on the high-frequency bands. In general, improved conditions are observed when sunspots are present on the visible disc of the sun. This observation is supported by the data of fig. 1, which shows a plot of signal strengths for Australian stations as observed at the author's station during the months of April and May, 1972 and 1973, between 1100 and 1300 GMT (short path). The equipment used by the author is shown in Table II. While a considerable spread in the data is observed, due primarily to the great variety of equipment used by the Australian stations logged, the *general trend* is toward increased signal strength at higher daily sunspot numbers. Apparently the increased D-region absorption which accompanies higher solar activity is more than compensated for by more efficient propagation paths. That is, with the F_2 layer generally at a higher level during periods of increased sunspot activity, the distance covered per "hop" increases, thus, fewer hops are required to traverse the distance to Australia (in this case), and the signal losses due to ground reflections (on the order of 6 db for a poorly conducting ground surface), and due to multiple passages through the D region (again, roughly 6 db per hop) are reduced.

Receiver:
Receiver Section of a Drake TR-3 Transceiver

Antennas:

Type	Manufacturer	Boom Length	Height
TA-33	Mosley	14 ft. (4.3 m.)	40 ft. (12.2 m.)
TA-33	Mosley	14 ft. (4.3 m.)	52 ft. (15.8 m.)
20M428C	Telrex	28 ft. (8.5 m.)	52 ft. (15.8 m.)

Table II — Equipment Employed at the Author's Station

It would appear, therefore, that sunspot counts, if made available on a day-to-day basis, might be useful for producing short-term propagation forecasts. The daily sunspot count, however, is not readily available, and further, is obtained in a rather subjective manner. If we are to make valid short-term predictions, though, it will be necessary to have a timely, objective measure of solar activity.

The Solar Flux

The sun is a source of radio-frequency radiation. These emissions are caused by a variety of phenomena in the solar atmosphere, including the random collisions of electrons; the noise from the quiet sun is of the latter type. The flux of solar radio noise at the Earth's surface is monitored at a number of observatories, and is published by the World Data Center A for Solar-Terrestrial Physics in the *Journal of Geophysical Research* (Lincoln, monthly publication). Solar flux values are also broadcast in voice by WWV at 18 minutes after each hour (Viezbicke, 1973). The values published by Lincoln, and those broadcast by WWV, are determined by an observatory in Ottawa, Canada, at a frequency of 2800 mHz (10.7 cm wavelength).

That the solar flux measured at 2800 mHz is a good indicator of solar activity is demonstrated in fig. 2. It is obvious that increased solar activity results in increased solar flux, with the relationship between the two parameters approximately linear. Let us therefore adopt the solar flux as the measure of solar activity to be used in our short-term predictions, since it is not only a more objective measure of solar activity, but is also more readily available than is the daily sunspot number.

The Equivalent Range Index ap, and the Planetary Index Ap

If we are to make reliable short-term predictions, a measure of the effects produced by solar particle radiation is needed. The arrival of these particles in the atmosphere results in ionospheric and magnetic storms

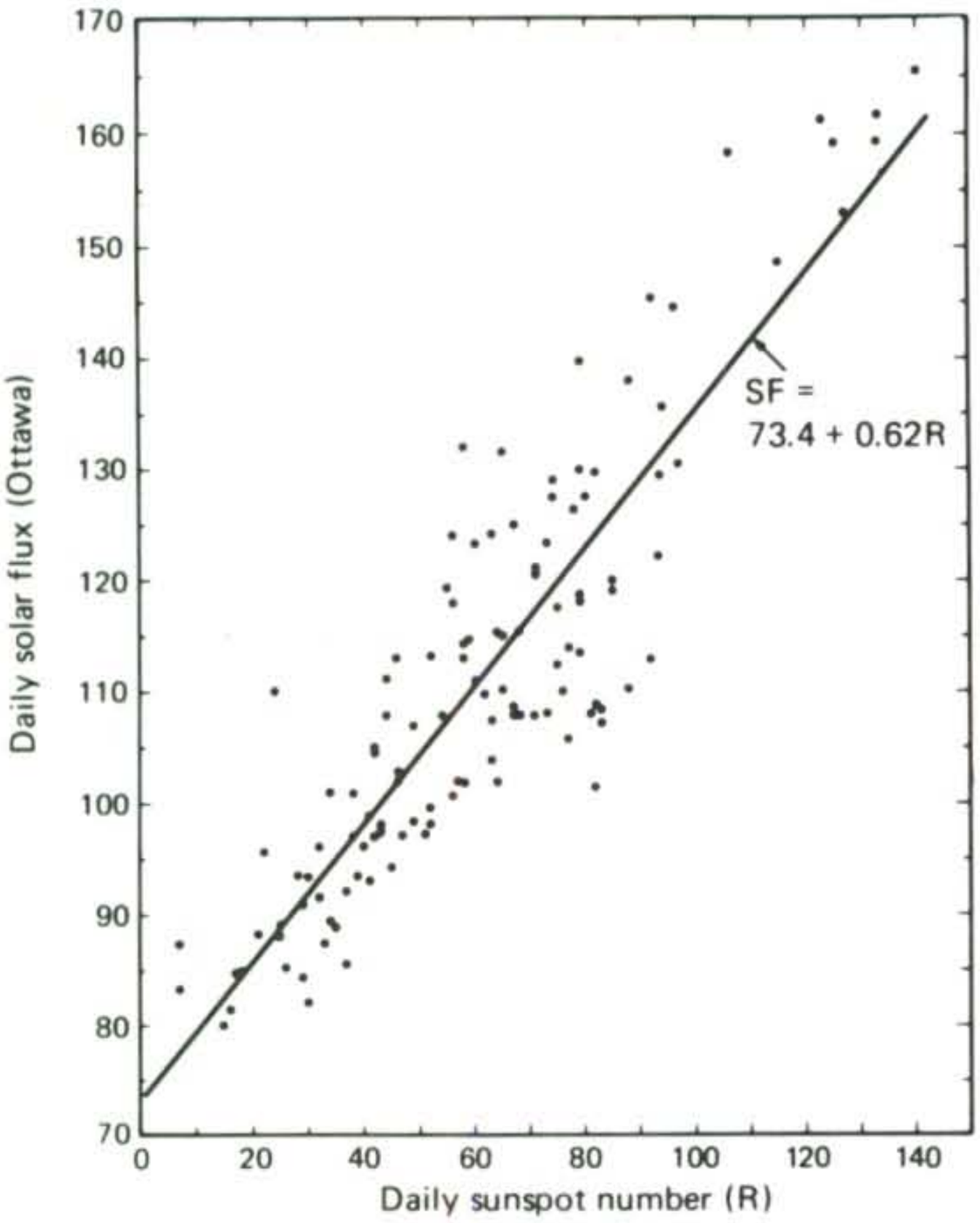


Fig. 2—Daily solar flux vs. daily sunspot number *R*, April-May 1972, 1973.

which produce signal fluctuations, fading and noise (static). The equivalent range index *ap* is designed to measure solar particle radiation by its magnetic effects. Higher index values, which indicate a greater influx of solar particles, can be correlated with weaker signals and greater signal fading. Although there are exceptions, an *ap* less than 10 indicates periods when the ionosphere is quiet (that is, little storm activity), while an *ap* greater than 20 indicates times when the ionosphere is usually disturbed. Because magnetic disturbances are most intense in the auroral zones, effects due to the arrival of magnetic storm particles are especially pronounced on signals which pass through the polar regions.

Measurements of *ap* are made at a number of observatories around the world, and are determined at three-hour intervals. Unfortunately, the worldwide averages of the *ap* values are not readily available to the public. The measure of solar particular radiation that is easily obtained on a day-to-day basis is the planetary index *Ap*.

The planetary index *Ap* is the daily average for the eight average three-hour *ap* indices obtained each day. The *Ap* index for the previous day is broadcast by WWV at 18 minutes after each hour, and the data are also published in the *Journal of Geophysical Research* (Lincoln, monthly publications).

Because the *Ap* values broadcast by WWV are not current, they may or may not indicate the ionospheric and magnetic storm conditions which exist at the time of broadcast. To prepare short-term predictions, we need the three-hour *ap* values, even if these values are from a single observatory. We can, however, use the *Ap* values to produce a *history* of circuit conditions as a function of solar particle radiation, since the data used in this study suggests 70% of the *Ap* and *ap* values for a given day to differ by 5 or less.

Short-Term Predictions—Method

The method proposed for making short-term ionospheric predictions is to display variations in signal strength for selected circuits as a function of the solar flux and the planetary index *AP*. Then, when current values for solar flux and the equivalent range index *ap* are broadcast by WWV, we can use (and refine) the previously-derived circuit-analysis charts to make short-term predictions for circuits of interest.

Data Analysis

To produce the circuit-analysis charts which follow, signal reports were first extracted from the author's log books for stations heard from the areas shown in Table III. The maximum signal strength observed on a given day was then categorized according to the scheme shown in Table IV. Employing this technique had the effect of smoothing the data, thereby minimizing effects produced by variations in the power, antennas, and locations used by the stations logged. The categorized signal strengths were then plotted as a function of the solar flux and the planetary index *Ap*. Preliminary results are shown in figs. 3, 5, 6 and 7. All of the circuit-analysis charts shown are for the 14 mHz (20 Meter) band. Again, however, the method employed can be applied to any band and path. Thus, while the circuit

	Prefixes	Years Analyzed	Months Analyzed	Times Analyzed (GMT)
Far East Asia	HM, JA, JD, KAG, KR6, VS6	1972, '73	Apr, May	1100-1400
Australia	VK1-8	1972, '73	Apr, May	1100-1300
Asiatic Russia	UA9	1971, '72 '73	Mar, Apr, May	0100-0330
Asiatic Russia	UA9	1971, '72 '73	Aug, Sep, Oct	0100-0330

Table III — Time Information

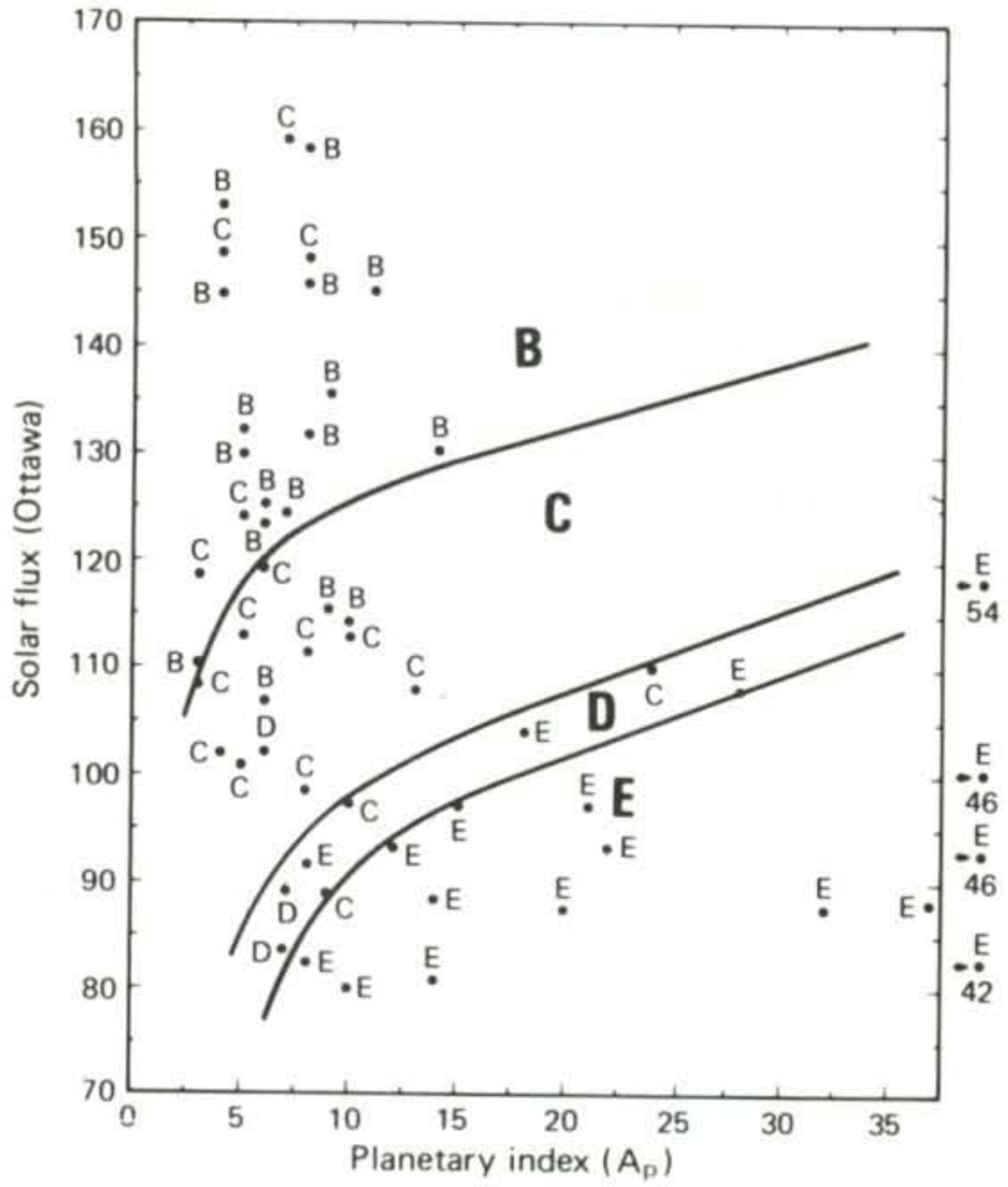


Fig. 3—Circuit analysis, far East Asia (HM, JA, JD, KA6, KR6, VS6) to East Coast USA (Virginia), 14 mHz short path, April/May 1972/1973, 1100-1400 GMT.

analyses shown may be useful to stations on the East Coast, they are meant primarily to illustrate the type of charts which can be produced using data which is available daily from WWV at 18 minutes after each hour.

Far East Asia (Figure 3)

The distribution of signal strength as a function of the solar flux and *Ap* index for the path between Far East Asia and the East Coast USA yields some interesting results. The contours of equal signal strength apparently dip more steeply for indices less than about 10 or 12; thus, small changes in the low *Ap* values can have a large effect on signal strength. Then too, the line separating the signal-strength areas for an open and closed band (D and E, respectively) is well defined. This appears to be a consequence of the fact that a significant portion of the path between the Far East and the East Coast is along the zone of maximum frequency of occurrence of overhead aurora (fig. 4). Thus, the Far East circuit (as well as other circuits with paths along the auroral zones) is expected to be far more sensitive to ionospheric and magnetic storms than is, for example, the Australian circuit. Of course, as we move west across the United States, absorption effects on the Far East path, caused by its position relative to the auroral zone, diminish.

Signal Strength (r)	Symbol	Signal Quality
$r > S9 + 30$ db	A	Excellent opening, exceptionally strong, steady signals
$S9 < r \leqq S9 + 30$ db	B	Good opening, moderately strong signals with little fading or noise
$S3 < r \leqq S9$	C	Fair opening, signals between moderately strong and weak, with some fading and noise
$S1 < r \leqq S3$	D	Poor opening, signals weak with considerable fading and noise
——	E	No opening expected

Table IV—Signal-strength categories. Note that this table is an interpretation of the *forecast signal quality* employed by Jacobs (CQ monthly publications.

Australia (Figure 5)

The data for Australia indicate that even for solar flux values as low as 80, and *Ap* values as high as 20, the circuit to the East Coast will be open between 1100 and 1300 GMT during April and May. This path, then, may be expected to open even during periods of low solar activity.

Unlike the results obtained for the Far East circuit, the *Ap* (or *ap*) index does not appear to be a significant indicator of path conditions on the Australian circuit. The results of fig. 5 suggest that here, to a first approximation, solar flux is the primary indicator of signal strengths to be expected.

[*continued on page 76*]

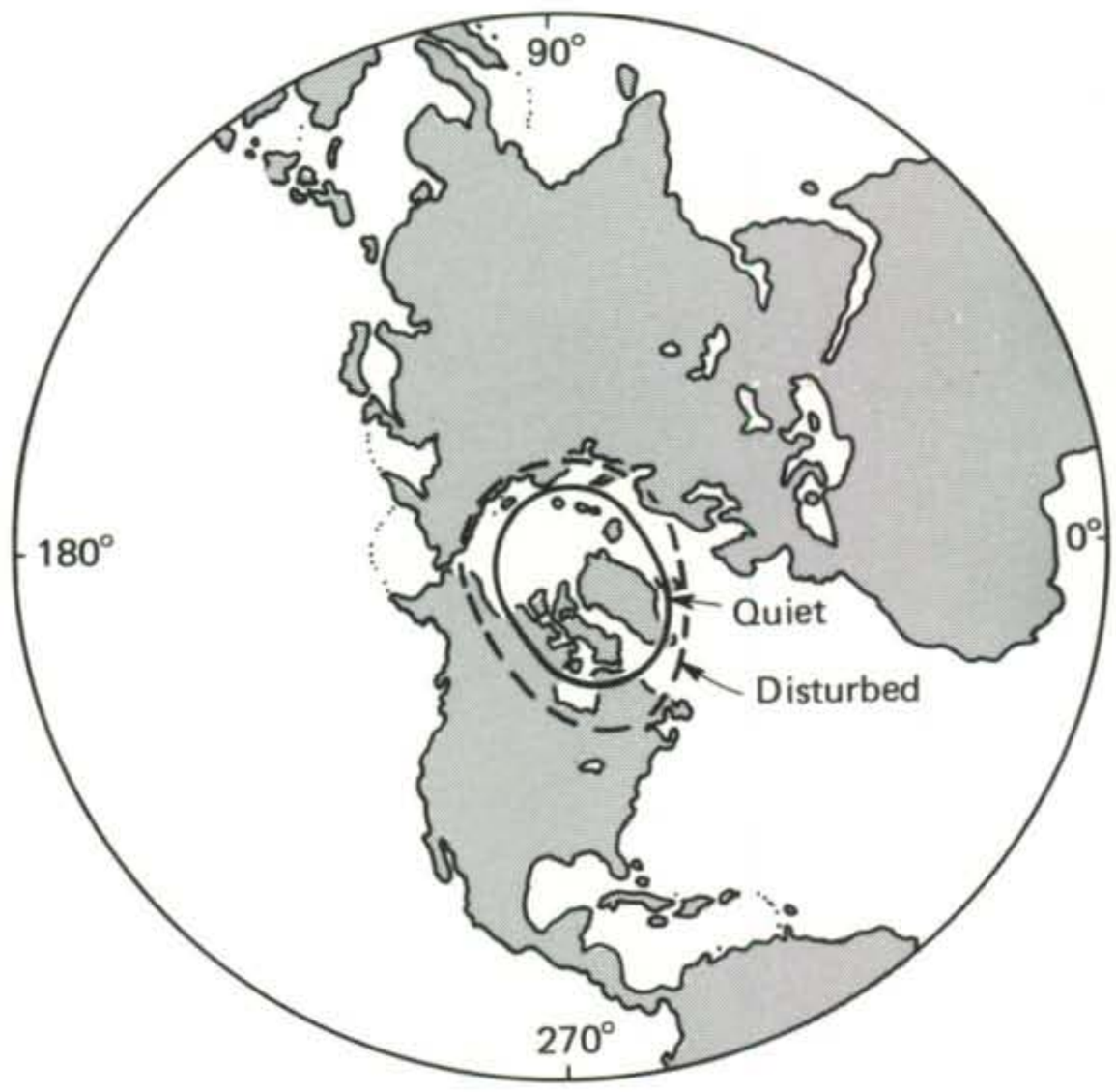


Fig. 4—Location of the Northern zone of maximum frequency of occurrence of overhead aurora on magnetically quiet and magnetically disturbed days. (After Y. I. Feldstein, "Investigations of the Aurora," Moscow, USSR, 1960.)

QRP

LOW-LOW POWER OPERATING

BY ADRIAN WEISS,* K8EEG

Receiver Input Tuned Circuits

Once the precautions outlined in the June column have been taken to insure that no unwanted signal paths exist from antenna to mixer, the next consideration is the input tuned circuit itself. The input circuit is the key to direct conversion receiver performance with respect to cross-modulation difficulties in particular, and overall selectivity in general. Bear in mind the principles which were ennunciated in the June column, especially numbers 2-4. Our objective is to achieve maximum selectivity in the input tuned circuit. The figures show the various types of circuits which will be discussed below.

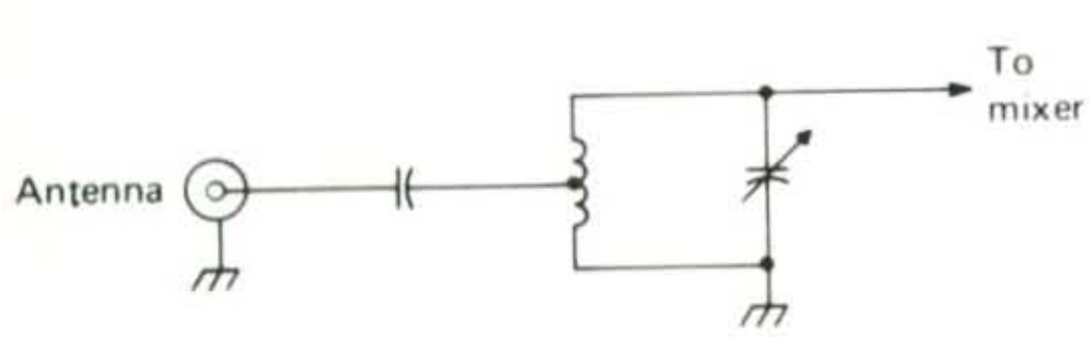


Fig. 1—Direct capacitive coupling from antenna to a tap on the input inductor.

Theory

The input tuned circuit is basically a means of transferring r.f. energy from the antenna to the first receiver stage. Since the antenna is a non-discriminatory pick-up device, that is, it will capture r.f. energy without respect to the frequency of the energy, every r.f. signal that is in the ionosphere in the location of the antenna will appear as an r.f. voltage on it. The

*213 Forest Ave., Vermillion SD 57069.

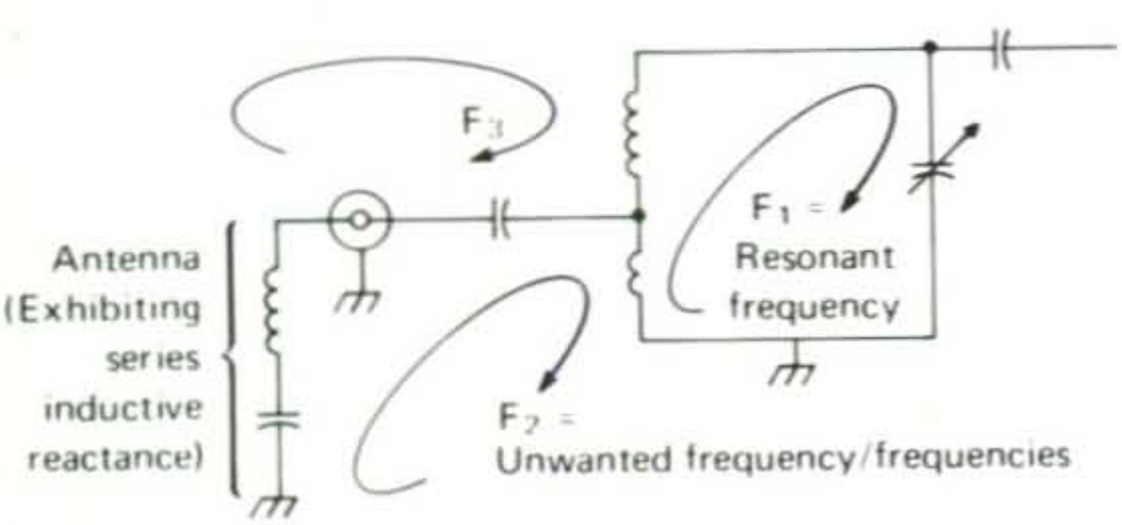


Fig. 2—Equivalent circuit when a reactive antenna is considered coupled to the circuit of fig. 1.

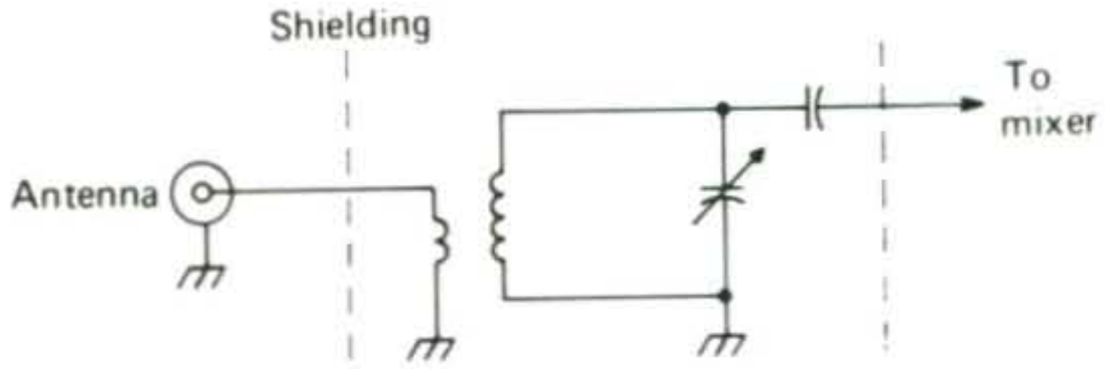


Fig. 3—Link coupled input circuit.

input tuned circuit offers a high impedance only to signals on or near its resonant frequency, and passes all other frequencies to ground. In other words, it is *selective* with respect to the frequency of the signals it passes on to the next stage in the receiver, hence the term "selectivity."

Thus, the input tuned circuit exhibits two characteristics which concern us here—the transfer of r.f. energy, and the selectivity of that transfer. These two characteristics are mutually dependent. The transfer of energy occurs because of *coupling* between the antenna and the first stage of the receiver, and the selectivity depends upon the nature of that coupling. In practical cases, two types of coupling are used—inductive and capactive, the latter of which is illustrated in fig. 1. Let's briefly explore the relationship between coupling and selectivity.

The selectivity of a tuned circuit is usually a function of its Q—the higher the Q, the more selective the circuit. The tuned circuit "stores up" for transfer to the next stage r.f. energy on or near its resonant frequency in direct proportion to the magnitude of its Q, while it dissipates as heat energy at other frequencies. Thus, the higher the Q, the better it accomplishes this storage-transfer-dissipation operation. The quality of the inductance used in a tuned circuit, and the ratio of inductance to capacitance (L/C ratio), both effect the Q. Coils wound on toroid cores will exhibit a very high Q, with air-wound coils second in line, while coils wound on lossy coil-forms will ordinarily exhibit a much lower Q. Secondly, the Q of the tuned circuit will be affected by the ratio of inductance to capacitance (L/C ratio). An optimum L/C ratio will exist for each resonant frequency, and it is generally a high L/C ratio —that is the inductance will be comparatively large with respect to capacitance.

The effectiveness of the circuit in transfer-

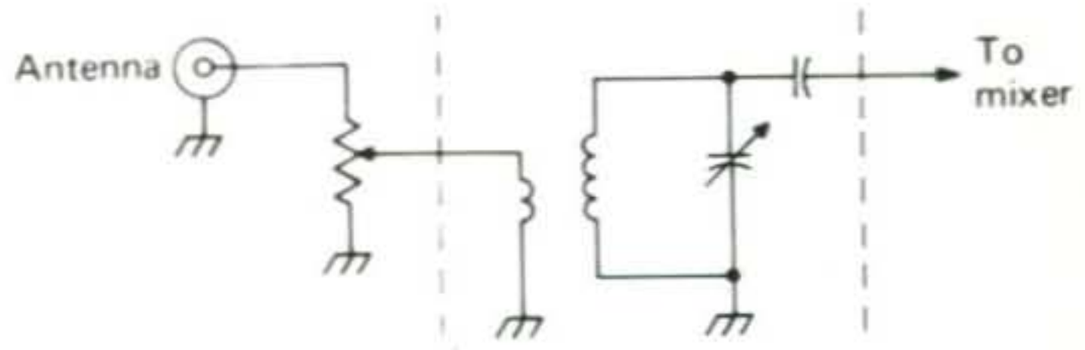


Fig. 4—Adding a potentiometer to the circuit of fig. 3 gives provision for controlling amount of energy reaching the input link.

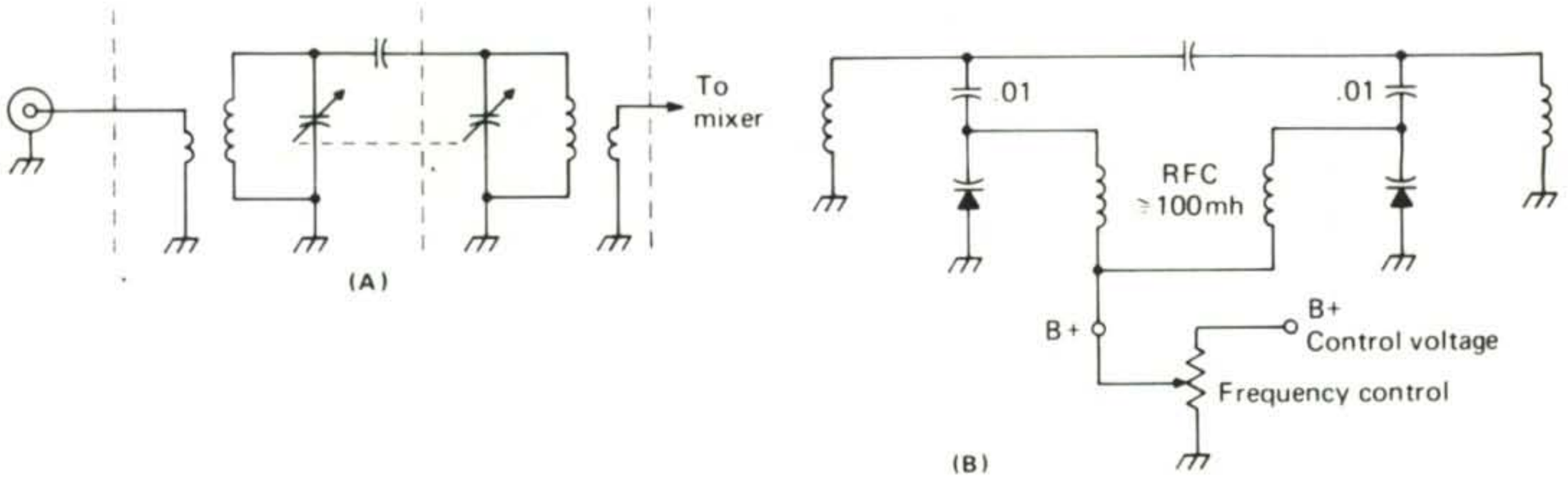


Fig. 5—(A) Double-tuned input circuit using variable capacitors as the tuning elements. (B) Same circuit using Varactor diodes as the variable elements.

ring r.f. energy is called the *coefficient of coupling*, and is expressed as a percentage of the total energy arriving at the input of the tuned circuit. There is an inverse relationship between *Q* and the coefficient of coupling—the greater the coefficient of coupling, the greater the degradation of the *Q*. In transmitter design, where the greatest transfer of energy is the prime consideration, the degradation of *Q* and decreased selectivity is an acceptable design trade-off. However, in receiver design, where extremely sensitive FET's and IC's are used, energy transfer is secondary to selectivity, and coefficients of coupling on the order of a few percent are quite acceptable because of the resultant increase in selectivity.

Practical Circuits

With these principles in mind, let us look at some practical input tuned circuits and evaluate them.

Figure 1 shows perhaps the worst possible method of coupling—short of hooking the antenna lead directly to the mixer inductance. First off, the tap connection upsets the symmetry of the inductance r.f. field—invariably a source of degradation of *Q* and decreased selectivity. Figure 2 shows that, when the antenna is taken into consideration, what we actually end up with are two tuned circuits, with the antenna-coupling capacitor circuit capable of circulating r.f. energy at frequencies other than that of the main tuned circuit. This assumes that the antenna will exhibit some reactance, which is usually the case (they say that there are antennas that present perfect 50 ohm resistive impedance to a receiver or transmitter, but I haven't seen one, myself). Third, varying the size of the coupling capacitor varies the coefficient of coupling, but such a change will also vary the impedance matching capability of the capacitor at a given frequency. In a word, this is a circuit to be avoided at all costs. HW-7 owners take note! You can simply disconnect C_1 (coupling capacitor) and substitute a 2- to 4-turn link at the cold end of the toroid and realize better results.

Figures 3 and 4 illustrate a more viable method of coupling through the use of a small link wound around the cold-end of the tuned circuit inductance. With this method, the r.f. field of the tuned circuit is left intact and the coefficient of coupling can be varied (changing the number of turns in the link coil) without seriously effecting the *Q* of the circuit. This is due to the fact that the coefficient will be very low to start with. With the sensitive devices used in r.f. and mixer stages these days, a few turns is usually more than adequate. The shielding shown may be necessary if cross-modulation is a persistent difficulty. Figure 4 illustrates the typical manner of inserting a potentio-

[*Continued on page 74*]

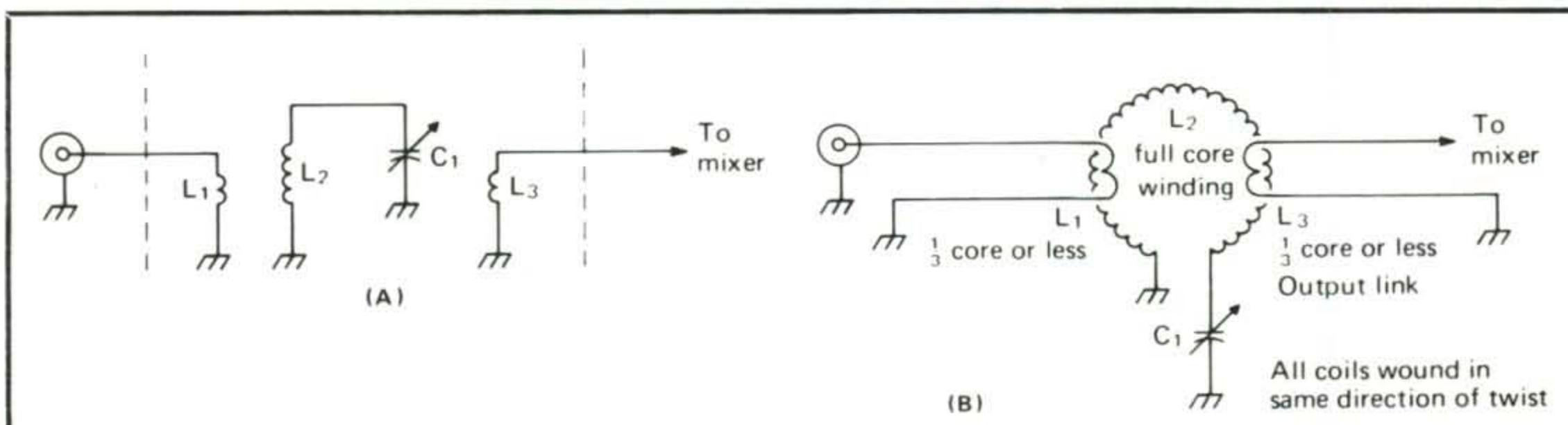


Fig. 6—Double-link toriod tank circuit. Winding details are shown at (B).

Rules: 1974 *CQ* World-Wide DX Contest

Phone: October 26-27 & C.W.: November 23-24
Starts 0000 GMT Sat. Ends 2400 GMT Sun.

I. OBJECTIVE: For amateurs around the world to contact other amateurs in as many zones and countries as possible.

II. BANDS: All bands, 1.8 thru 28 mHz.

III. TYPE OF COMPETITION: 1. Single Operator. Single Band & All Band.

2. Multi-Operator (all band operation only).

a. Single Transmitter, only one transmitter and one band permitted during the same time period (defined as 10 minutes). *Exception*: One other band may be used during the same time period only if the station worked is a new multiplier.

b. Multi Transmitter (no limit to transmitters but only one signal per band permitted).

IV. NUMBER EXCHANGE: PHONE: RS report plus zone (i.e.: 5705). C.W.: RST report plus zone (i.e.: 57905).

V. MULTIPLIER: Two types of multiplier will be used.

1. multiplier of one (1) for each different zone contacted on each band.

2. A multiplier of one (1) for each different country contacted on each band.

Stations are permitted to contact their own country and zone for multiplier credit. The *CQ* Zone Map, DXCC country list, WAE country list and WAC boundaries are standards.

VI. POINTS: 1. Contacts between stations on different continents are worth three (3) points.

2. Contacts between stations on the same continent but different countries, one (1) point. (*Exception*: For North American stations *only*, contacts between stations within the North American boundaries count two (2) points.

3. Contacts between stations in the same country are permitted for zone or country multiplier credit but have zero (0) point value.

VII. SCORING: All stations: the final score is the result of the total QSO points multiplied by the sum of your zone and country multiplier.

Example: 1000 QSO points × 100 multiplier (30 Zones + 70 Countries) = 100,000 (final score).

VIII. AWARDS: First place certificates will be awarded in each category listed under Sec. III in every participating country and in each call area of the United States, Canada, Australia and Asiatic USSR.

All scores will be published. To be eligible for an award a Single Operator station must show a minimum of 12 hours of operation. Multi-operator stations must operate a minimum of 24 hours. A single-band log is eligible for a single-band award *only*. If a log contains more than one band it will be judged as an all-band entry, unless specified otherwise.

In countries or sections where the returns justify, 2nd and 3rd place awards will be made.

All certificates will be issued to the licensee of the station used.

IX. TROPHIES & PLAQUES: Handsome trophy awards will be made to the highest scoring stations in the following categories.

Single Operator, Single Band Trophy Donors

1. World — Phone (*Dr. Harold Megibow, K2HLB Memorial—N. Jersey DX Assoc.*)
2. World—C.W. (*Earl Lucas, W2JT Memorial—N. Jersey DX Assoc*).
3. Canada—Phone (*Gene Krehbiel, VE6TP*)
4. Carib./C.A.—Phone (*G. Kuether, HR2GK*)
5. So. America—Phone (*Brazil DXers*)
6. Europe — 14mHz — C.W. (*Tom Martin, G2LB Memorial-From his friends*).

Single Operator, All Band Trophy Donors

7. World—Phone (*Bill Leonard, W2SKE*)
8. World—C.W. (*Larry LeKashman, W8AB*)
9. USA—Phone (*Potomac Valley Radio Club*)
10. USA—C.W. (*Frankford Radio Club*)
11. Canada—Phone (*Jack Baldwin, VE3BS*)
12. Europe—Phone (*W4BVV Operators*)
13. Europe—C.W. (*W3AU Operators*)
14. Carib./C.A.—Phone (*Harold Fox, W3AA*)
15. Carib./C.A.—C.W. (*Harold Fox, W3AA*)
16. Africa—Phone (*Gordon Marshall, W6RR*)
17. Africa—C.W. (*Gordon Marshall, W6RR*)
18. Asia—Phone (*Japan CQ Magazine*)
19. Asia—C.W. (*Japan CQ Magazine*)
20. Oceania—Phone (*No. Calif. DX Club*)
21. Oceania—C.W. (*Maui A.R.C.*)

Multi-Operator, Single Trans. Trophy Donors

22. World—Phone (*John Knight, W6YY*)
23. World—C.W. (*Anthony Susen, W3AOH*)
24. Canada—Phone (*Calgary A.R.A.*)

Multi-Operator, Multi Trans. Trophy Donors

25. World—Phone (*Radio Club Venezolano*)
26. World—C.W. (*Hazard Reeves, K2GL*)

Contest Expedition Trophy Donors

27. World—Phone (*Stuart Meyer, W2GHK*)

CQ World Wide DX Contest CQ

Page 8 of 15 Pages

Last Full Weekend of October (Phone) & November (CW)

Call Sign W1MDO ☐ Phone ☒ CW Log for 21 MC Band

(use separate log for each band)

DATE GMT	TIME GMT	STATION	SERIAL NUMBER SENT	SERIAL NUMBER RECEIVED	INDICATE MULTIPLIERS ONLY ZONE	INDICATE MULTIPLIERS ONLY COUNTRY	QSO POINTS
NOV. 24, 1973	1405	G3HCT	58905	57914	14	ENGLAND	3
	08	DL9PF	579	58914		GERMANY	3
	11	DM2ATD	579	57914		EAST GERMANY	3
	20	UB5WF	599	59916	16	UKRAINE	3
	23	W1WY	599	59905	05	U.S.A.	0
	25	G4RJ	569	57914			3
	32	OH8RC	579	59915	15	FINLAND	3
	40	VE5US	599	59904	04	CANADA	2
	45	DLØWX	589	58914			3
	47	YO8DD	579	57920	20	ROMANIA	3
	1500	4Z4HF	589	58920		ISRAEL	3
	2215	WA6GLD	599	59903	03		0
	17	KV4FZ	599	59908	08	VIRGIN ISLANDS	2
	19	YV5BPJ	599	59909	09	VENEZUELA	3
	28	W4WSF	589	58904			0
	31	KH6IJ	589	59931	31	HAWAII	3
	46	JA8MM	569	57925	25	JAPAN	3
	48	JA3WCZ	579	56925			3
	52	JH1RCJ	579	57925			3
	2300	KL7MF	589	57901	01	ALASKA	2
NOV 25, 1973	1315	OH2BM	599	58915			3
	17	HB9AG	579	58914		SWITZERLAND	3
	24	UA1DZ	579	57916		EUR. RUSSIA	3
	29	~~4Z4HF~~	~~589~~	~~57920~~		DUPLICATE	0
	32	G3FXB	599	59914			3
	1600	PJØCC	599	59909		NETH. ANT.	3
	05	ZD3Z	589	58935	35	GAMBIA	3
	17	CR6CA	579	59936	36	ANGOLA	3
	1820	F9FF	579	57914		FRANCE	3
	22	~~KV4FZ~~	~~599~~	~~59908~~		DUPLICATE	0
	28	DK2TA	579	57914			3
	32	KG1JA	579	58940	40	GREENLAND	2
	35	TF2WFZ	589	57940		ICELAND	3
	50	ZS5QU	599	58938	38	SOUTH AFRICA	3
	2130	JA5SZ	579	57925			3
	35	~~JA3WCZ~~	~~569~~	~~58925~~		DUPLICATE	0
	38	JA9MF	569	57925			3
	2200	VK2EO	589	58930	30	AUSTRALIA	3
	24	KA2AB	599	57925			3
	58	VS6DO	569	57924	24	HONG KONG	3
			37	TOTALS (This Page Only)	18	25	98
			QSO's (minus duplicates)		(Zones)	(Countries)	(Points)

Note: Duplicate QSO's can mean disqualification!

CQ Form 10568 rff Aug. 1969

A sample log page—40 QSO's to a page. You may work your own country for multiplier credit, but receive NO QSO points. Logs must be checked for duplicate QSO s.

Year 1972

CQ World Wide DX Contest CQ

Last Full Weekend of October (Phone) & November (CW)

Call Sign W6DGH U.S.A. Country

Single Operator: ☒ Phone ☐ CW ☐ Single Band ☒ All Band

Multi-Operator (All Band Only): ☐ Single Transmitter ☐ Multi-Transmitter

	QSO's (minus duplicates)		QSO Points		Zone Multiplier		Country Multiplier		Score	
1.8 mc	1	→	0	×	1	+	1	=		1.8 mc
3.5 mc	46	→	116	×	19	+	30	=		3.5 mc
7.0 mc	49	→	130	×	18	+	23	=		7.0 mc
14 mc	164	→	458	×	33	+	67	=		14 mc
21 mc	578	→	1714	×	31	+	69	=		21 mc
28 mc	175	→	495	×	27	+	59	=		28 mc
All Bands	1013	→	2913	×	129	+	249	=	1,101,114	All Bands

How to score: QSO Points × (Zones + Countries) = FINAL SCORE

EXAMPLE: 1000 QSO Points × (30 Zones + 70 Countries) = 100,000 points

Station Description KWS-1 75A-3

Antenna(s) 2-L(40) 4-L(20) 7-L(15) 5-L(10) DIPOLES (80-160) 2-L QUAD 10-15-20

Operators

Remarks (Biggest thrill in Contest, funniest story, comments, etc.) TOUGH GOING HERE ON THE WEST COAST!

Club Competition (Minimum 3 logs) SOUTHERN CALIFORNIA DX CLUB

This is to certify that in this contest I have operated my transmitter within the limitations of my license and have observed fully the rules and regulations of the contest.

Type or Print (Signature) Richard J. Norton

Name RICHARD J. NORTON Call W6DGH

Address 21290 WEST HILLSIDE DRIVE

City TOPANGA

State or Country CALIFORNIA (Zip) 90290

Logs must be postmarked no later than December 1st for PHONE and January 15th for CW. Indicate PHONE or CW on envelope.

Mail to: CQ Contest Committee, 14 Vanderventer Ave., Port Washington, N.Y., U.S.A. 11050

Note: Duplicate QSO's can mean disqualification!

CQ Form 1037A 1969

A sample summary sheet. Free summary sheets, log pages, and zone maps may be obtained upon receipt of a large s.a.s.e. or, if outside the U.S., sufficient IRCs

28. World—C.W. (*Donald Miller, W9WNV*)

CQ will award championship plaques to stations ineligible for a world trophy.

Trophy winners may win the same trophy only once within a three year period. (This does not apply to any of the *CQ* plaque awards).

The Canadian, Carib. C.A. and the African awards are for residents *only*.

X. CLUB COMPETITION: *CQ* will award a handsome plaque to the club submitting the highest aggregate score of the phone and c.w. scores submitted by its members.

1. The club must be a local group and not a national organization.

2. Participation is limited to members operating within a local geographic area, (except for DX-peditions especially organized for operation in the contest and manned by members.

3. To be listed, a minimum of 3 logs must be received from a club and an officer of the club must submit a list of participating members and their scores, both on phone and c.w.

XI. LOG INSTRUCTIONS: 1. All times must be in GMT.

2. Indicate zone and country multiplier only the FIRST TIME it is worked on each band.

3. Logs must be checked for duplicate contacts, correct QSO points and multipliers, and recopied logs must be in their original form with corrections clearly shown.

4. Use a separate sheet for each band.

5. Each entry must be accompanied by a Summary Sheet showing all scoring information, category of competition, contestant's name and address in BLOCK LETTERS and a signed declaration that all contest rules and regulations for amateur radio in the country of operation have been observed.

6. Official log and summary sheets and zone maps are available from *CQ*. A *large* self-addressed envelope with sufficient postage or IRCs must accompany your request.

If official forms are not available, make up your own by following the samples shown, 40 contacts to the page on 8½" x 11" paper.

XII. DISQUALIFICATION: Violation of amateur radio regulations in the country of the contestant, or the rules of the contest, unsportsmanlike conduct; taking credit for exclusive duplicate contacts; incorrect QSO's or incorrect multipliers will be deemed sufficient cause for disqualification.

Disqualification can also result in the disqualified operator(s) being barred from competition in all *CQ* contests for a period of up to three years.

Actions and decisions of the *CQ* Contest Committee are official and final.

XIII. DEADLINE: All entries must be postmarked NO LATER than December 1, 1974 for the Phone section and January 15, 1975 for the C.W. section. In rare isolated areas the deadline will be made more flexible. Indicate phone or c.w. on envelope. Logs go to:

CQ WW Contest Committee
14 Vanderventer Avenue
Port Washington, L.I., N.Y. USA 11050

(Please circulate this information to your DX friends and radio clubs)

MATH'S NOTES

BY IRWIN MATH,* WA2NDM

WE have decided to take a look at Field Effect Transistors this month as there is more circuitry being designed with these devices and it would do the experimenter no harm to at least have a general knowledge of their characteristics. As is this author's policy, theory will be kept to an absolute minimum.

There are two basic families of FETS today, the junction type and the Metal-Oxide-Semiconductor FET (or MOSFET). Both types are available in "P" and "N" configuration and both types are in wide use today. We will only concern ourselves with N type units in this discussion but, as with bipolor transistors P type devices simply require that all polarities be reversed.

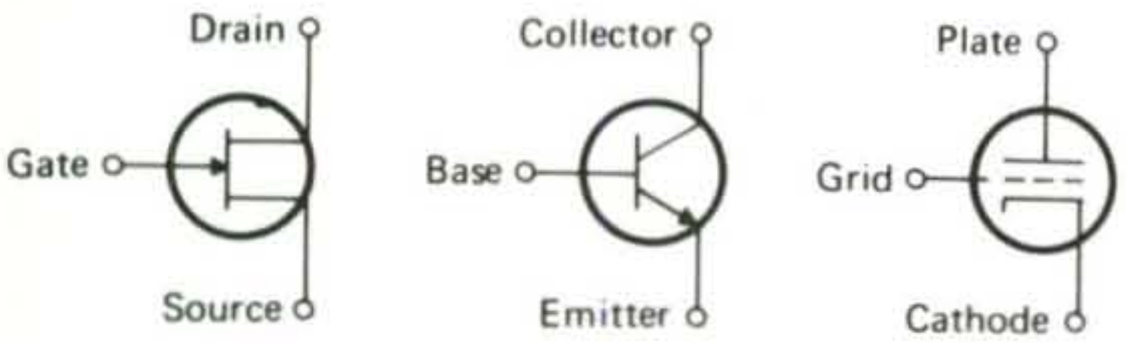


Fig. 1—Schematic representations discussed in the text.

Fig. 1 is a schematic representation of an N channel JFET an NPN transistor and a vacuum triode. Similar elements that perform similar functions are obvious from the drawing. All three devices, very simply, permit a flow of electrons from source, emitter, or cathode, to drain, collector, or plate. The third element, the gate, base or grid serves to modify this electron flow and in this respect, all three devices are similar. Where the similarity ends most appreciably, is in the nature of the control element. In the vacuum tube, the grid "does its job" as a function of the voltage (with respect to the cathode of course) impressed on it.

In the bipolar transistor, it is the base current, often a quite significant amount, that exercises the control while in the JFET, we again revert back to the gate voltage as the controlling influence. Compared to the vacuum triode however, the *current* required by a typical JFET gate is measured in tenths of nanoamperes or even picoamperes (10^{-12} amperes) while for the vacuum tube, typical grid currents are only in the 1-10 nanoampere range.

Thus we can see that the input impedance for a junction FET is quite high, certainly as high as a vacuum tube and in most cases even higher.

To complete the discussion, we will introduce the MOSFET at this point. It is also a voltage controlled device but, because of the nature of its construction, gate currents of tenths of picoamperes or even less in some special devices result in the highest input impedance of any conventional semiconductor device (or vacuum tube for that matter) available. Fig. 2 is the schematic representation of an N channel MOSFET.

Other positive features of FETS are those common to many other semiconductors i.e. small size (To-18, To-5, etc), long operating life, extremely low power consumption and low noise to mention a few.

*5 Melville Lane, Great Neck, N.Y. 10023.

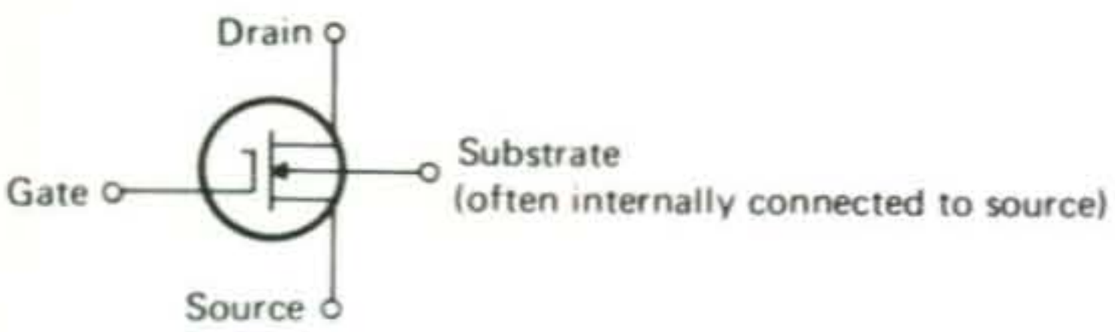


Fig. 2—N channel MOSFET schematic symbol.

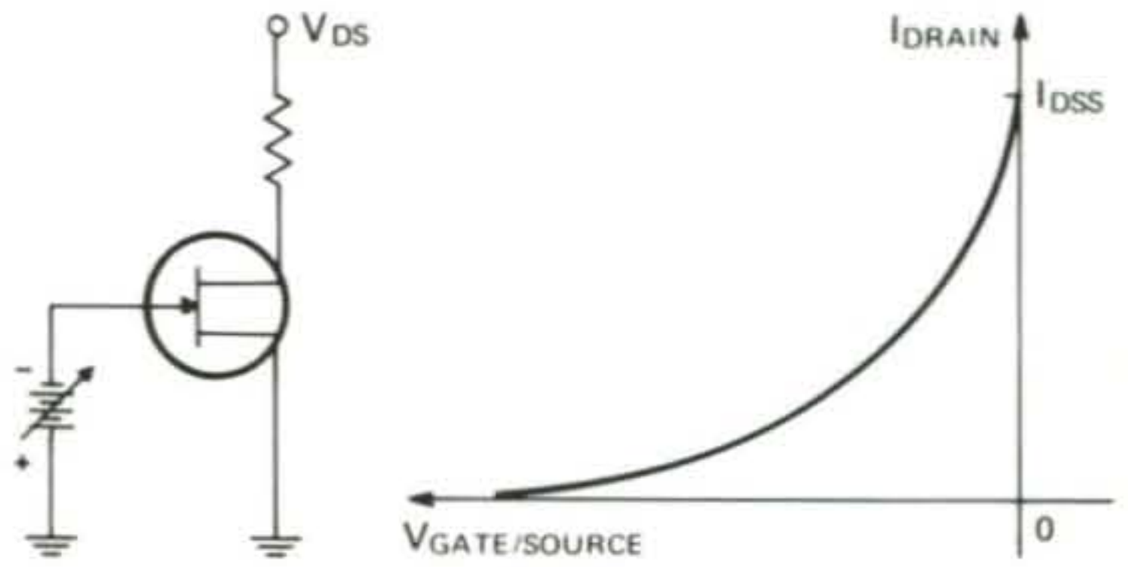


Fig. 3—I_d VS V_{gs} for a typical junction FET.

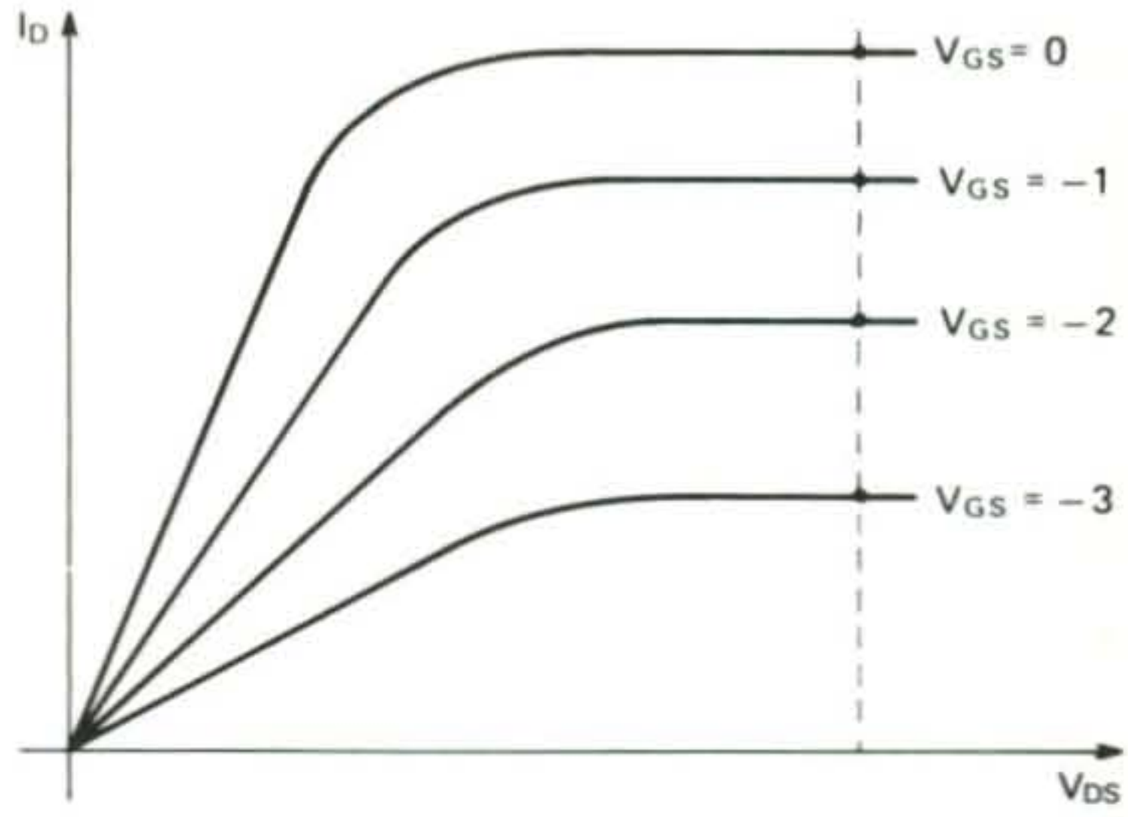


Fig. 4—Operating characteristics for a junction FET.

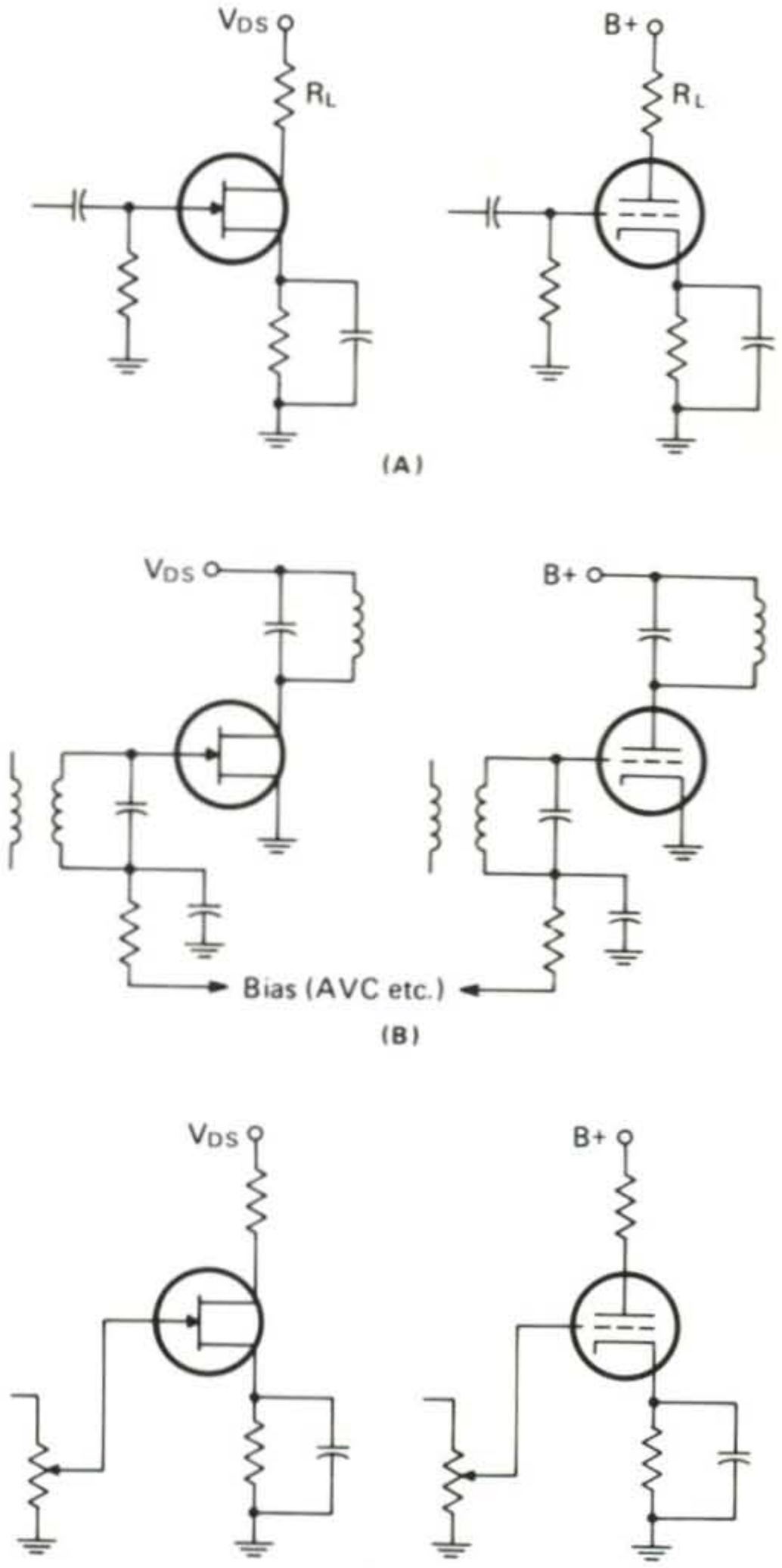


Fig. 5—Similarity between vacuum tube and FET circuitry.

Output Characteristics

All JFETS have a typical drain current characteristic such as shown in fig. 3. Notice that with the gate to source voltage at zero, the drain current is at a maximum determined only by the value of drain resistor and V_{ds} value. This is in a sense the saturation point. Note also that there is a parameter that is known as ID^{ss} which is the maximum (saturation) current that the JFET can pass. Let us now re-arrange the curve of fig. 3 to show drain current at several values of gate to source voltage as a function of V_{ds}.

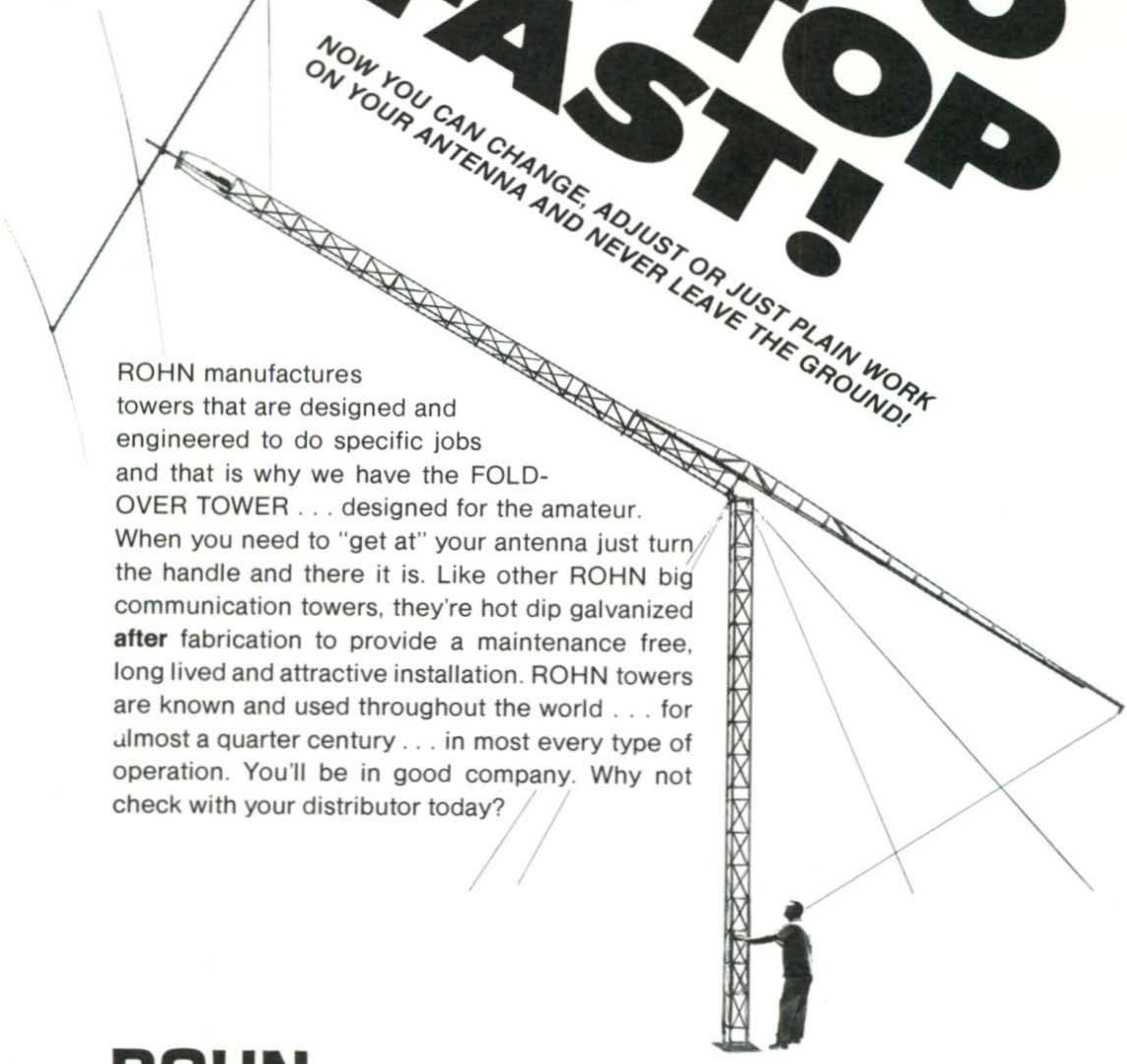
We now have a set of curves that look quite similar to vacuum tube curves and may be used in applying these devices in a manner similar to vacuum tube design.

To summarize then, for the JFET: with zero gate voltage, maximum drain to source

[*continued on page 86*]

GET TO THE TOP FAST!

NOW YOU CAN CHANGE, ADJUST OR JUST PLAIN WORK ON YOUR ANTENNA AND NEVER LEAVE THE GROUND!



ROHN manufactures towers that are designed and engineered to do specific jobs and that is why we have the FOLD-OVER TOWER . . . designed for the amateur. When you need to "get at" your antenna just turn the handle and there it is. Like other ROHN big communication towers, they're hot dip galvanized **after** fabrication to provide a maintenance free, long lived and attractive installation. ROHN towers are known and used throughout the world . . . for almost a quarter century . . . in most every type of operation. You'll be in good company. Why not check with your distributor today?

ROHN® MANUFACTURING

DIVISION OF UNARCO INDUSTRIES Inc.

P.O. Box 2000 / Peoria, Ill. 61601

antennas

BY WILLIAM I. ORR,* W6SAI

"WHAT are you reading, buddy?", asked Pendergast as he strode into the shack, thumbs tucked under his belt. He surveyed the room, which seemed to meet with his approval, as he settled into my favorite chair.

"I just got a copy of the new handbook, *VHF for Radio Amateurs* hot off the press. Herb and I wrote it."[1]

"Looks good. Very good", said Pendergast taking the copy from me and riffling through the pages. "One of these days I want to talk to you about Moonbounce antennas for 144 mHz".

"It's all in there", I replied. "What do you want to talk about today?"

"More about antennas, high frequency ones, that is. To be specific, do you have any more information on that 2 element HB9CV beam design? I'd sorta like to build one up for 6 meters, or maybe 15 meters. There's a lot of sporadic-E DX on 6 these days, and 15 is far from dead".

"Here's an interesting version of the HB9CV antenna, with dimensions for both 15 and 6 meters (fig. 1). The elements are made of light-weight aluminum tubing and are interconnected with a length of 300 ohm TV-type ribbon line and two gamma matching devices. Each element has its own gamma, made out of heavy aluminum wire, or small-diameter aluminum tubing." I handed Pendergast a drawing.

As if by magic, Pendergast produced his notebook and started to copy the drawing in it.

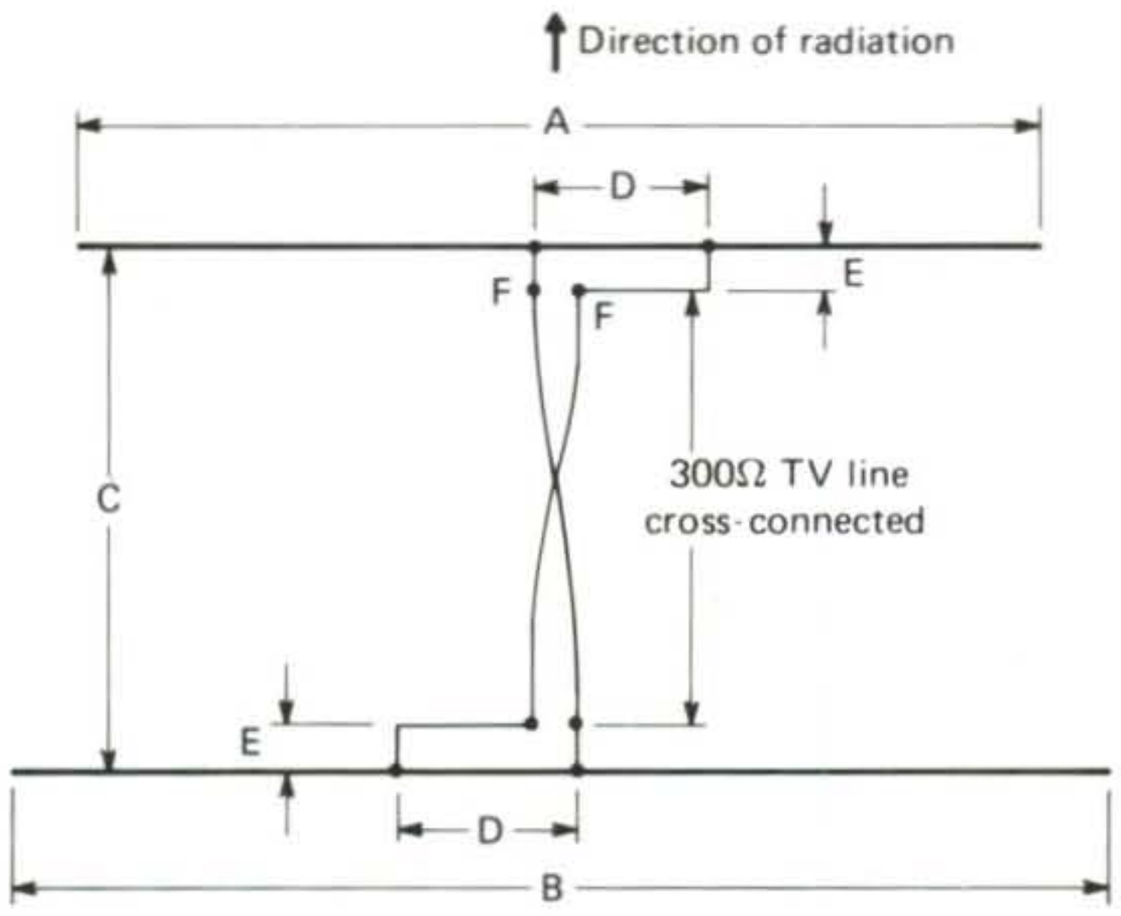
"The information came from a recent issue of *CQ·Ham Radio*, the nifty Japanese magazine". I opened a desk drawer and rummaged through a pile of papers and clippings.

"My filing system has broken down", I admitted. "I subscribe to a number of overseas amateur magazines and find them very informative and refreshing. I get a lot of good ideas from them, even if I can't read some of the magazines! You would be surprised at the number of ham magazines in the world. I file any good dope from them in this drawer".

"Let me look into that file of yours", said Pendergast. "You might have some goodies tucked away that I can add to my notebook." I relinquished the drawer to his easy grasp.

"Look at this," said Pendergast, waving a page torn from a magazine. "Here's a great idea for the assembly and construction of a four-band dipole antenna. This is a really nifty mechanical design (fig. 2). It would make a good portable antenna for Field Day work. From the Japanese magazine, too".

"I agree", I said. "It looks nice and is rugged. A good friend of mine, Bill Leonard, W2SKE, designed a similar antenna a few years ago for portable use. He did a lot of operating from hotels and was always on the go. His multi-band dipole was designed for 20, 15 and 10 meters and was extremely light. It was made of 300 ohm twin-lead (fig. 3). Bill took a



Band	A	B	C	D	E
50mHz	9'3"	9'8"	2'6"	1'5"	2"
21mHz	22'4"	23'7"	5'5"	2'4"	4"

Fig. 1—Electrical details of the HB9CV beam antenna for 15 or 6 meters. Plan view, showing elements and feedline. Directivity is through element A (see arrow). Elements A and B are made of light weight aluminum tubing. The interconnecting feedline is made of a length of 300 ohm TV ribbon line. The elements are supported on a wood boom having the length indicated by dimension C. The elements are interconnected by means of two gamma matches (D) which can be made out of heavy aluminum wire, or small-diameter tubing. The transmission line s.w.r. may be adjusted by varying dimension D. A coaxial feedline and ferrite balun are connected at feedpoint F-F. In this design, the rear element is made longer than the front element to improve the front-to-back ratio of the array.

*48 Campbell Lane, Menlo Park, CA 94025.

[1]"VHF Handbook for Radio Amateurs," by Herb Brier, W9EGQ (Editor of *CQ's* Novice column), and Bill Orr, W6SAI. 336 pages, $5.95 plus 25¢ postage from Radio Publications, Inc., Box 149, Wilton, Conn., 06897

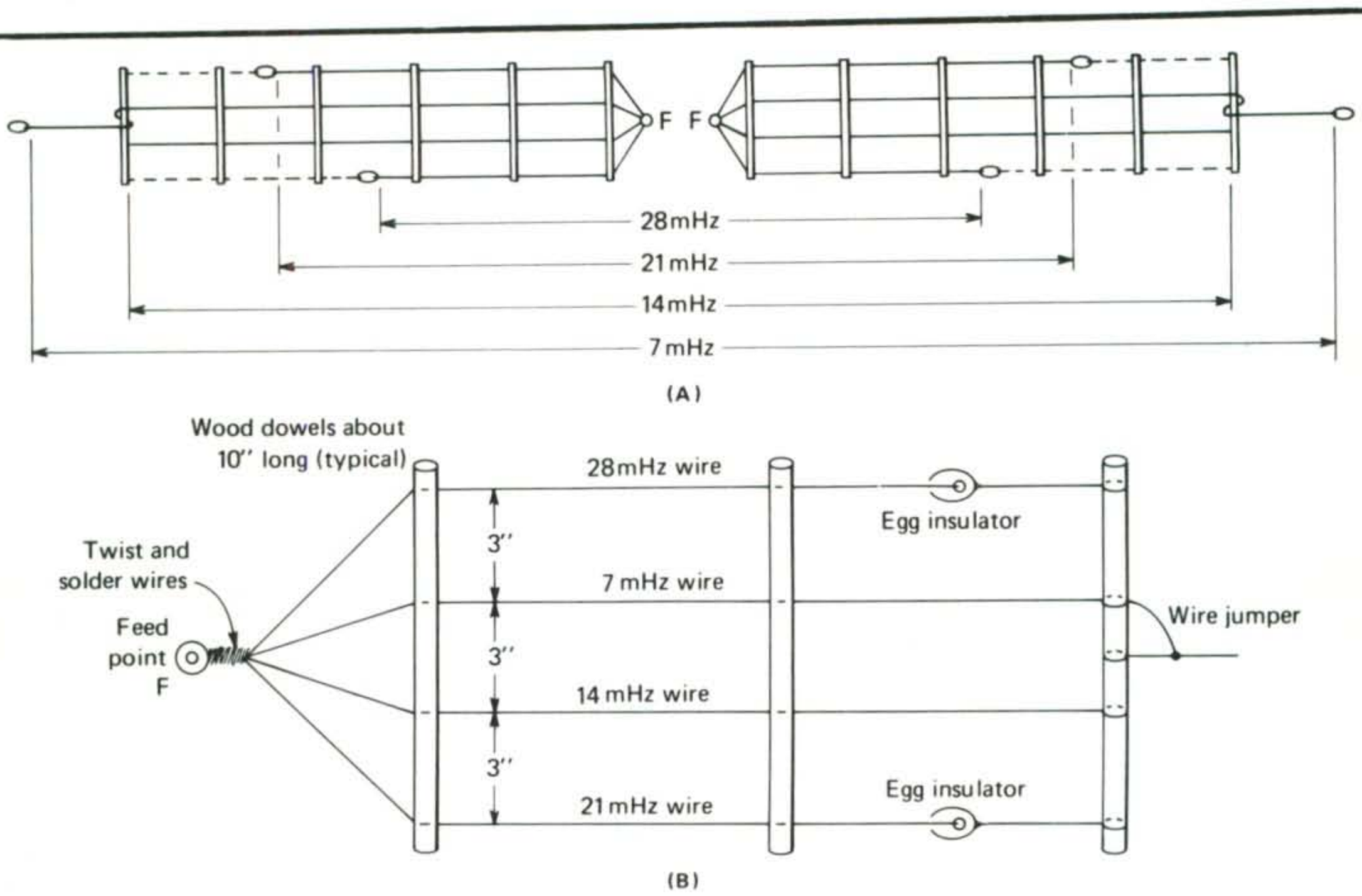


Fig. 2—Multiband dipole assembly. Four dipoles for the 40, 20, 15 and 10 meter bands are connected in parallel and fed at points F-F. The dipoles are supported in position by spacers made of 1" diameter dowel rod. The spacers are coated with waterproof epoxy to make them weather-resistant. The array is held in position by extension wires which form the outer portion of the 40 meter dipole. The extension wire is attached to the midpoint of the dowel so that the array is balanced and the tension on all wires is equal. The shorter dipoles are terminated with egg insulators and the outer (dotted) sections of the assembly are made up of additional lengths of wire. Rope should not be used as it will expand and shrink according to the amount of moisture in it. At the center of the assembly, the dipole wires are twisted and soldered together and the halves of the antenna are fed with a 50 ohm transmission line. A ferrite balun may be used, if desired. Dipole lengths are conventional. Complete assembly is shown in illustration (A) and simplified view of one half is shown at (B).

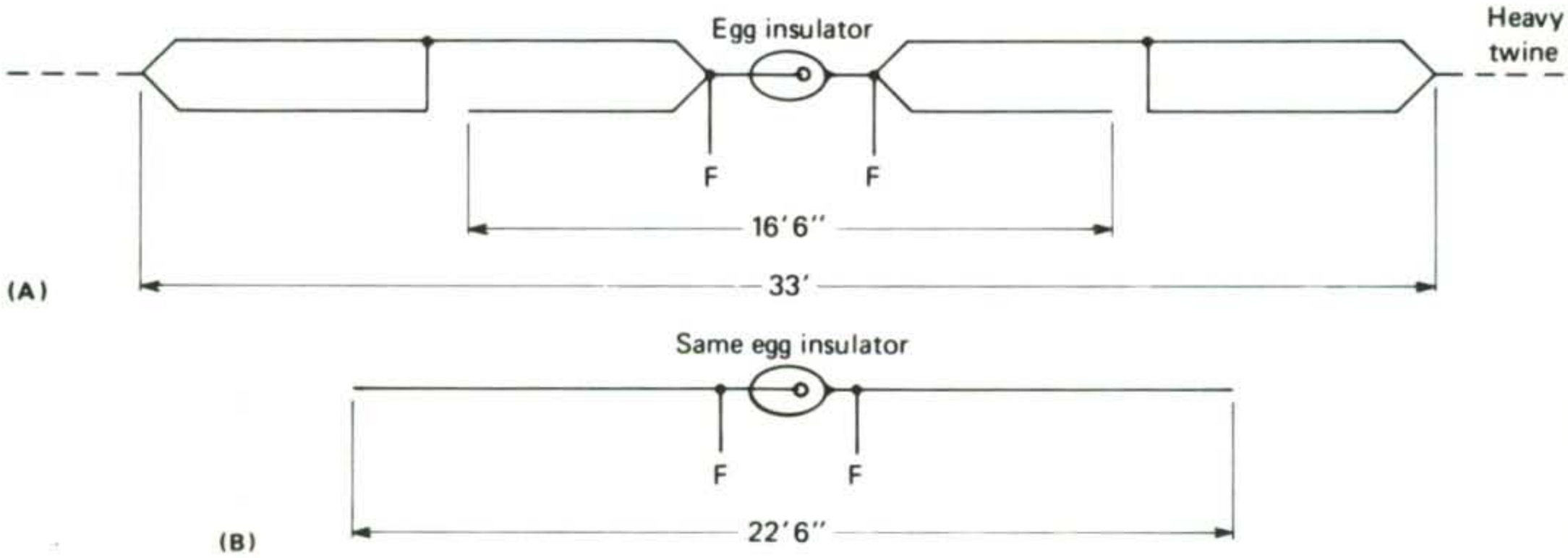


Fig. 3—Assembly of 20-15-10 meter dipole. (A) Twenty and ten meter sections are made of 300 ohm ribbon line. One leg of line is broken on each half of the assembly to form the 10 meter section. The unused outer tips are connected back to the 20 meter section to prevent the antenna from tearing apart under tension. Only a small segment of wire is cut free at the break, leaving the center webbing intact. (B) A 15 meter section is added to the ribbon dipoles, made of lengths of insulated wire. The 15 meter antenna is taped to the ribbon dipole and connected in parallel with it at feedpoints F-F. The triband antenna is fed with a random length of RG-58/U coaxial line.

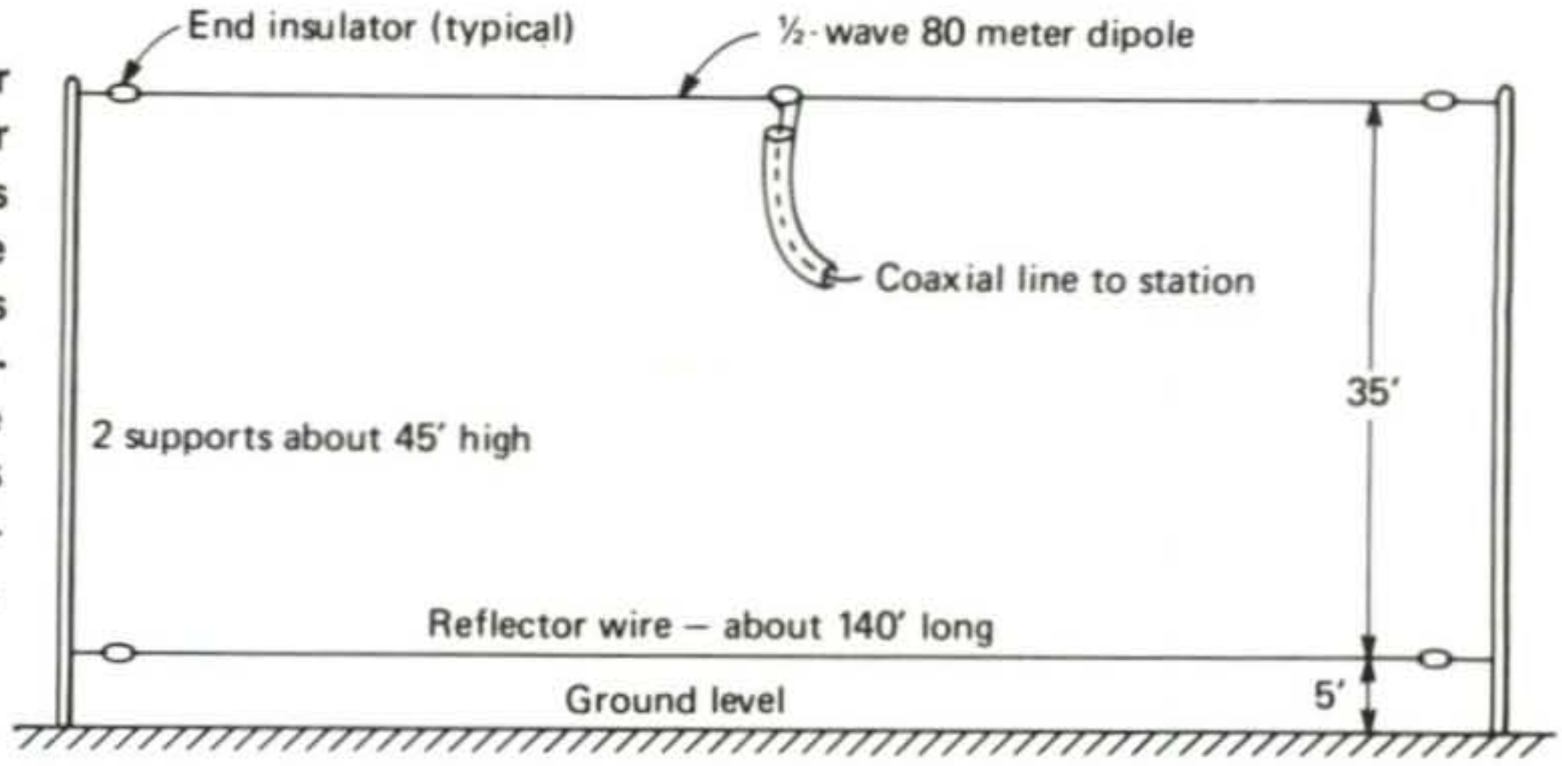


Fig. 4—80 meter dipole array for short range work. Single reflector wire below dipole concentrates high angle energy to improve short range signal. Some versions use 5 or 10 reflector wires. Reflectors are not grounded. Care should be taken so that the ends of the reflectors cannot be touched as they are at a high r.f. potential.

length of ribbon line 33 feet long, shorted the ends and placed an insulator at the center. This made the 20 meter section. One wire of the twin-lead was cut 8'2" on each half of the dipole and the *outer section* wire was cleaned of insulation for about a half an inch, and soldered to the 20 meter wire for added strength. This allowed the short center section wire to function as a 10 meter dipole. Finally two 11'2" sections of insulated hookup wire were taped along the twin lead, each side of the center insulator, and the inner ends soldered to the common joints at the insulator. This made up the 15 meter section. The wire was taped to the twin-lead every foot. The last step was to attach a length of RG-58/U coaxial, 50 ohm transmission line across the center insulator. The whole assembly was very light, and W2SKE carried it all over the world for quickie operation from temporary locations".

There was a long silence as Pendergast's pencil scratched in his notebook. Finally, he asked, "Didn't he use a balun?"

"No," I replied. "No balun. With low power and a temporary lash-up like this, a balun really is more of a nuisance than a help. It adds weight to the center of the antenna. W2SKE slung his antenna up with string and when he was ready to leave the air, a quick tug on the coax line brought the whole thing down".

"What else do you have", said Pendergast to himself, as he leafed through an assortment of papers. He paused, and pulled one out.

"Hey, I like this", he said. "Here's a drawing of a short-haul 80 meter antenna (fig. 4). It consists of a 2 element beam, aimed straight up so as to bounce a strong signal off the ionosphere, directly overhead. It should be a "bomb" within 1000 miles or so."

"I heard some fellows on 3995 kHz using antennas of this type", I said. "They were back east and really put out a good signal, even as far as the West Coast. So the antenna really is better than just a 'local' antenna. It works for long skip, too".

Pendergast paused in his search through the papers. "Have you received any interesting mail?", he asked.

"Yes", I replied. "By coincidence, in the same mail, I received letters from the Chief Engineers of two antenna manufacturing companies. Both of the companies make a wide line of antennas for radio amateurs. For each company, the most popular antenna sold is the inexpensive 3-band vertical that works on 10, 15 and 20 meters. In one case, the vertical employs traps for bandswitching, and in the other case, the vertical has a tapped base loading coil."

"Well, what was the problem?", asked Pendergast, putting down the notebook. "That seems like a pretty simple antenna to get going!"

"Apparently not", I replied. "More antennas of this type are sold than any other type, and a large percentage of them go to Novices and beginners who don't have a lot of expertise in putting up an antenna. They run into trouble, get angry when the antenna doesn't seem to work, then send off a fiery letter to the antenna manufacturer."

Pendergast took the two letters and read them carefully. "Very simple", he said. "My motto is: *as a last resort, read the instruction manual*".

"That's part of the problem", I replied. "The anxious amateur, with a new antenna in his hot little hands, rushes out and tries to put it up, without first reading the assembly instructions. Look at this: here's a list of antenna problems compiled by one manufacturer from the complaints he has received about a 3-band vertical antenna.

Problem #1. The user forgets to install radials, or forgets to make a ground connection at the base of the antenna.

Problem #2. The user installs the antenna along the side of a building, thus detuning the antenna.

Problef #3. The dimensions given for the antenna are ignored.

Problem #4. The user expects the vertical antenna to be competitive with his neighbor's 4 element beam installed 120 feet above ground.

"The Engineer of one antenna company lets

[*continued on page 78*]

DX

BY JERRY HAGEN,* WA6GLD

THE DX Department hopes that all had a fine Summer including good outdoor recreation as well as the excitement of the Kingman Reef Operation (KP6KR) which should be credited as a new country on the DXCC Countries List by this time.

DXTRA

This month's DXTRA was published in June by Hugh (Cass) Cassidy, WA6AUD publisher of the *West Coast DX Bulletin* and provides an interesting viewpoint on DXing from an international standpoint. The editorial is entitled "DX Is Amateur Radio . . . Everywhere."

"There are countries which belong to the ITU and in which the only amateur operation is DXing and when the one or two or the handful of amateurs in that country turns on his rig, he is DXing. Take Nepal, 9N1MM by Father Moran has been the only amateur activity there for some years. Or Sudan, where ST2SA operated by Dr. Sid Ahmed Ibrahim is the only Sudanese station on the air. Pitcairn Island maintains its weekly contact with the outside world through VR6TC operated by Tom Christian. You can check Macao, Sarawak or Brunei, You can check St. Helena Island, the Falkland Islands and Tristan de Cunha and you will find that DXing is the only amateur activity. And in Sikkim, AC3PT the only amateur station, is operated by the Prince who rules the country. In Jordan, King Hussein signs JY1 and a check of any Call book will show many calls in the Arabian peninsula countries, where the licensee is a Prince or King. In many countries DXing is the ony amateur activity—there is nothing else. There is an International Frequency Conference set for 1979. There will be representatives from member countries of the ITU and among the things that will be discussed will be Amateur Frequency allocations. When a DXer from the U.S. encounters a DXer from another country, they will speak a common language. But what about others?

There are those among us in Amateur Radio who say that DXing has been overblown; that there has been too much emphasis and that it should be de-emphasized. To believe this, would be to believe that the one activity that is common to amateur radio in every country signatory to the ITU treaties is not especially important and should be down-graded.

Perhaps it is felt that the emphasis should be on traffic handling. Perhaps at an ITU meeting it would be well to talk of traffic nets and phone patches. It might be well to speak about such things as the National Traffic System and the myriad of other nets. It might be well to talk about these, but could one find a responsive ear? If one talks with someone from

*P.O. Box 1271, Covira, Ca 91722

The WAZ Program

S.S.B. WAZ

1201.....JA6ERI
1202.....W6HUR
1203.....EA3UU
1204.....JY3ZH
1205.....W7CUJ
1206.....LA8RL
1207.....WB5DJA
1208.....G3TLV
1209.....W8OA
1210.....F6AJA
1211.....SP5PQ

C.W.—Phone WAZ

3713.....WA2DNY
3714.....JA3ULD
3715.....JA3GSM
3716.....EA6BH
3717.....F5GV
3718.....YO9APJ
3719.....JA2WK
3720.....YU1ODO
3721.....JA1ATF
3722.....DL5SD
3723.....SP6DMJ
3724.....SP9CTW
3725.....SP9ABE

Phone WAZ

497.....W6HUR

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

The operating site and partial operating crew of the II4FGM special prefix to commemorate the 100th anniversary of Marconi's birth. Operators shown (l. to r.) are I4TA, I4CJW, I4NE, I4AXS, an SWL, I4ZGI and I4ADS (sitting.) (Tnx I4ZSQ.)

CQ DX AWARD HONOR ROLL

The *CQ* DX Award Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more countries for the mode indicated. The ARRL DXCC Country List, LESS DELETED COUNTRIES, is used as the country standard. This listing reflects the deletion of Tibet and Zanzibar which were deleted from the ARRL Current Countries list on June 1, 1974. The total number of current countries on the DXCC list is now 320.

C.W.

W6PT 319	W4IC 308	W6ISQ 303	DL3RK 298	WA6MWG 289
K6EC 315	W8LY 307	W6LEB 302	W4BQY 295	WA6EPQ 288
W6ID 315	W9DWQ 305	VK3AHQ 301	W6NJU 294	WA8DXA 287
W8KPL 314	ON4QX 304	W0AUB 299	K1SHN 289	DJ7CX 281
W4YWX 309				

2XSSB

TI2HP 319	I8AA 313	K4RTA 308	WA3IKK 299	DL6KG 287
W2TP 318	I8KDB 313	VE3GMT 307	K4HJE 297	K1KNQ 287
IØAMU 318	W2QK 313	K3GKU 307	WB6DXU 297	DL1MD 289
W2RGV 318	W ??? 313	F9MS 306	W6FW 297	K8GQG 286
WA2RAU 317	W6EL 313	K6EC 306	W9KRU 297	W3CRE 284
DL9OH 316	W6KTE 313	W9QLD 306	W0YDB 296	W90HH 284
K2FL 316	W6RKP 313	XE1AE 306	YV1KZ 296	W8ZOK 283
W4NJF 316	K6WR 313	OZ3SK 305	G3RWQ 295	VA7WJ 282
W4SSU 315	W9JT 313	WA6MWG 305	YS10 295	WB6PNB 282
W6EUF 315	F9RM 312	KH6BB 305	K1SHN 294	W6TCQ 282
W6REH 315	SM6CKS 312	VE2WY 304	WAØCPX 293	HP1JC 281
IT9JT 314	WA2EOQ 312	W2CNQ 304	I8YRK 291	OE3WWB 281
SM5SB 314	K4MQG 312	G3DO 303	W0SFU 291	WA2VEG 280
VE3MR 314	F2MO 311	WA6AHF 303	G3KYF 290	W6FET 280
W3ARD 314	W6NJU 310	ZL1AGO 303	WB2RLK 290	OK1MP 279
W3NKM 314	ZL3NS 310	VE3MJ 302	XE2YP 289	W6HUR 279
W4IC 314	ZS6LW 310	W6KZS 302	YV1LA 289	I1WT 275
W9DWQ 314	W3DJZ 309	OE2EGL 301	OE1FF 288	VE7HP 275
W9ILW 314	W6YMV 309	SM6CWK 301	WAØKDI 288	
G3FKM 313	IØZV 308	WA2HSX 301	DJ7CX 287	

Region I and III of the IARU, you would be speaking about something that is not legal, as third party traffic is absolutely illegal in many ITU countries.

There are those who say that OSCAR or AMSAT is the future of amateur radio. If this is true, it may be a distant future, as presently Amateur Radio lacks the awesome capability needed to put a transponder into earth-orbit without government support. But at the same time DX can be achieved with a simple rig and dipole. It can, and it has, and it will!

"Many are beginning to worry about 1979 and the way amateurs may fare at the allocation of frequencies by the ITU treaties. Perhaps it is time to consider how amateur activities within the U.S. look to other countries. Each month *QST* lists over many pages those activities which are illegal over two thirds of the earth. DX plods its way along . . . short on attention and encouragement, but it survives. DX is Amateur Radio . . . Everywhere. Can you name other activities which can say that? There are none!"

The Arkansas DX Association featured a slide presentation by A2CCY at their annual banquet in December 1973. On the left of the photo is Bill, W5KGJ-ADXA President and on the right is Bob Furzer, A2CCY.

Here and There in the World of DX

The International DX Association has re-

The CQ DX Award Program

C.W. DX	2XSSB DX
156—JA1CKE	350—G4AMT
157—G3DLH	351—G3UVA
158—G4AMJ	352—DA1JP
	353—WA7RFH
	354—UA6RB
	355—UV3CE
	356—UO5BZ
	357—VA7WJ
	358—K3NEZ

Endorsements

C.W.: G3DLH-150
2XSSB: ZL3NS-310, W4WSF, W6HUR, VA-7WJ-275, WB4TPU-200, K3NEZ-150
3.5/7mHz—W4WSF
Mobile—K3NEZ (1st Mobile endorsement issued!)

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

The WPX Program

Mixed

442—I4BFY
443—F6AJA
444—SP5XM

C.W.

1319—JA5MG
1320—F5GV
1321—UB5WAB
1322—UA3YAA
1323—UK2GBY
1324—UQ2IL
1325—UP2BAS
1326—UW4HH
1327—UW3PQ
1328—UW1YY
1329—UK5LAG
1330—UA3XJ
1331—SP9BPF
1332—SP2FBC
1333—SP1AFU
1334—SP9CTW

S.S.B.

802—JA3KWJ
803—I8JN
804—W2IOZ
805—G3SEM
806—F6AJA
807—UK4WAB
808—WA7RFH
809—SP7AWA

WPNX

72—WN2LVV

VPX

71—UA3-142-498
72—UA4-133-302
73—UB5-064-382
74—UA1-14373
75—UQ2-0371
76—UB5-073-389

Endorsements

Mixed: W4CRW—1000, W9IRH—800, F6AJA-550, SP5XM-500, I4BFY-450
CW: WB4SIJ, UK4WAB-600, V01KE, K1-WJB-450, K2BQW, UW9AI, F5GV, UB-5WL-400, DJ1YH, W10PJ, UK2GBY, SP 9BPF-350
SSB: ZL3NS-850, WA6AHF-700, WA6TAX, UW3IN-650, 9H4G, UB5WE-600, W2IOZ, WA5VDH-500, JA3KWJ, LU1BAR/W3-450, 18JN, G3SEM-350
VPX: DL1-3521-500, W410646-450, UA3-142-498
80 Meters: K4RDU, UK5MAG, UQ2IL, VO1KE
20 Meters: UK5MAG
Africa: ZL3NS, WB4SIJ, 9H4G, DL-12521, F6AJA
Europe: ZL3NS, UB5WK, 9H4G, DL-12521, JA5MG, SP2FBC, SP1AFU, SP7AWA, F6AJA
North America: ZL3NS
Oceania:.ZL3NS, WB4SIJ
South America: ZL3NS, WA6HRS

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

DIAL-A-PROP 516-883-6223

Scott, WB4VGY of the 1S1A DXpedition (left) and Jim, W6BHY (Ex-ZD8Z, and 9Y4AA) posed for this pix at the Fresno DX Convention. Actually Scott is tall, but Jim runs out about 6'7"!

organized and hopes to step up assistance to DX Stations and QSL Manager Services. INDXA is currently handling QSL's for CR5-AB, VR1AA, FY7AF, VR1AC, YK1AA, ST2-SA, AP2KS and XT2AA. An s.a.s.e. sent to INDXA, P.O. Box 125, Simpsonville, MD 21150 will bring details on the organization and purpose of this DX Club.

Bo, SMØOS has returned from Afganhistan where he signed YA1OS during 1973. He is anxious to QSL Stations worked by the address listed in the QSL section. An s.a.s.e. would be of great help.

Our French *CQ* Checkpoint, F9MS, is now active with the rare prefix call FRØBCS from Reunion Island using his "S" Line and a Hy-Gain 204BA 4 element yagi. Claude will be active on c.w. and s.s.b. until mid-November. QSL to his home address with IRC for Airmail Reply.

The ARI, Italian Amateur Association, under the patronage of the "Marconi Foundation" has organized a series of Celebrations, in order to commemorate the first centenary of the birth of Guglielmo Marconi, which occurs in 1974. An official Award has also been issued and is called "Diploma Guglielmo Marconi," for which rules are available from ARI, Bologna Section, Casella Postale 3133, Bologna, Italy.

The Resellar Polytechnic Institute Radio Club made over 3800 QSO's using the special Call KS2RPI to celebrate the 150th anniversary of the Institute. Amateurs in 101 countries and all states were worked during April.

The Heathkit HW-16 c.w. transceiver sent to the Maritius Amateur Radio Society in 1970 by the So. California DX Club is currently being used by Jacky, 3B6CF on Agalega Island. In Mauritius, 3B8DA is active on 14040 c.w. at 0300 and 1300 GMT daily.

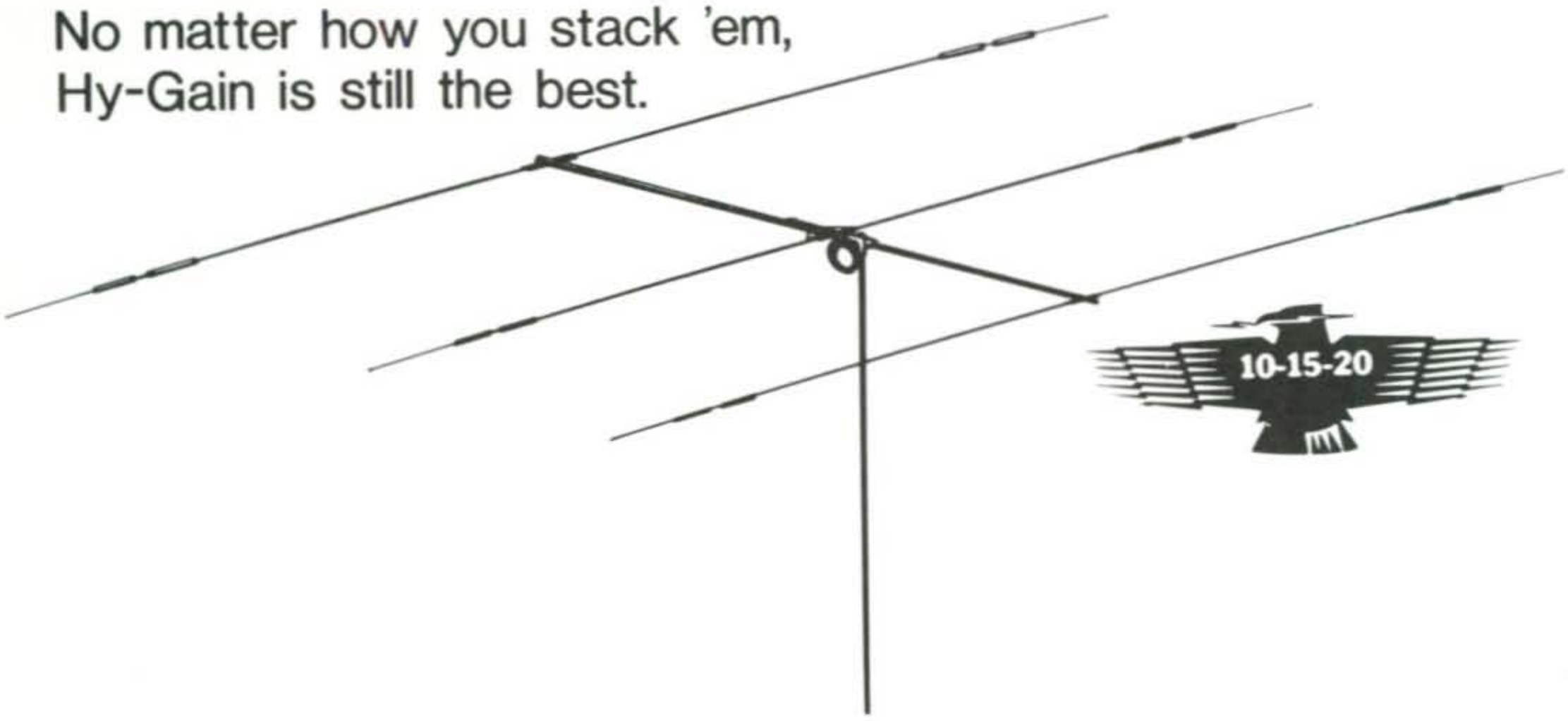
The City of New Bern, N.C. is celebrating its Bicentennial from August 16-25. The local radio club has requested the special call KB4-ERN for this period. Local amateurs will be active from public events during the week and

[*Continued on page 75*]

hy-gain TH3Mk 3

10-15-20 Meter Tri-Band Antenna

No matter how you stack 'em,
Hy-Gain is still the best.



Outstanding performance makes the difference in Hy-Gain's popular 3 element TH3Mk3 tri-band beam. Superior construction makes it the best. The Hy-Gain TH3Mk3 superior construction includes a cast aluminum, tilt head, universal boom-to-mast bracket that accommodates masts from 1¼" to 2½". Allows easy tilting for installation, maintenance and tuning, and provides mast feedthru for beam stacking.

Taper swaged slotted tubing on all elements. Taper swaged for larger diameter tubing at the element root where it counts, and less wind loading at the element tip. Slotted for easy adjustment and readjustment.

Full circumference compression clamps at all joints are mechanically and electrically superior to self-tapping metal screws.

Extra heavy gauge machine-formed, element-to-boom brackets with plastic sleeves used only for insulation. Bracket design allows full support.

"Hy-Q" traps for each band are tuned at the factory. You can tune the antenna, using charts supplied in the manual, for optimum performance on your preferred mode, phone or CW.

Hy-Gain's exclusive Beta Match for optimum matching, balanced input on all 3 bands and DC ground to eliminate precipitation static.

For best results, use with Hy-Gain BN-86 balun is recommended.

- Up to 8 db gain.
- 20-25 db front-to-back.
- VSWR less than 1.5:1 at resonance.
- 1 KW AM, 2 KW PEP power capability.
- Turning radius...15.7'.
- Net weight...36 lbs.
- Boom length...14'.
- Longest element...27'.
- Surface area...5.1 sq. ft.
- Nominal 50 ohm input.

CLIP THIS AD!
And send it with your check for $189.95 for your Hy-Gain TH3MK3,. 100' of *free* RG-8/U foam cable and prepaid shipping!

Electronix Sales
23044 S. CRENSHAW BLVD., TORRANCE, CALIF. 90505
HOME of LA AMATEUR RADIO SALES

Propagation

BY GEORGE JACOBS,* W3ASK

FROM mid-September to mid-October high frequency propagation conditions are usually in a state of change. On some days, they should continue to be much the same as they were earlier in the summer, but on other days the first signs of wintertime conditions should be noticeable. For this reason, this month's column contains *DX Propagation* Charts for the one month period September 15-October 15, rather than the usual two month span. This month's column also contains *Short-Skip Propagation Charts* for September and October.

During September and early October expect a slight increase in 10 *meter* DX possibilities. While we're too low in the sunspot cycle to expect regular DX openings on 10, look for the occasional one into South America and to the South Pacific, and perhaps to Africa as well, during the afternoon hours. An increasing number of DX openings can also be expected for *15 meters* during the daylight hours. *Twenty* looks like it will continue to be the best band for DX propagation from just after sunrise to a few hours after sunset. Signals should be a bit stronger than they were during July and August, but the band will close an hour or two earlier because of the shorter hours of daylight. Improved nighttime DX propagation conditions are also expected on *40, 80 and 160 meters,* with considerably *lower* static levels and with these bands remaining open somewhat longer in the northern hemisphere as the hours of darkness increase. *Forty* should provide the best chances for DX from after sunset through the sunrise period.

Mid-September through mid-October marks the fall equinoctial period. This is the period when the sun crosses the equator on its apparent travel into southern skies, and the hours of daylight and darkness are just about equal length throughout the world. This generally results in an *improvement* on long DX openings between the temperate regions of the northern and southern hemispheres, on all h.f. amateur bands. Look for more frequent openings between the USA and South America, Oceania, South Asia and southern Africa, especially on *20 meters* for several hours after sunrise and again during the early evening.

For readers interested in short-skip conditions, for openings less than 250 miles use *80 meters* during the day and either *80 or 160 meters* at night. Between 250 and 750 miles it should be *40 meters* during the day and *80 meters* at night. For openings between 750 and 1300 miles try *20 meters* during the day, *40 meters* from sundown to Midnight and *80 meters* from Midnight to sunrise. For openings beyond 1300 miles, *20 meters* is the best bet during most of the daylight hours, with *40 meters* optimum during the hours of darkness.

V.h.f. Ionospheric Openings

Although summertime sporadic-E ionization is expected to fall off considerably during September, an occasional *6 meter* short-skip opening may still be possible over distances ranging between 1000 and 1300 miles. Best time to check is before noon and during the early evening.

Conditions for trans-equatorial, or TE-scatter propagation are usually at their best during equinoctial periods. An occasional *6 meter* TE opening should be possible during September between the southern half of the USA and South America. The best time for TE openings is between 8 and 11 p.m. While most TE openings are of very short duration, some may last for an hour or longer. As a rule, signal levels

*11307 Clara St., Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For September, 1974

	Forecast Of Signal Quality			
Propagation Index .....(4)		(3)	(2)	(1)
Date: September				
Above Normal: 4, 11-13, 22-23	A	B	C	C
Normal: 3, 5-7, 9-10, 14-16, 21, 24-25	B	C	D	E
Below Normal: 2, 8, 17-18 20, 26, 29-30	C	D	E	E
Disturbed: 1, 19, 27-28	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 (3) will be *poor* (D) on Sept. 1 and 2, *fair* (C) on Sept. 3 and *good* (B) on Sept. 4, etc.

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

during TE openings on *6 meters* are usually weak, and there may be noticeable flutter-type fading.

Auroral activity also usually increases during the equinoctial period. Look for some fairly good *6 and 2 meter* auroral-type openings when conditions on the h.f. bands are below normal or disturbed. Check the "Last Minute Forecast" at the beginning of this column for those days forecast to be below normal or disturbed during September.

No major meteor showers are expected during September and few, if any, meteor-scatter openings are likely on the v.h.f. bands.

Sunspot Cycle Progress

The Swiss Federal Solar Observatory reports a mean sunspot number of 38.7 for June. This results in a smoothed sunspot number of 33 centered on December, 1973. This is about the same level of activity recorded for October and November, so it seems as if the present cycle may have reached another brief plateau, as it slowly progresses towards a minimum. It now seems unlikely that the bottom of the present cycle will occur before the end of next year.

Here's a recap on that big solar and radio storm of early July. A very large group of sunspots, which formed on the backside of the sun, first came into view on June 29. by July 1, it was joined by another large group of new sunspots, and the combination became the center of numerous solar flares which caused large disturbances in the earth's magnetic field and blackouts on all h.f. bands for several hours at a time. Flare activity reached a peak on July 5th, when one of the largest solar flares seen in many years occured at 2142 GMT. The cosmic and X-ray energy emitted from this flare reached the earth's atmosphere early on July 6th and caused a tremendous magnetic storm, and just about wiped out the ionosphere for a day. Sunspot activity began to subside by July 7, and by the 8th the active area began to pass into the backside of the sun, and conditions slowly began to return to normal.

A smoothed sunspot number of 25 is forecast for this month.

How To Use The Short-Skip Charts

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

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

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

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

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

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

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

CQ DX Contest Special

This year's *CQ* Worldwide DX Contest will be held on the following dates:

October 26-27—Phone Section
November 23-24—C.w. Section

Following the practice of the past 23 years, next months' PROPAGATION column will be devoted to a special, comprehensive forecast which will cover both Sections of the Contest.

Regular subscribers to Mail-A-Prop will receive an even more comprehensive forecast a few days before each Section is scheduled to begin. An annual subscription to this weekly propagation newsletter is $30. For readers not yet subscribing to Mail-A-Prop, a special *five issue* introductory offer will be available, which will include both Contest Sections, for $5. Checks should be sent to Mail-A-Prop, P.O. Box 86, Northport, N.Y. 11768 *before* October 15 to receive this special subscription.

Be sure to read "Short-Term Predictions For Ionospheric Propagation" by Ted Cohen, W4UMF, which appears elsewhere in this issue of *CQ*.

73, George, W3ASK

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 aeras 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 *daylight saving* time is used, *not* GMT. To convert to GMT, *add* to the times shown in the appropriate Chart 7 hours in the PDT Zone, 6 in the MDT Zone, 5 in the CDT Zone and 4 in EST Zone. For example, 14 in Washington, D.C. is 18 GMT and 20 in Los Angeles is 03 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.

CQ Short-Skip Propagation Chart

September & October, 1974

Local Daylight Savings Time At

Path Mid-Point

Band (Meters)	*Distance Between Stations (Miles)*			
	50-250	*250-750*	*750-1300*	*1300-2300*
10	*Nil*	10-21 (0-1)	08-10 (1) 10-15 (1-2) 15-22 (1)	08-10 (1-0) 10-14 (2-0) 14-18 (1) 18-22 (1-0)
15	*Nil*	08-10 (0-1) 10-14 (0-2) 14-22 (0-1)	08-10 (1) 10-14 (2) 14-17 (1-3) 17-18 (1-2) 18-22 (1) 22-00 (0-1)	08-10 (1) 10-14 (2) 14-17 (3) 17-18 (2-1) 18-20 (1) 20-00 (1-0)
20	12-20 (0-1)	08-10 (0-1) 10-12 (0-2) 12-15 (1-4) 15-17 (1-3) 17-20 (1-2) 20-07 (0-1)	08-10 (1-2) 10-12 (2-4) 12-15 (4) 15-17 (3-4) 17-19 (2-4) 19-20 (2-3) 20-21 (1-3) 21-23 (1-2) 23-08 (1)	08-09 (2-1) 09-10 (2) 10-14 (4-2) 14-16 (4-3) 16-19 (4) 19-21 (3) 21-23 (2) 23-01 (1) 01-06 (1-0) 06-08 (1)
40	08-18 (0-2) 10-12 (2-4) 12-16 (3-4) 16-18 (2-3) 18-20 (1-2) 20-22 (0-1)	08-10 (2-3) 10-12 (4-3) 12-16 (4-2) 16-18 (3) 18-20 (2-4) 20-22 (1-4) 22-00 (0-3) 00-03 (0-2) 03-06 (0-1) 06-08 (0-2)	08-10 (3-2) 10-12 (3-1) 12-16 (2-1) 16-18 (3-2) 18-20 (4-3) 20-22 (4) 22-00 (3-4) 00-03 (2-3) 03-06 (1-2) 06-08 (2-4)	08-10 (2-1) 10-16 (1-0) 16-18 (2-1) 18-20 (3-2) 20-21 (4-3) 21-00 (4) 00-03 (3-4) 03-06 (2-3) 06-08 (4-2)
80	07-09 (3-4) 09-12 (4) 12-19 (4-3) 19-22 (4) 22-04 (3-4) 04-07 (2-3)	07-09 (4-2) 09-12 (4-1) 12-17 (3-1) 17-19 (3-2) 19-21 (4-3) 21-04 (4) 04-06 (3-4) 06-07 (3)	07-09 (2-1) 09-17 (1-0) 17-19 (2-1) 19-21 (3-2) 21-22 (4-3) 22-04 (4) 04-06 (4-2) 06-07 (3-2)	07-09 (1) 09-17 (0) 17-19 (1) 19-21 (2) 21-22 (3-2) 22-04 (4-3) 04-06 (2) 06-07 (2-1)
160	17-19 (1-0) 19-21 (2-1) 21-06 (4) 06-08 (3-2) 08-10 (2-1) 10-12 (1-0)	18-20 (1-0) 20-21 (1) 21-03 (4-3) 03-06 (3-2) 06-08 (2-1) 08-10 (1-0)	20-21 (1-0) 21-23 (3-1) 23-03 (3) 03-06 (2-1) 06-08 (1)	21-23 (1-0) 23-03 (3-2) 03-06 (1) 06-08 (1-0)

ALASKA

September & October, 1974

Openings Given In GMT†

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

HAWAII

September & October, 1974

Openings Given In Hawaiian Standard Time†

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

[*Continued on page 72*]

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

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

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

COP'S COLUMN

BY COPTHORNE MACDONALD,*
WØORX

IN the July column which reported on SSTV happenings at Dayton this year, you may recall the observation that different scan-converters showed different amounts of line-ot-line "mis-registration," "staggering," or "sync jitter." Since this is a common problem in monitors, not just scan-converters, this month we'll take a first look at it. (If you have your own anti-jitter approach or any suggestions which you'd like to pass along to other slow-scanners, please drop me a line.)

Some Causes Of Line-To-Line Jitter

The effect we're talking about appears in Fig. 1, an off-the-air photo of a single frame of a CQ by WB6QWC. We know from experience that the letters of the alphabet have edges which are either straight lines or smooth curves, and it bothers us to see ragged edges like these. There are several possible reasons for the staggering, and it is impossible just to look at a single frame like this and diagnose the cause. One of the most frequent causes is wow and flutter in any tape recorder used; at either the send or receive end. If the speed of the tape past the record or playback head is not perfectly constant, there will be slight differences in the duration of each line of video on playback. Since the monitor scan rate across the screen is constant, these slight speed variations cause a "staggered" effect. Cassette recorders are notorious offenders because of their low speed and small flywheels. (RMS wow and flutter of 0.1% should be the goal for perfect "staggerless" reproduction, and is attainable at 6½ i.p.s. in a good reel-to-reel machine. A wow level of 0.2% is not bad, but only the best cassette recorders are this good.)

Ionospheric propagation under fast fading conditions can cause staggering. To a first order approximation, the strongest signal will "capture" the limiter. If the received signal is arriving by several paths of different lengths, abrupt changes in picture phasing can result as one path fades in and another fades out. There is not much that can be done about line-to-line staggering from this source. A good triggered horizontal sweep system in the monitor should have some advantage over a phase-locked loop or a.f.c. system in minimizing both this problem and the effects of tape recorder wow. This is because with a triggered sweep you get a new solid starting or reference point every 1/15 second when the horoizontal sync pulse arrives. A phase-locked loop doesn't respond this quickly because it is designed specifically not to react to a single sync pulse, but to the average phasing of many sync pulses.

Sometimes what appears to be sweep-related jitter or staggering has nothing to do with the basic sweep circuitry at all, but with poor power supply regulation. Random or video-inspired variations of the low voltage power supply voltages can cause centering voltages to change slightly, or the sweep capacitor charging rate to vary slightly, producing jitter. Even poor regulation of the CRT high voltage can cause this effect with certain types of video material. A crosshatch pattern will usually reveal the existence of this problem because it contains vertica lines which show up the jitter effect, and horizontal lines which switch the CRT screen current between zero and some fairly high level, at a slow rate.

A fourth major cause of staggering is less than optimum design of the monitor sync separation and detection circuitry. My own early SCFM monitor design (*QST*, March, 1964) used a single tuned circuit resonated at 1200 Hz and followed by a full-wave rectifier, but no ripple elimination filter. This meant that the horizontal sweep was triggered by an individual half cycle of the 1200 Hz subcarrier. Unless the phase of the subcarrier was reset in the camera at the beginning of each sync pulse, a slight staggering of lines would appear

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

Fig. 1—Example of line-to-line jitter or staggering.

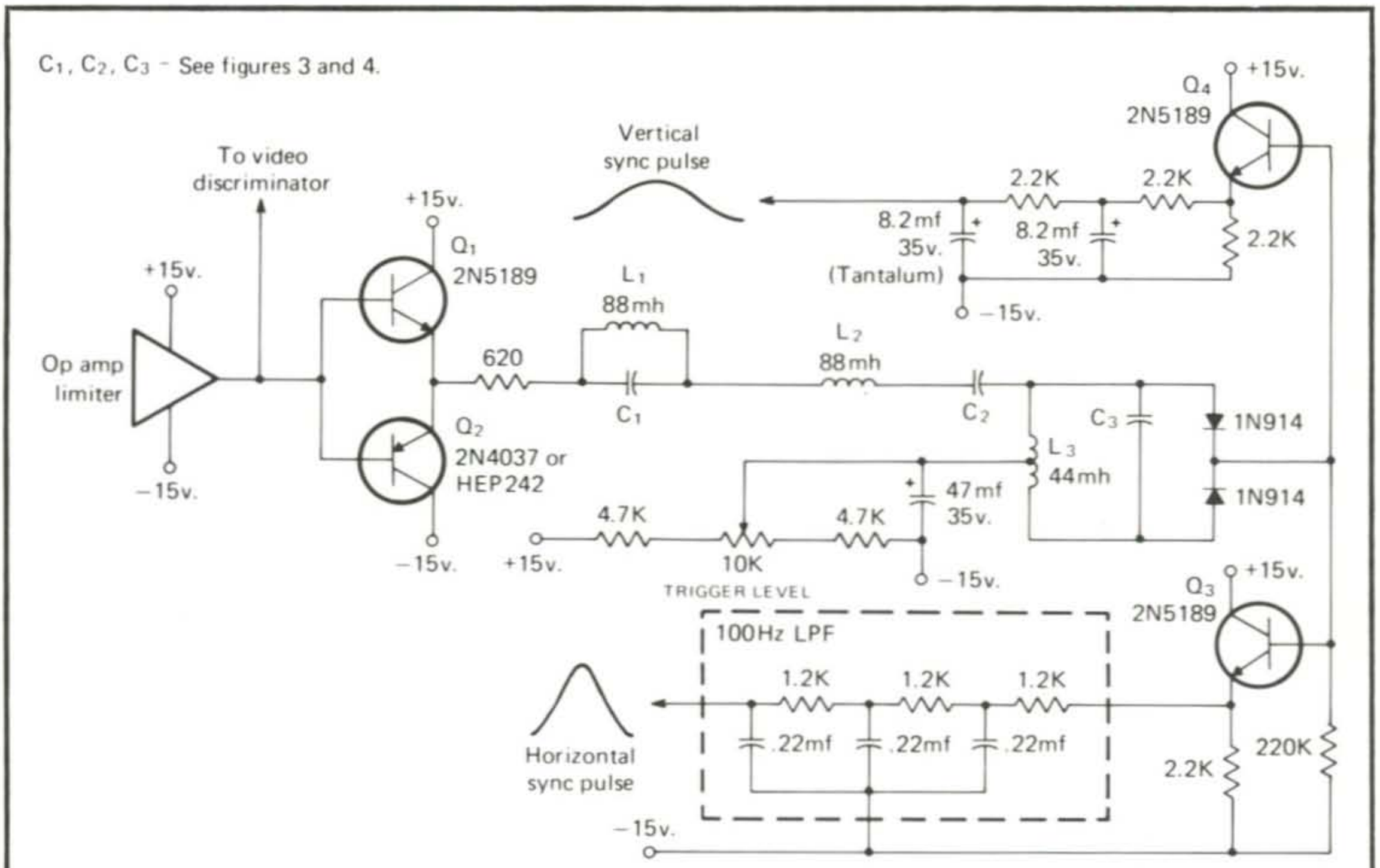


Fig. 2—Bandpass/Lowpass sync separation circuit.

in the picture due to the random phase of the 1200 Hz subcarrier. (As I'll discuss, this problem can be eliminated by filtering the rectified subcarrier.)

Another approach used in many monitors today is similar to that used in home TV sets. The sync is stripped from the demodulated video by a circuit which detects when the video goes to the "blacker-than-black" sync level. This approach is simple and inexpensive, but can cause jitter if the subcarrier ripple elimination filter doesn't do an adequate smoothing job with 1200 Hz input. The relatively wide bandwidth (about 1 kHz) of this detection scheme can also result in jitter when the S/N is low during weak signal reception.

A version of the lowest jitter sync system I've tried so far is shown in Fig. 2. Although I designed it some years ago, it received only limited publicity until Ralph Taggart, WB8DQT, used it in one of his recent monitor designs. The basic idea is to feed the limiter output through an optimized multi-pole sync discriminator filter. This discriminator output is then rectified and filtered to remove ripple by a 100 Hz or 200 Hz low-pass filter. The 200 Hz wide 3 db bandwidth of the discriminator, and the bandwidth of the l.p.f. were chosen to match the 5 millisecond duration of the horizontal sync bursts. With these bandwidths, the demodulated and filtered sync pulses rise gradually, reaching maximum amplitude just at the end of the 5 ms period. The post-limiter noise bandwidth is thus reduced to the minimum practical.

The Sync Discriminator Filter

The frequency response curve and schematic of the filter are shown in Fig. 3. Note the infinite rejection frequency at 1540 Hz. This gives a sharp cutoff on the high frequency side of the filter passband which insures that all video frequencies from 1500 to 2300 Hz are attenuated to a low level at the filter output. The inductors are the ubiquitous telephone toroids; one is the 44 Mh variety, while the other two are 88s. The capacitors should be a good quality extended-foil film type (Sprague "Pacer" or similar). Each branch of the filter must be tuned to the correct resonant frequency by selecting or paralleling fixed capacitors until resonance at that frequency is obtained. Fig. 4 shows a simple test setup for checking resonance, and the details of the adjustment procedure. In each case, resonance occurs at the frequency of *minimum* level at the scope or meter. Take the steps in the order shown; then wire these "selected" parts into the filter circuit shown in Fig. 3. I wouldn't attempt to build the filter unless you have the facilities to go through the adjustment procedure. The 1200 Hz resonating operations in particular should be performed carefully. Try to hit 1200 Hz within ± 20 Hz or better, and for a symmetrical passband try to get the two "1200 Hz" resonant branches within a very

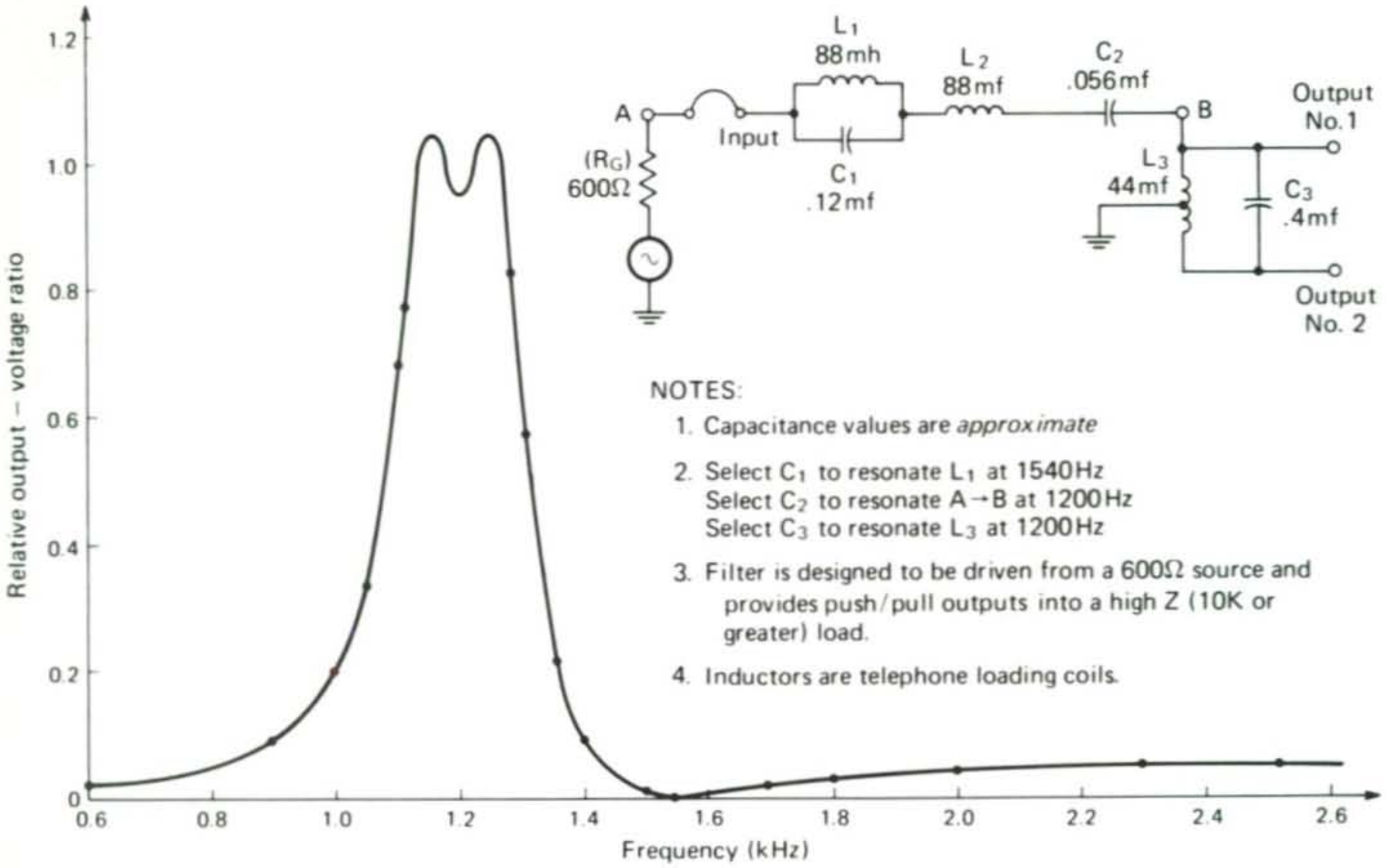


Fig. 3—Sync Discriminator Filter and response curve.

few Hz of each other.

A Complete Sync Circuit

Fig. 2 shows the sync discriminator filter with adjacent circuitry as it might be used in a monitor with ± 15 volt supplies and an op-amp limiter. Though we're talking primarily about horizontal sync here, this circuit also includes a vertical integrator circuit and will deliver vertical sync too. The TRIGGER LEVEL pot would normally be a set-and-forget trim-pot, and its purpose is to allow the sync slicing or triggering in the following stage to occur at the desired point on the rising slope of the filtered sync pulse. (About half amplitude seems best.) Typically, the circuit of Fig. 2 would feed into the base of an NPN transistor with emitter grounded or op-amp comparator for shaping purposes, or directly to a sweep multivibrator trigger circuit. The required filter source impedance of about 600 ohms is obtained through the use of the low-Z emitter follower drivers (Q_1 and Q_2) followed by a

[*Continued on page 81*]

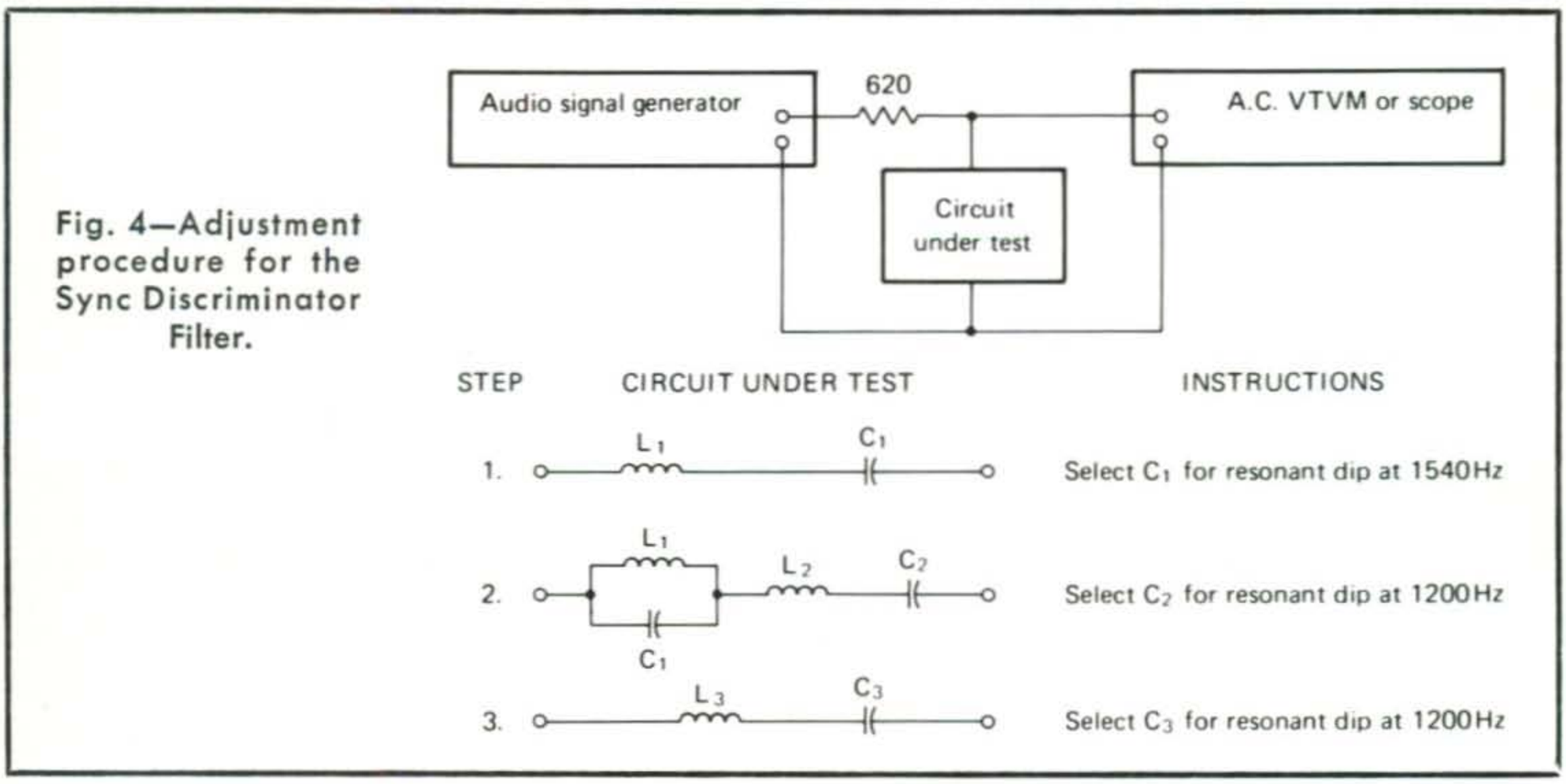


Fig. 4—Adjustment procedure for the Sync Discriminator Filter.

'JUP on FM

BY NORM STERNBERG,* W2JUP

ONE of the annoying problems currently afflicting some of the repeaters in large metropolitan areas is channel occupancy. In places like New York, Chicago, Los Angeles, Washington and other huge urban centers, there are many times when it becomes a challenge just to get a word in edgewise on some repeaters. Repeater time becomes valuable, especially during prime time such as commuter rush hour. In response to this challenge, the W2JUP psycho-electronic laboratories has developed a solution which is currently being tested on the air in the New York area. Your attention is referred to our newly-designed Cliché Code.

This code would be used much in the manner of the famous "Q" signals of ancient times. Each repeater user is granted the necessary opportunity to express himself with a significant reduction in channel occupancy time, thereby leaving more open time on the repeater for those operators who are basically perverts, and have to tie the repeater up with technical balderdash and long pointless discussions about radio techniques.

The Cliché Code is numerical, the numbers being assigned in arbitrary fashion. While there is no special significance associated with the Cliché Code numbers, inveterate contest operators may, at their discretion, accumulate all Cliché Code numbers received for the day, week, month or year, tabulating their totals by adding the individual numbers and applying for recognition as the "Clichéopertaor" of the year for his call district.

In the following Cliché Code list, each code number and meaning is followed by a brief explanation of its proper utilization. Naturally, Cliché Code number usage may vary with the individual and the circumstances.

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

Code Number	Interpretation and Explanation of Proper Usage
1.	*"How am I making the machine?"* Self-explanatory. Greatest use during the first few months of f.m. operating. Failure to use this signal shows excessive self-confidence and must not be tolerated in the newcomer.
2.	*"Am I full quieting?"* Standard signal for letting all stations on the channel know that you have fully mastered the understanding of angle modulation techniques. Essential for all f.m. operators.
3.	*"What's the handle there?"* Fully in keeping with the greatest traditions of the Wireless Art. This signal shows that you have the true Amateur Spirit and that the use of ordinary words such as "name," is only for the outcasts.
4.	*"I just wanted to see if I could make the machine from here."* Widely applicable on trips or any other time when the user is more than five miles from the repeater. Very practical for putting an end to those boring technical discussions which have no place on radio.
5.	*"(------) for a call, please (insert your call)* Useful at any time. Widely appreciated during lulls in dull conversation between two or more overly technical operators showing off their knowledge. Guaranteed to break up train of thought and allow for new subject matter to penetrate their excessively electronic chit-chat. Also valuable for insertion when one station has asked a question of another and is anxiously awaiting reply. (Note! Extra points may be awarded if this signal is used during a declared emergency traffic period.)
6.	*"How does my audio sound?"* Shows everyone on channel that you had six months of Latin in Junior High School and that you understand the elements of high-fidelity engineering. Very valuable for operators of newly-acquired rice boxes.
7.	*"Do I sound like I'm on frequency?"* Outstanding signal for operators who wish to demonstrate their mastery of amplitude modulation techniques. Even more valuable when receiving operator has discriminator meter on receiver. (Note!—this signal is not valid for use on direct or simplex channels and its use subjects the operator to applicable penalties.)

Code Number	Interpretation and Explanation of Proper Usage
8.	*"I don't want to tie up the machine."* This signal shows your consideration for the other users of the machine. Proper use of this signal is after some five to ten minutes of pointless chatter without leaving any pauses for breakers. Must not be used unless has been on the requisite time.
9.	*"(WB2ZWR) this is (W2JUP) . . . are you there, Joe?" (insert your call and the other guys call)* Greatly needed during busy hours. Shows your concern for the other station and that you want to know if he failed his last audiometry test. Indicates that you don't think that he will answer unless you specifically ask him for his attendance report. A *must* signal for the newcomer who doesn't understand the functioning of squelch circuits.
10.	*"OK, fine (------). (insert name of other guy)* Mandatory signal for begining each transmission. Shows that you have not forgotten with whom you are in contact. Special credit when used responding to other guy's transmission which you copied only 25 percent due to high noise level at your very bad location. Prevents him from feeling badly that you might have missed anything. Prevents repetition.
11.	*"That's a Roger!"* Use of this signal shows your independent nature. Proves that you are not a slave to tradition and that you are fully prepared to give new meaning and vitality to time-worn World War Two prosigns. Superior to Citizen's Band use of "ten-four."
12.	*"I'm running an HT and a linear."* Permits you to show all users on the channel that not only are you in good standing with Master Charge, but that you have willingly sacrificed transmission efficiency for the sake of running an extra-clean f.m. signal, since only fools believe that f.m. will flow unaltered through a Class C amplified.
13.	*"(W2JUP) (insert your call) listening repeat."* Essential signal to indicate to all users of the channel that if anyone is crass enough to call you direct on the repeater output that you will not respond, that you insist the other

The Ultimate F.M. Transceiver

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

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

- Operates on FM, AM or Modulated CW
- Built-in DC and AC power supplies
- Frequency Range of 143.5 to 148.5 MHz in 5 KHz increments
- Autoscan in 5 KHz steps across entire band, with adjustable speed and frequency limits.
- Synthesizer flexibility that offers choice of 600 KHz up or down, 1 Meg up or down, simplex, frequency split, or any nonstandard split (programmable) all from a single function switch.
- Receiver Sensitivity of 0.35 Mv for 12 db SINAD on FM
- Dual power output of 20 watts or 5 watts across entire band
- Adjacent channel rejection (30 KHz) 100 db minimum
- Image spurious and intermodulation (EIA) 80 db minimum
- 10 pole, 13 KHz crystal filter
- Receiver Superhet, single conversion
- Frequency stability of 0.0005%
- Built-in tone burst and PL encoders and decoders
- Built-in touch tone pad
- Full LED Digital readout
- Built-in S Meter also serves as VSWR bridge, power output meter, battery indicator, deviation indicator and discriminator meter.
- Audio output 4 watts @ 10% THD
- Speaker built-in to left side of cabinet for maximum mobile reception
- Headphone jack for noise-free mobile operation
- Independent selectable priority channel
- Built-in Auto CQ
- Temperature range from -20^{o} to 170^{o} Fahrenheit
- Size: 4" H x 8" W x 10" D Weight: 10 pounds
- One million channels (1000 Rec. x 1000 Trans.)

The EBC-144 "DREAM MACHINE"

$1495.00

A $150 deposit will insure early delivery and guarantee price

AMATEUR PRODUCTS DIVISION

emergency beacon corp.

15-RR River Street
New Rochelle, N.Y. 10801
(914) 235-9400

guy come through the repeater.

14. *"(W2JUP) (insert your call) listening direct."*
"(W2JUP) or listening simplex"
The converse of the preceding signal. Indicates that you will just not answer any station that calls you via the repeater. You want to do it your own way at all times.

15. *"I'm just leaving the QTH."*
or
"I'm going to the QTH."
This signal is perfect for indoctrinating the new amteur who has just graduated directly from his year of penitence on the Novice bands with c.w. It shows him that the same familiar "Q" signals that he heard and misused on c.w. can be just as nicely misused on f.m. phone without a second thought. The use of this particular signal in this manner will blow the minds of any foolish students of philosophy and logic who might bother to look up the old meaning of "QTH." The fact that the above-mentioned act is literally impossible adds new spice to the old radio game.

16. *"QRZ nine four?" (or any other frequency you choose)*
This signal is modern. It is most properly transmitted after a minimum five minute silent period on the channel. Be absolutely certain that your call sign has not appeared on the channel! The fact that no one has been calling you adds zest to the game and is worth extra points. Let's face it! "CQ" went out with the quenched gap! Besides which, sending out calls for Generals may get you classified with the militarists and who needs that?

17. *"I'm at the home QTH."*
Similar to Signal 15. Be sure that you know that your pad is located at 43°36′15″ North, 72°04′26″ West!

Reader Mail

I would like to thank the following brave souls for the letters they have sent me, and I promise firmly to ignore their requests for me to get out of town. . . .

W4LNG, K6UYV, W8IHJ, K4LYE, WA2HVK/6, W4RKE, W5CD, W8SDZ, K6SF, WORJZ, WB9JHS, WA7YEO, WB9JKZ, WA2BNS and a variety of others who make up this cast of thousands that we call Amateur Radio.

73's, Norm, W2JUP

Wilson Electronics

DIRECT

SPECIAL SUMMER SALE !!!

WILSON 1402SM HAND HELD
2.3 WATT FM TRANSCEIVER

- *Rubber Flex Antenna
- *Complete Set NiCad Batteries
- *Leather Case
- *Three Sets of Crystals

16/76, 34/94, 94/94, Other Available at $8.00 Pr.

ALL FOR JUST $199.95

- 6 Channel Operation, Individual Trimmers On All TX and TR Xtals. All Xtals Plug In.
- S Meter Battery Indicator.
- 10.7 IF and 455 KC IF Ceramic Filter.
- .3 Microvolt Sensitivity For 20dB QT.
- 2.3 Watts Minimum Output.
- Microswitch Mike Button.
- Size 8-7/8 x 1-7/8 x 2-7/8 Inches.
- Weight 1 lb. 4 counces, Less Battery.
- Current Drain Rx 14MA TX 380 MA.

ACCESSORIES:

SMI Speaker Mike $24.00
BCI Battery Charger $29.95
1410A Amplifier Mobile Mount $99.00

To: Wilson Electronics
P.O. Box 794
Henderson, Nevada 89015
(702) 451-5791

Ship me 1402 SM Special Summer Package
Plus ☐ SM1 ☐ 1410A ☐ BC1

Enclosed is $ _____ ☐ Check ☐ Money Order
☐ Master Charge ☐ Bank Americard
_____ M/C Interbank # _____
Card Expiration Date _____
Extra Xtals _____ _____ _____

Name _____

Address _____

City and State _____ Zip _____

All orders will be shipped Air Mail within 24 hours after receipt of order (excluding weekends). Enclose additional $3.00 for prepaid Air Mail shipping. Nevada residents add sales tax.
Sale ends October 31, 1974

THE awards PROGRAM

BY ED HOPPER,* W2GT

USA-CA HONOR ROLL

2000

K1VSJ 203
K4TSJ 204

1500

K7LQI 246
WA3TUC 247
K4TSJ 248

1000

K7LQI 330
WA3TUC 331
K4TSJ 332

500

CR4BS 998
K7LQI 999
WA3TUC ..1000
JA1JKG 1001
WA1QBH ..1002
K4TSJ 1003

THE "Story of the Month" for September is:

Earl H. Harrison, K9UTI

(All Counties #114, 1-10-74)

As Earl says: "County Hunting for me started in earnest in 1963, when I asked to ride along with W5JUG/M, from Texas to South Carolina.

"A bunch of us, K9EAB, WA9DCQ, K8CIR, K8KOM, WØMCX, K8VZW, W5EHY, W8CXS, VE3CBY, K8IWI, W2QHH, WA5AEB, W4EVO, W7KOI, W8UMR, WØJWD, WØGYM, W8WT and K8IQB (hope my memory isn't bad) had weekly (Sunday) get-togethers on 80 meters, trying to snag a County the hard way. It was soon decided to set up a 40 meter net- after getting over 40 Counties from W5JUG/M.

"Well, my family and I were trying to get a business started and they were not getting much out of me, due to time spent County Hunting.

"In 1965 my rig broke down, and business sure required more of my time, so I got away from County Hunting for a few years, but not until I had racked up over 2000 Counties.

"When my time was a bit more plentiful, I got back to County Hunting and found a 20 meter net going strong, and some of the old gang were still at it, so it was not difficult getting back to the chase.

"For challenge, *CQ*'s USA-CA has to be the greatest — too tough for some but for the patient, dogged kind who just don't know it can't be done — it's something else.

"It's always a pleasure to give out a needed County, just as much as to get one you need. Guess that helping each other attitude that kept this group, where ever you find them, a particular breed that is a pleasure to be associated with!

"I've made many lasting friends in the County Hunters over the years. It's been nothing but honest to goodness pleasure for me — a bit nerve racking on my family — but when the last County was confirmed — they were pleased.

"Now a little about myself — I started out in 1929 playing and singing in Jazz Bands — ended up in Cuete, playing at all the hotels and radio stations with many different bands. Married in 1940 and migrated back to Metropolis in 1945, where I had gone to school and got into the food business. Built a new restaurant about 7 years ago, serving charcoal steaks and etc . . . We have 7 children — 4 girls and 3 boys. All married except the first and last.

"Oh yes, Bill Smith, W7GHT gave me my last County, Custer, Idaho. Bud, W7SVY was going to get it for me, when he had that terrible accident, but Bill had overheard my need and came through. That's what I mean, always some one helping you. But my thanks to all those good Gals and Guys who have driven those many extra miles for all of us, plus those wonderful Net Controls!

"Having had to retire after a heart attack in October '72, I'll never be able to repay all the debts I owe by giving out needed Counties — but when I feel well enough, I'll try my darndest

Thanks to you *all* for making amateur radio just a bit more *Interesting*."

Awards Issued

Howie Bromberg, K1VSJ added USA-CA-2000, All 14, All S.S.B. to his collection, and brought his endorsement of USA-CA-500 through USA-CA-1500 to include All Mobile To Mobile.

Tom Harrell, K4TSJ was issued USA-CA-2000, Mixed; USA-CA-1500, All S.S:B., All Mobiles; and 1000 & 500 endorsed All S.S.B., All Mobiles, All 14.

Frank McJannet, K7LQI obtained USA-CA-500, 1000 and 1500.

Paul Bugen, WA3TUC won USA-CA-1500, All S.S.B.; 1000 and 500 endorsed All S.S.B., All 14, All Mobiles.

Angelo Mendes, CR4BS *(What a signal-WOW)* was issued the first USA-CA to CR4

Earl Harrison, K9UTI.

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

Clara YL-DXCC Award.

and it was endorsed All 2 × S.S.B.

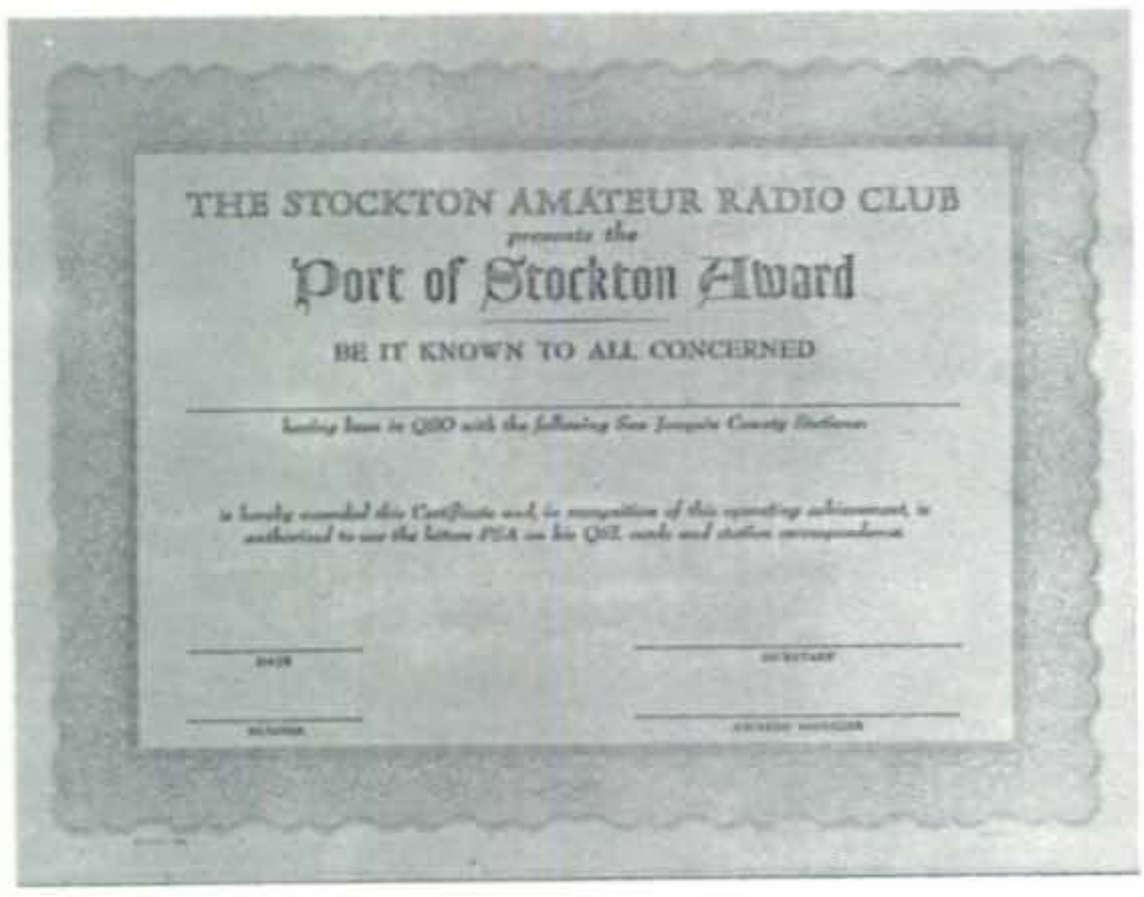
Teruharu ("Tel") Hosogai, JA1JKG got USA-CA-500, All A-1., #9 to Japan and #10 to Asia.

Robert A. Howell, WA1QBH (exWN8ZZD, WA8ZZD, WA3ONZ, ZF1AH) claimed USA-CA-500, endorsed All A-1.

Awards

Worked All Washington Counties: The Amateur Radio Association of Bremerton, Washington sponsor this WAWC Award for working all 39 Counties after January 1, 1973. Send $1.00 and log data signed by applicant and two other licensed operators or applicant and the Secretary of his Radio Club to: John Cathey, W7DAZ, 1433 Howard Ave., Port Orchard, Washington 98366.

Port of Stockton Award: The Stockton Amateur Radio Club has reactivated the Port of Stockton Award with slight revisions in the qualifying rules. There is now no charge for the certificate, but only one certificate will be given to a station, although endorsements will be made to the certificate. The rules are more-or-less standard ones: The award is issued for working stations in San Joaquin County, California. A contact with a member station outside the county will count (WA6CPP, K6HXY, and WA6MGG are the three stations for which this exception applies). California stations work 10, the rest of the U.S. work 5, and the rest of the world work 3 stations. No date/time/QTH restrictions.



Port of Stockton Award.

The award is issued in three ways: Basic award, no seal, any band and mode mixed; endorsement and red seal for all one band or all one mode; endorsement and gold seal for all one band—one mode.

There is no charge for the award; stations should supply s.a.s.e. or IRC for return of the certificate.

No QSLs are required; send log data to WA6CPP, Award Manager, Box #10, Wallace, California 95254.

The club station W6SF is active in most contests and is activated several times a month.

125 awards have been made to 18 states, 15 countries; there are 2 continents waiting for a first qualification—South America and Asia.

YL-DXCC Award: Sponsored by the Canadian *L*adies *A*mateur *R*adio *A*ssociation and issued for working YLs in 100 different countries. Send complete log data and $1.00 to: Certificate Custodian: Cathy Hrischenko, VE3GJH, 30 Lisburn Crescent, Willowdale, Ontario M2J 2Z5, Canada. No. QSLs necessary — use approved countries list. Seals for additional 20, send complete log data and s.a.s.e. Also see data in CONTEST CALENDAR by Frank, W1WY of *A*nnual *C*lara *D*ay *C*ontest by CLARA, 1800 GMT 14 Sept. to 1800 GMT 15 Sept.

Editor's Notes

A nice note from Earl, WA3DMH to say that he received Leopon Award #000388, #1 to U.S.A. and it is very colorful and beautiful. Data on this Award was on pages 64 and 65 of February '74 *CQ*, although it is obvious that the title under it and the Award next to it, were mixed.

Here is the latest and correct data on the County Hunter Nets: S.S.B.: daily usually starting about 1400 GMT on 14336 and until the band folds — then look on 7237 or 3943. Also 7237 is often used for close in QSOs when 14 skip no good. Most s.s.b. County Hunters will answer calls by c.w. County Hunters.

C.W.: Saturday 14070 at 1400 and 2000 GMT.

Sunday 7055 at 1430 GMT.

Wednesday 7055 at 2300 GMT.

During Fall/Winter/early spring months: Monday 2400 GMT on 3574.

I am sure you all had a wonderful time at KC '74 and at Micro-Mini Convention July 13, 1974 at Valley Forge, PA., let me have the details.

Sorry, again ran out of space. How was your month? 73, Ed., W2GT.

CQ ANNOUNCES NEW SUBSCRIPTION RATES

The recent increases in the prices of paper, postage and printing are forcing us to raise CQ's subscription prices. We regret the need to follow all other amateur magazine publishers in raising prices, but we must do so if we are to continue to provide the high quality reading CQ readers have come to expect.

Effective Sept. I, 1974, CQ's domestic subscription rates will be:

$7.50 for one year
$13.00 for two years
$17.00 for three years

Overseas rates will be as follows:

$8.50 for one year
$15.00 for two years
$19.00 for three years

As a courtesy to present subscribers, we will honor long term reduced rate subscriptions during the next six weeks only, as follows:

3 years.... $14.00
4 years.... 18.50
5 years.... 23.00
10 years... 43.00
15 years.... 63.00
LIFE..... ...100.00

These rates good only through Sept. 15, 1974. Orders received after Aug. 10 using older, reduced rate order forms will be pro-rated to reflect the new rates. Reduced rate long term subs are non cancellable.

CQ MAGAZINE
14 Vanderventer Avenue
Port Washington, N.Y. 11050

☐ Please send info on new CQ books.

Enter my ☐ new ☐ renewal subscription to CQ for ------ years Enclosed is ☐ check ☐ money order for $ _____ . Start new sub. with the _____ issue if possible. (Allow six weeks for processing of new subscription.)

Name _____ Call _____

Address _____

City _____ State _____ Zip _____

NOVICE SHACK

BY HERBERT S. BRIER,* W9EGQ

Capacitor Fundamentals

Assume a simple *capacitor* constructed of two metallic plates separated by a layer of insulation (called the *dielectric*) with a voltmeter connected across the plates and also a battery, a 3-position switch, an ammeter, and a resistor connected in series across them (fig. 1). When the battery is switched into the circuit, the ammeter will immediately flip up and gradually fall back to zero. At the same time, after a momentary hesitation at zero volts, the voltage across the capacitor will gradually increase to the battery voltage. At this point, the battery can be removed from the circuit; and, if losses are low, the capacitor will remain charged indefinitely. Later, when the resistor is switched across the capacitor, the ammeter will deflect in the opposite direction, indicating that energy is now flowing out of the capacitor. This fact is verified by the drop in capacitor voltage as its stored energy is consumed as heat in the resistor.

The fundamental characteristic of a capacitor is its ability to accept electrical energy and release it at a later time.

*385 Johnson St., Gary, Indiana 46402.

Members of the Cabrillo High School Amateur Radio Club, W6GK, one of the nation's largest and active high school radio clubs, really have it made! Its Novice course is part of the school's regular curriculum. Dick Di'ddel, W6ZSI, Electronics Instructor, is briefing some of the students and club members on the operation of the club's Hammarlund receiver. Besides the Novice course, the school offers several other electronics courses. See text for more information.

Theory

The surfaces of the capacitor plates contain huge quantities of electrons that are not too firmly bound to their atoms. Consequently, the positive battery terminal gobbles up electrons from the plate it is connected to, resulting in it having a net positive charge. Simultaneously, the negative battery terminal crams an equal number of electrons on the other plate, giving it a negative charge. This process continues until the voltage across the plates equals the battery voltage.

The unit of capacitance is the *farad*. By definition, a flow of a *coloumb* (one ampere in one second) into a 1 farad capacitor will charge it to one volt. But an air-insulated, 1 farad capacitor will have a plate area of over 36 square feet! Fortunately, practical values in electonic circuits range from approximately one *pico* farad (pf) in some r.f. applications to several thousand *micro* farads (mf) in low-frequency audio and power-supply applications.

Capacitance depends on the area of the facing plates, which are usually arranged in two interleaved stacks with alternate plates connected together; the spacing between the plates; and the type of insulation between them. Very approximately, two, 1" square plates separated by about an eighth of inch of air has a capacitance of around 10 pf. But, slipping a piece of solid insulating material of the same thickness between the plates will multiply the capacitance by the *dielectric constant* of the material. Air has a dielectric constant of 1; waxed paper, 2.5 to 3;

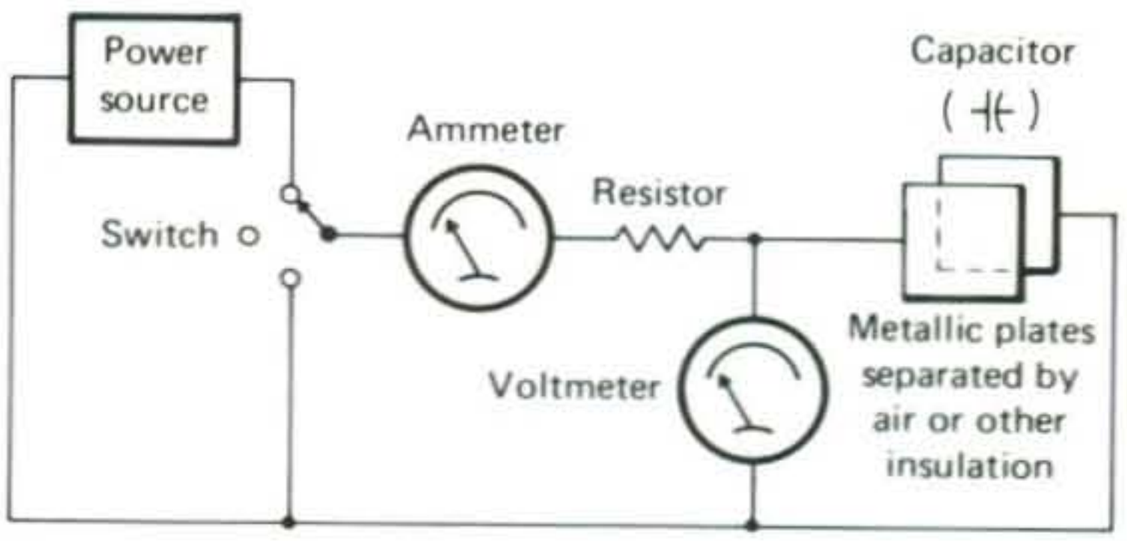


Fig. 1—Fundamental circuit to illustrate how the *capacitance*, that exists between any conductors separated by an insulator, reacts in an electronic circuit.

mica, 4 to 9; and some rutile ceramics have dielectric constants up to 100. Obviously, solid-dielectric capacitors can be made more compact than air-dielectric units. But they also have higher losses and are usually not as stable. For these reasons, air-dielectric capacitors (often variable) are preferred in critical, tuned r.f. circuits of our receivers and transmitters, and the least-expensive, compact, solid-dielectric capacitors that will do the job are chosen for other circuits.

Capacitors And Alternating Current

Assume the battery of fig. 1 is replaced by an a.c. generator and the resistor R is shorted out. Referring to fig. 2, as the generator voltage increases from zero at the start of the cycle, maximum current starts to flow into the capacitor. But, as the capacitor becomes charged, it accepts less and less current from the generator. At the end of a quarter cycle (90°), the generator voltage is maximum and cannot force any more current into the capacitor. On the contrary, as the voltage starts decreasing as the cycle continues, the capacitor reacts by spilling current back into the generator; until, at the end of a half cycle (180°), the generator voltage is again zero. As the cycle continues and the generator voltage starts increasing in the negative direction at the start of the second half cycle, the voltage and current curves become mirror images of the preceding half cycle.

Thus, alternating current effectively flows through a capacitor, but there is opposition to the process called *Capacitive Reactance*, which is calculated from the equation: $X_c = 2\pi FC$, where X_c is the capacitive reactance in ohms. $\pi = 3.14$, $F =$ frequency in Hz, and $C =$ capacitance in farads, or $F =$ frequency in mHz and $C =$ capacitance in mf.

(To be continued)

Operating On An Expired License

When Marilyn Harman, WN8NPR, 3616 Kendall Ave., Cincinnati, Ohio, passed her General class examination at the quarterly examination in Cincinnati, Ohio, a few days before her Novice license was due to expire and expected to be off the air for weeks between licenses. The FCC examiner informed her, however: she had passed her General class test before her Novice license had expired; therefore, she could continue to operate as a Novice, even after the Novice license expired. But she could not venture out of the Novice bands until she had the General class license in her possession. Presumably, the same rule applies to all Novices who pass their General or Advanced class exams shortly before their Novice licenses expire.

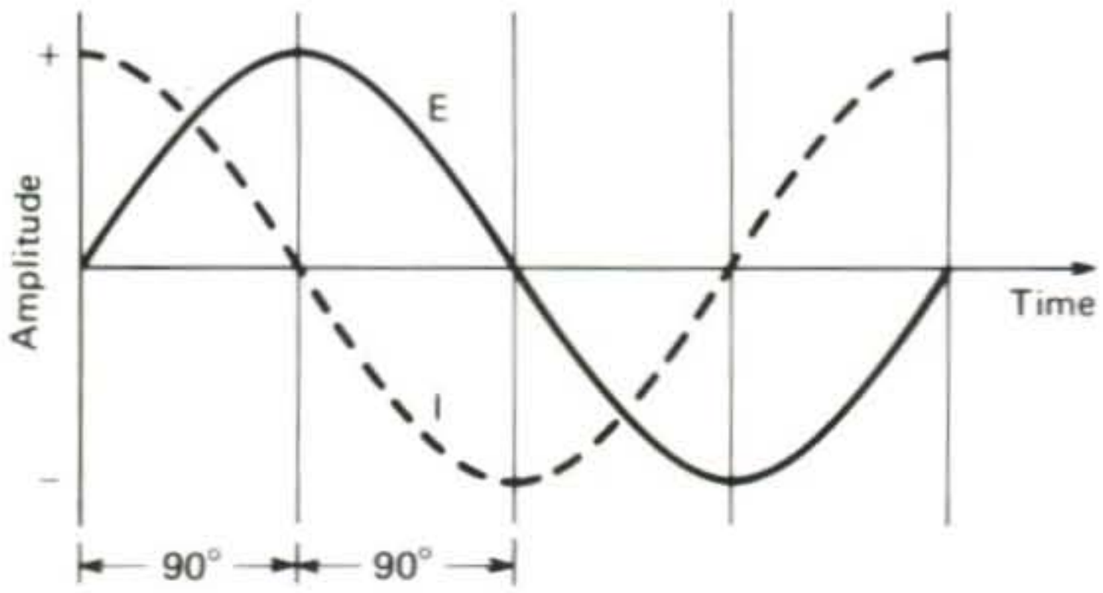


Fig. 2—Current *(I)* and voltage *(E)* relationships in an ideal capacitor.

Novice Shack Photo Contest

To encourage readers to send us better photographs of themselves and their amateur stations, we will award a one-year subscription to *CQ* to the sender of best photograph we publish in the Novice Shack each month. Rules are simple. Send a sharp, well-focused photo of yourself and amateur station and some details about your equipment, antennas, states and countries worked, and what you particularly like about amateur radio to Novice Shack Photo Contest, 385 Johnson St., Gary, Ind. 46402, and we will do the rest. Even if you do not win a subscription, other suitable pictures will be published, as space permits. Black and white pictures are preferable, but sharp color pictures are also usable. Will you be the first winner?

New National High School Radio Net

Although not strictly a Novice activity, the Cabrillo High School Amateur Radio Club, W6-GK, is sponsoring a national High School Radio Net every Thursday at 3:00 P.M., EST, 12 noon, PST, on 14,322 kHz. Regular operation will start September 12 and continue until June. All HS radio stations are invited to join. By the way, the new Junior College Amateur Radio Net operates on 14,317 kHz, also on Thursdays. Write to the Cabrillo High School Amateur Radio Club, 4350 Constellation Road, Lompoc, Calif. 93436, for more information on the nets and see the picture on these pages for some reasons why it is one of the nation's most active and popular high-school radio clubs.

CB beats Amateur Radio! Last year, the FCC reports that of 4,000 cases of interference to "home entertainment equipment," 3600 were the fault of CB equipment, and 400 were the fault of amateur equipment.

Novice News

Dr. David C. Chaffin, WB4WHE, Box 91, Kumba, United Republic of Cameroon, Africa, had his application for a Cameroon (TJ) license turned down; so he plans to do a lot of SWL'ing on his Heathkit HW-16 before he returns to the USA in 1975. Dave got his Novice license in August, 1971, and he has never got over the thrill

of working WN's and hearing them say, "U R mi first Tenn," and his goal is to work 1000 WN's. We hope the Cameroon government relents and permits Dave to achieve his goal as a "TJ." . . . "Cop's Column" in July *CQ* told of several Novices and ex-Novices getting on 7133 kHz daily at 6:30 A.M., local time, to talk about something more than name, QTH, and RST. You are invited to join by calling or answering "CQ NEWS." The time and frequency are flexible, and the frequency will probably change to 3733 kHz as the fall season develops . . . **Chuck Holzer, WN9LYV,** 1713 Portage Ct., Indianapolis, Ind. 46227, has an identity problem. He worked either SK7BBL or VA7BBL in a short contest-style QSO—just a report, no name or location—on 15 meters in May and asks "What country did I work, and how do I exchange QSL cards?" The prefix *SK* is assigned to military club stations in Sweden; and the prefix *VA* may be signed by Canadian amateurs this year in place of the regular Canadian prefix *VE* in commemoration of the 100th anniversary of the Royal Canadian Mounted Police. Because of the three letters after the number, we suggest sending the QSL card to VE7BBL.

Bill Horger, WN4DWB/8, operating from a 10th floor dormitory at Ohio State University, worked 45 states from September to April with a transmitter output of 2.5 watts. He used a variety of random-length, end-fed antennas sloping down from the feed point, which was 110 feet high. Bob admits that the height was an advantage, but the antenna was shielded by other buildings, making it difficult to work stations to the east on the higher frequencies; fortunately, however, results to the east were fairly good on 80 meters. As a result, he missed only Maine and Vermont in that direction. Before going to Ohio, last fall, WN4DWB worked 45 states in three months of concentrated operating from Tennessee. Bill gives the back of his hand to the few higher-class operators who seem to resent Novices, but he tips his hat to many non-Novices who gave him new states and fine ragchews. They are the ones who sharpened his operating practices and increased his code speed to the point that he was going up for his advanced license.

Again we remind you that the Novice Shack is *your* column. We particularly invite your reaction to the technical discussions, such as the one on capacitance this month. Because of space limitations, they are difficult to write with accuracy and clarity. Also, they reduce the space available for general Novice operating news, equipment reviews, etc. Which do you prefer? If you vote for more news, you can reinforce your vote by sending us some news about yourself and station. Which is your favorite band? How many states and countries have you worked? What is your pet peeve? Send a clear photograph of you operating your station. And if a buddy is too bashful to tell the world about himself, become his publicity man. ■

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

*Sept.	1	Ohio QSO Party
Sept	1	RTTY ART Contest
Sept.	2	Labor Day Zip-Code Contest
Sept.	7-8	ARRL VHF QSO Party
*Sept.	7-9	Four Land QSO Party
*Sept.	14-15	Europen Phone Contest
*Sept.	14-15	Scandinavian C.W. Contest
*Sept.	14-15	Annual Clara Day Party
*Sept.	14-16	Maryland/DC QSO Party
*Sept.	14-16	Wash. State QSO Party
Sept.	14-16	Pennsylvania QSO Party
*Sept.	18-20	YLRL "Howdy Days" Party
*Sept.	21-22	Scandinavian Phone Contest
Sept.	21-23	VE/W Contest
Sept.	28-29	Delta QSO Party
Oct.	5-6	VK/ZL/Oceania Phone
Oct.	5-6	California QSO Party
Oct.	5-6	Missouri QSO Party
Oct.	5-7	W.E. Phone/CW QSO Party
Oct.	12-13	VK/ZL/Oceania C.W.
Oct.	12-13	RSGB 21/28 mHz Phone
Oct.	16-17	YLRL Anniv. C.W. Party
Oct.	19-20	RSGB 7 mHz C.W. Contest
Oct.	19-20	WADM C.W. Contest
Oct.	19-20	Boy Scouts Jamboree
Oct.	19-21	Manitoba QSO Party
Oct.	**26-27**	**CQ WW DX Phone Contest**
Nov.	1-4	CHC/FHC/HTH Party
Nov.	2-3	ARRL C.W. Sweepstakes
Nov.	2-3	RSGB 7 mHz Phone
Nov.	7-8	YLRL Anniv. Phone Party
Nov.	9-10	North Carolina QSO Party
Nov.	9-10	Rocky Mountain QSO Party
Nov.	10	Czechoslovakia Contest
Nov.	16-17	ARRL Phone Sweepstakes
Nov.	**23-24**	**CQ WW DX C.W. Contest**

*Covered in last month's Calendar

Labor Day Zip-Code Contest

Starts: 0000 GMT Monday, September 2
Ends: 2359 GMT Monday, September 2

This is a new one organized by the South Eastern Virginia Wireless Assoc.

The same station may be worked on each band and mode. Phone and c.w. are separate contests. Check sheets are required for entries with more than 100 contacts.

Exchange: RS(T), Zip Code on address of station license, and state, province or country. (DX stations send 00025)

Scoring: Based on the total of the sum of the last two digits in the Zip Code worked. ie: 23518 is worth 18 points. (A very unique system, should make some stations very popular.)

Frequencies: C.W.—60 kHz up from each band edge. Phone—3900, 7260, 14280, 21360, 28550. Novice—3710, 7110, 21110, 28110.

Awards: None mentioned but I am sure top scores will be rewarded. Include a large s.a.s.e. for copy of results

Mailing deadline Oct. 1st to South Eastern Virginia Wireless Assoc. P.O. Box 14411, Norfolk, Va. 23518.

RTTY ART Contest

Starts: 0000 GMT Sunday, September 1
Ends: 2400 GMT Thursday, October 31

This is not only a new contest but also involves a new technique of RTTY transmission which is being used by many keyboard operators.

Entries will be judged on the originality in the selection of subject matter, technique and appearance.

Suggest that you write to Don Royer, WA6-PIR, 16387 Mandalay Drive, Encino, Calif. 91316 for more details.

Pennsylvania QSO Party

Starts: 2300 GMT Saturday, September 14
Ends: 0200 GMT Monday, September 16

This is the 17th annual party sponsored by the Nittany ARC. The same station may be worked on each band and mode for QSO points.

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

Scoring: For Penn. 3 points for out-of-state contacts, 1 point if with other Penn. stations. Multiply total by number of different ARRL sections worked. *Others:* 1 point per QSO multiplied by Penn. countries worked. (max. of 67).

Frequencies: Look for c.w. activity on odd GMT hours 72.5 kHz from low end of each c.w. band. Phone on even hours 20 kHz from top of each phone band.

Awards: Section awards to high scorers and Activity certificates for working ARRL sections, Penn. counties and the NARC Award. Write the NARC for details.

Mailing deadline Oct. 15th to: Nittany ARC, P.O. Box 60, State College, Penn. 16801.

VE/W Contest

Starts: 2300 GMT Saturday, September 21
Ends: 0200 GMT Monday, September 23

The VE/VO's will be working the W/K's in the "General" portion of the US bands in this one. Phone and c.w. are considered separate contests and must be logged and scored separately. There are two classes, single and multi-operator.

Only a total of 20 hours operating time may be used in the above period. On and off times

*14 Sherwood Road, Stamford, Conn. 06905.

must be indicated in the log, the minimum off period is 15 minutes.

Exchange: QSO no., RS(T) and QTH. ARRL section for the W/K's, geographical areas for the VE/VO's. (Provinces plus Newfld., Lab., Yukon and N.W.T. Total of 13)

Scoring: Each completed QSO 2 points. W/K's use sum of VE areas from each band for their multiplier. (max. of 13 each band) VE/VO's use ARRL sections each band.

Awards: Certificates to the top scoring stations, both phone and c.w., in each section. (min. of 25 QSO's) Awards to multi-operator stations will be issued if there are at least 3 entries per section. And two Trophies, one to the Top Canadian, and Top U.S. station.

Summary and check sheets are a must, as is a signed declaration that all rules and regulations have been observed. (Same available by sending s.a.s.e. plus IRC to address below). A dupe check sheet is required for logs with 200 or more contacts.

Reduction of claimed score by 2% or more because of duplicate contacts and etc. may result in disqualification.

Mailing deadline for logs is October 31st to: VE/W Contest Committee, VE2IZ, P.O. Box 2206, Dorval Station, Quebec H9S 3K9, Canada.

Delta QSO Party

Starts: 2000 GMT Saturday, September 28
Ends: 0200 GMT Monday, September 30

This is the 5th annual QSO party sponsored by the Delta Division of the ARRL. Delta stations (Ark., La., Miss., Tenn.) work stations both in and outside their boundries, others only Delta stations. The same station may be worked on each band and mode, portable and mobile each county change.

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

Scoring: For Delta, QSO's times ARRL sections worked. (max of 74) Others, QSO's times Delta counties worked. (max. of 316) DX stations may be worked but for QSO points only.

Frequencies: C.W. — 3550, 7050, 14050, 21050, 28050. Phone — 3990, 7290, 14290, 21390, 28590. Novice — 3775, 7175, 21125, 28125.

Certificate Awards:

A. Achievement: All stations contacting 5 or more stations in each of the 4 Delta states.

B. Delta: To the 3 highest scoring stations in each of the 4 states. (4th and 5th if warranted)
C. Others: To the highest scoring station in each ARRL section and country. (2nd and 3rd if warranted)

D. Plaques: Top scorer, in and outside the Delta divsion, and the Top scoring portable and mobile Delta stations.

Mailing deadline October 21st to: Malcolm P. Keown, W5RUB, 213 Moonmist, Vicksburg, Miss. 39180.

VK/ZL/Oceania DX Contest

Phone: Oct. 5-6 C.W.: Oct. 12-13
Starts: 1000 GMT Saturday
Ends: 1000 GMT Sunday

Stations in the rest of the world will concentrate on Oceania, with the emphasis on VK/ZL.

Rules apply to stations other than VK/ZL.

Exchange: RS(T), plus a progressive QSO no. starting with 001.

Scoring: *Oceania stations*: 2 points for VK/ZL contacts, 1 point with rest of world.

Outside Oceania: 2 points for VK/ZL contacts, 1 point for Oceania contacts.

Final Score: Total QSO points multiplied by sum total of VK/ZL call areas worked on all bands. Single band logs are also acceptable.

Logs: Date/time in GMT, station worked, number sent/rec'd, band and QSO points. Underline each new VK/ZL call area worked on each band, use separate log sheet for each band.

A summary sheet showing the scoring, your name and address in BLOCK LETTERS and a signed declaration that rules and regulations have been observed is also requested.

Awards: Attractive colored pictorial certificates to the top allband scorer, both Phone and c.w., in each country and call areas of W/K, JA and USSR. Single band awards if returns warrant.

There is also a s.w.l. section. Only VK/ZL stations are to be logged. Include call of station being worked and serial number sent.

Logs must be in the hands of the committee no later than Jan. 25, 1975. They may be sent to: NZART Contest Manager, P.O. Box 489, Wellington, New Zealand or 152 Lytton Road, Gisborne, New Zealand.

California QSO Party

Two Periods (GMT)
1800 Sat. Oct. 5 to 0600 Sun. Oct. 6
1500 Sun. Oct. 6 to 0300 Mon. Oct. 7

This is the 9th annual QSO party sponsored by the North Hills Radio Club. The same station may be worked once per band and mode. Calif. stations may work each other for QSO and section credit.

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

Scoring: One point per QSO. Calif. use ARRL sections and DX countries for their multiplier. Others use Calif. counties. (max. of 58)

Frequencies: C.W.—1805, 3560, 7060, 14060, 21060, 28060. s.s.b.—1815, 3880, 3980, 7280, 14280, 21280, 21380, 28580. Novice—3735, 7125, 21125, 28125.

Awards: Certificates to the top scorers in each of the 74 ARRL sections and each DX

country. Additional awards where justified.

Include a summary sheet, list countries, sections and DX countries worked. Name and address in BLOCK LETTERS and the usual signed declaration.

Mailing deadline Nov. 1st to: John Minke, W6KYA, 6230 Rio Bonito Drive, Carmichael, Calif. 95608. Include s.a.s.e. for results.

Missouri QSO Party

Starts: 1800 GMT Saturday, October 5
Ends: 2300 GMT Sunday, October 6

This is the 11th annual party sponsored by the St. Louis A.R.C. Special effort will be made to activitate hard to get Mo. counties.

The same station may be worked on each band and mode, and mobiles from each county change. Mo. stations may work other Mo stations for QSO and state multiplier.

Exchange: QSO no., RS(T) and QTH. County for Mo., state, province or country for others.

Scoring: One point per QSO. Mo. multiply total by sum of states, provinces and DX countries worked. Others use Mo. counties for their multiplier. (max. of 115) KH6 and KL7 count as state only.

Frequencies: 60 to 70 kHz up from low end of each band, c.w. and phone.

Awards: Certificates to top scorers in each state, province and DX country, the top 10 Missouri entries, and the top Mo. mobile.

Mailing deadline is Dec. 1st to: The St. Louis A.R.C., K0LIR, 842 Tuxedo Blvd., Webster Groves, Missouri 63119. Include s.a.s.e. for results.

RSGB 21/28 mHz Phone Contest

Starts: 0700 GMT Saturday, October 12
Ends: 1900 GMT Sunday, October 13

Its the world working the British Isles (G, GC, GD, GI, GM, GW) on 21 and 28 mHz, single operator only in this one.

Same station may be worked once on each band, but cross band QSOs are not permitted. Use a separate log for each band.

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

Scoring: Each QSO with a British Isle station counts 5 points. In addition a bonus of 50 points may be claimed for the first contact, on each band, with each B.I. prefix. (G2, GC3, GD4, GM5 and etc. a max. of 36 for each band. No bonus for GB) There is no multiplier, just total QSO and bonus points.

Awards: Certificates of merit will be awarded to continental leaders, U.S. call areas and others where returns justify. (A definite improvement over last year).

There is also a s.w.l. section. Only British Isles stations are to be logged, and scoring is same as above.

Logs should be received no later than December 9th and go to: RSGB HF Contests Committee, c/o M. Harrington, 123 Clensham Lane, Sutton, Surrey, England.

Editor's Notes

We take great pride in the generous selection of Trophies awarded in our World Wide Contest. See page 34 this issue for the Trophy awards list in this year's contest announcement.

All the World awards and those donated by U.S. amateurs are administered by myself. All others are handled by the donors themselves.

Some of our fellows have been donating these Trophies almost since the inception of the contest. If you are one on the lucky winners a letter of thanks and appreciation would be in order.

Wherever possible we try to make the presentation through a personal representative. Shipping via the usual channels has proven very unreliable to most of the overseas areas, and unfortunately caused long delays.

Some of you fellows that do a lot of traveling could offer your services. They usually roll out the red carpet when you present one of our Trophies.

73 for now, Frank, W1WY

Purchase your SWAN from AMATEUR ELECTRONIC SUPPLY

300B 80-10m 110vac Transceiver	$519.95
300B with SS-16B Filter installed	589.95
14A 12vdc Convertor for 300B	49.95
700CX 80-10m Transceiver	599.95
700CX with SS-16B Filter installed	669.95
250C 6m Transceiver	499.95
CYGNET 1200X Linear	299.95
Mark II 80-10m Linear	749.95
117XC AC Supply w/spkr. in cabinet	124.95
230XC 230v AC Supply, spkr., cabinet	134.95
14-117 12v DC Supply w/cable	149.95
14C 12v DC Module/cable ONLY	84.95
117X Basic AC Supply - w/117v cord	79.95
510X MARS Oscillator - less crystals	54.95
508 Full coverage VFO	189.95
VX-2 Plug-in VOX	44.95
FP-1 Phone Patch	54.95
MTK Mobile Mounting Kit	9.95
GMTK "Gimbel type" mobile mtg. kit	5.20
SS-16B Custom Crystal Lattice Filter	89.95
600T 80-10m Transmitter, 600w	589.95
600RC CUSTOM Receiver	545.95
600RC CUSTOM Receiver/SS-16B	599.95
600S Speaker for 600R	24.95
600SP Deluxe Speaker (w/phone patch)	69.95
600 Hz CW Filter for 600R	34.50
AM Filter for 600R	44.50
SWAN 444 Desk Mike	35.95
SWAN 404 Hand Mike	24.95
WM-1500 Wattmeter	64.95
Solid-State 80-10m Transceivers (12 volt)	
SS-15 15 watt PEP input	$599.95
SS-15 with SS-16B installed	669.95
SS-200A 300 watt PEP input	799.95
SS-200A with SS-16B installed	869.95
Mobile Mounting Kits for SS-15, 200	
SSGMTK "Gimbel type" (under dash)	$ 11.95
SSMTK Hump-mount kit	16.95
PS-10 AC Supply for SS-15	99.95
PS-20 AC Supply for SS-200	159.95
PS-210 220 volt AC supply	109.95
PS-220 220 volt AC supply	169.95
SS-208 External VFO	189.95
610X Crystal-controlled oscillator	54.95
Solid-State Mono-Banders (12 volt)	
MB-40 40m Xcvr, 75w PEP input	$299.95
MB-80 80m Xcvr, 75w PEP input	299.95
MB-40A 40m Xcvr, 160w PEP input	329.95
MB-80A 80m Xcvr, 160w PEP input	329.95
P-1215 AC supply for above MB's	49.95
P-2015 220v AC Supply for MB's	59.95
MBCW CW Monitor for MB's	19.95
Model 45 80-10m Antenna	84.95
Kwik-on Connector	7.95
BMT Bumper Mount	26.95
FM-2XA 2m FM Transceiver	$259.95
AC Supply for above	40.00
FM-1210A 2m FM Transceiver	319.95
AC Supply for above	40.00
Crystals for FM-2XA and 1210A . each	5.00
MD-4 2m Antenna	21.95
TMD Trunk mount for MD-4	9.95
RMD Roof mount for MD:4	5.95

SAVE $70

SWAN 160X 160m Xcvr, 1.8 to 2MHz. 1 KHz Readout, Switchable pwr. - 50, 100, 200 or 400 watts PEP. Less pwr. supply (117XC)
Reg. $469 NOW ONLY $399

SAVE $50

SWAN VHF-150 2m amplifier (143-149 MHz). 180 PEP or 150W DC input on CW & FM with 6 to 10w of drive. Built-in AC supply.
Reg. $299 NOW ONLY $249

SAVE $15

SWAN WM-1500 In-Line Wattmeter 2-30 MHz 0 to 5, 50, 500 & 1000 watts.
Reg. $64.95 NOW ONLY $49.95

Now you can use your
SWAN CREDIT CARD
at
AMATEUR ELECTRONIC SUPPLY
to purchase any new Swan equipment

SWAN ELECTRONICS
305 Airport Road Oceanside, CA 92054

Revolving Credit Account Nr. 7388
Issued To: Joe Ham
Address: 599 QSO Lane, Anywhere, USA
Call: W9XYZ
Joe Ham
Signature

NOTE We are able to offer the special price on the WM-1500 due to a large purchase made at the old price

SAVE $30
External VFO for 160X
Reg. $119.95
NOW $89.95

To: AMATEUR ELECTRONIC SUPPLY
4828 W. Fond du Lac Ave, Milwaukee, Wis. 53216

am interested in the following new equipment:

I have the following to trade: (what's your deal?)

Ship me:

I Enclose $_____; I will pay balance (if any):
☐ COD ☐ Swan Credit Card ☐ GECC Revolving Charge Plan
☐ Master Charge* ☐ BankAmericard ☐ American Express

Account Number:

Expiration DATE _____ *Master Charge Interbank number _____ (4 digits)

Name:

Address:

City & State:

☐ Send used gear list

AMATEUR ELECTRONIC SUPPLY

4828 West Fond du Lac Ave. Milwaukee, Wis. 53216
Phone (414) 442-4200

HOURS: Mon & Fri 9-9; Tues. Wed & Thurs 9-5:30; Sat 9-3

IMPORTANT! – Please Be Sure to send all Mail Orders and Inquiries to our Milwaukee store, whose address is shown above. The following Branch stores are set up to handle Walk-in business only.

17929 Euclid Ave.; Cleveland, Ohio Phone (216) 486–7330
621 Commonwealth Ave.; Orlando, Florida Phone (305) 894–3238

SURPLUS sidelights

BY GORDON ELIOT WHITE*

WITH summer at an end and most of us getting back into our work routine I can anticipate a flood of letters to this column asking questions on surplus. It must be the time when all we surplus hounds start looking at the jewels we found at last Spring's hamfests and wondering what on earth did we get? Or perhaps its just the pent-up drive to get back to the shack after vacation. Whatever the reason, over ten years of writing on surplus, the mail has been consistently much more heavy in September than in any other month.

It's not that I don't like corresponding with all you loyal readers out there, but I want to make a couple of suggestions that might eliminate some mail that should be directed elsewhere. I don't have a secretary; I have two and a half jobs already, my wife is the head of the PTA and several other organizations, and I have at least four time-consuming hobbies, from antique autos to sailing.

First: I am glad to get questions I can answer. I hate to reply "I don't know," or refer the inquiry elsewhere, in fact I tend to let unanswerable letters pile up until I'm too embarrassed to ignore them any more—about six months later. If you want to know when a particular article on surplus was published since World War II, I can generally refer you to the magazine issue you want. You then have to get that issue either from the publisher or from a library. I don't stock back issues. Some are re-printed in *CQ's* anthology book (cat. 102-1 and 102-2) and *Surplus Handbook* (cat. 122), available from *CQ*.

I can refer you to many common schematics in *Surplus Schematics Handbook,* which I do stock here, at $2.50 postpaid.

I can get copies made of several hundred other more or less common surplus schematics, generally from 1940-1965 which I have in my library. I have to search out the diagram, often dismantle the book it's in, and carry it into Washington D.C. and have it commercially copied, so I ask the nominal donation of one buck to cover all that drudgery and the expense.

I can, if pressed, copy entire manuals, but it costs quite a bit and I have to charge 10¢ per page for that service. I'm really not set up for that operation; It would be cheaper to buy the book from a surplus manual dealer.

I refer about 50 percent of my mail to a pair of hams who deal in surplus manuals, and some special problems to a couple more. To save that relay process, if you need a book, please try these people first:

Sam Consalvo, 7218 Roanne Dr., Oxon Hill, Md. 20021

Quaker Electronics, Hunlock Creek, Pa., 18621

Van's Electronics, 302 Passaic Ave., Stirling, N.J. 07980

BVE Electronics, Box 73, Paramus, New Jersey 07652

Please send self-addressed stamped envelopes with all inquiries to these people. They can't afford the postage and the time to answer inquiries otherwise.

Only in rare circumstances will I be able to tell you where some surplus item may be bought. Usually I bought it six months before the article appeared and the original lot is long gone. The best thing to do is try the people who advertise surplus items in *CQ;* Often they have a lot of things they don't list in a single ad, and, after all, the essence of surplusing is the search, isn't it?

I am not much good at answering questions about commercial gear, even ham gear, unless I have covered it in the column. I do have some diagrams of antique radios, but I am not strong in that department.

I find it frustrating to answer letters asking, essentially, "what's the best surplus to buy?" That's far too philosophic a question.

I offer the following letter, sent to an inquiring new amateur, as my philosophic approach to surplus:

Dear Bill,

As a novice, just getting started in ham radio, surplus does indeed offer a lot of value for (usually) little money.

There are a couple of general observations I might make: The most easily-used surplus is that still left over the World War II. Even though it is at least 30 years old, much of it is still quite usable, particularly for someone who is not pushing the frontiers of electronic knowledge just yet.

On the other hand, there was little television in 1942 and some of the WWII stuff is notorious for TVI. Much of it is terribly heavy and bulky. All of it is tube-type, an advantage and a disadvantage. Much of the best WWII stuff still around was made for aircraft and has 24 v d.c. or 117 volt 400 Hz a.c. power supply requirements. You can always build a 60 Hz power supply, but keep that in mind.

Usually when surplus is described as in "excellent condition" it is neither rusty nor obviously damaged. Hardly anyone will guarantee that it works, particularly since much of it will not work at all without some sort of conver-

*1502 Stonewall Rd., Alexandria, Va. 22302

sion—at least finding where to attach a line cord. The old ART-13 has a dynamotor power supply inside. Many surplus units have separate power supplies. You have to know.

Most surplus is not in kit form, but you may feel that it was by the time that you get it on the air.

The BC-645 transceiver, for example, is horribly obsolete. It was a u.h.f. transponder set, built early in the game for u.h.f., and I consider it virtually useless. It *can* be used, but for the effort you can do better. Since there is not much 430 mHz stuff around, maybe it has a place. The MK II tank radio is another dog. Even the Russians didn't want it in lend-lease tanks.

Much surplus is very good. The Command Sets are an example. They were far ahead of their time in 1939, and offer excellent value today, both the transmitters and the receivers, which were in production until about ten years ago, a fantastic lifespan in electronics.

Even the oldest surplus stuff is way above gear built for civilian consumption. Right now, current 1974 electronics for amateur use are closer to mil specs because of the use of printed circuits and transistors. Back when, the difference was enormous.

Manuals are not generally found with surplus gear. You can sometimes find books from the few remaining manual dealers who are listed above, and occasionally the dealer who sells the unit will have a book, but not always. Replacement parts are usually found by scrounging in the same place that you found the original set. Obviously capacitors and resistors are found at all commercial electronic wholesale outlets.

Sincerely,
Gordon White

As most faithful readers are aware, I have a great liking for the Command Sets — RAV, ATA/ARA, SCR-274-N, AN/ARC-5, AN/ARN-30, AN/ARC-60, etc. I will talk for hours about their history and design, and will correspond at once with anyone who knows them from the old days, or who knows where I might find the rare 9-13.5 mHz RAV receiver from the Command series.

I have a complete library of Teletype manuals from Model 14 through Model 37, although my Kleinschmidt references are less complete. For MITE information, contact Harry March, 200 Fox Drive, Winchester, Va.

I have *Signal Corps* and *BuShips* historical references going back to 1917.

I have a number of military equipment indexes, but my stuff comes to a halt about 1964. Anyone who has a current 1974 update of *Mil Handbook 161* can get a pretty good swap on it from me.

I am much more a receiver expert than a transmitter man.

I will try to be as helpful as I can, but I don't promise full satisfaction. I'll do my best with all your inquiries, but I ask one thing: Please send me a self-addressed stamped envelope, and please, please don't send a postcard with only your call on it. My callbook is circa 1963 and not much use any longer. ■

Propagation [*from page 48*]

Western States	10-15 (1)	07-10 (1) 10-12 (2) 12-15 (3) 15-16 (2) 16-18 (1)	06-07 (1) 07-10 (3) 10-12 (2) 12-14 (3) 14-16 (4) 16-18 (3) 18-19 (2) 19-21 (1)	17-18 (1) 18-19 (2) 19-01 (4) 01-03 (3) 03-06 (2) 06-07 (1) 19-20 (1)* 20-22 (2)* 22-02 (3)* 03-04 (2)* 04-06 (1)*

September 15—October 15, 1974

Time Zone: EDT (24-Hour Time System)

EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western Central Europe & North Africa	*Nil*	10-11 (1) 11-15 (2) 15-16 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	18-19 (1) 19-21 (2) 21-23 (3) 23-02 (4) 02-03 (3) 03-04 (2) 04-05 (1) 20-22 (1)* 22-01 (2)* 01-04 (1)*
Northern Europe & European USSR	*Nil*	10-13 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-14 (1) 14-16 (2) 16-18 (1)	18-20 (1) 20-04 (2) 04-05 (1) 21-04 (1)*

Eastern Mediter-ranean & Middle East	*Nil*	10-11 (1) 11-13 (2) 13-15 (1)	07-08 (1) 08-09 (2) 09-14 (1) 14-16 (2) 16-17 (3) 17-18 (2) 18-19 (1) 22-00 (1)	19-21 (1) 21-00 (2) 00-01 (1) 22-00 (1)*
West Africa	14-16 (1)	09-11 (1) 11-13 (2) 13-16 (3) 16-17 (2) 17-18 (1)	08-10 (1) 13-15 (1) 15-16 (2) 16-17 (3) 17-18 (4) 18-20 (3) 20-21 (2) 21-23 (1)	20-23 (1) 23-02 (2) 02-04 (1) 01-03 (1)*
Central & East Africa	*Nil*	11-13 (1) 13-15 (2) 15-16 (1)	13-15 (1) 15-17 (2) 17-18 (3) 18-19 (2) 19-21 (1)	21-02 (1)
South Africa	11-14 (1)	09-11 (1) 11-13 (2) 13-15 (3) 15-16 (2) 16-17 (1)	08-10 (1) 13-15 (1) 15-18 (2) 18-19 (3) 19-20 (2) 20-21 (1) **23-01 (1)**	19-22 (1) 22-00 (2) 00-02 (1) 23-01 (1)*
Central & South Asia	*Nil*	09-11 (1) 18-20 (1)	07-08 (1) 08-10 (2) 10-12 (1) 10-12 (1) 19-22 (1)	05-07 (1) 20-23 (1)
Southeast Asia	*Nil*	10-12 (1) 14-16 (1) 18-20 (1)	07-08 (1) 08-10 (2) 10-12 (1) 16-18 (1) 20-22 (1)	06-08 (1)
Far East	*Nil*	09-11 (1) 18-20 (1)	08-09 (1) 09-10 (2) 10-12 (1) 17-19 (1) 19-21 (2) 21-23 (1)	06-08 (1)
South Pacific & New Zealand	15-18 (1)	11-15 (1) 15-17 (2) 17-18 (3) 18-19 (2) 19-20 (1)	07-08 (1) 08-11 (2) 11-14 (1) 16-20 (1) 20-00 (2) 00-04 (1)	01-02 (1) 02-03 (2) 03-06 (3) 06-09 (2) 03-04 (1)* 04-06 (2)* 06-07 (1)*
Australasia	17-19 (1)	14-17 (1) 17-19 (2) 19-20 (1)	07-08 (1) 08-10 (2) 10-12 (1) 14-16 (1) 16-18 (2) 18-21 (1) 21-00 (2) 00-02 (1)	02-04 (1) 04-06 (2) 06-07 (3) 07-08 (2) 08-09 (1) 04-05 (1)* 05-06 (2)* 06-07 (1)*
Caribbean, America & Northern Countries of South America	11-14 (1) 14-17 (2) 17-18 (1) 17-18 (1)	09-10 (1) 10-13 (2) 13-15 (3) 13-15 (3) 16-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	07-08 (1) 08-09 (3) 09-10 (4) 09-10 (4) 10-15 (2) 15-17 (3) 17-19 (4) 19-21 (3) 21-22 (2) 22-00 (1)	19-20 (1) 20-21 (2) 21-04 (4) 21-04 (4) 04-06 (3) 06-07 (2) 07-08 (1) 21-23 (1)* 23-04 (2)* 04-06 (1)*
Peru, Bolivia, Paraguay, Brabil, Chile, Argentina and Uruguay	14-15 (1) 15-17 (2) 17-18 (1)	09-10 (1) 10-11 (2) 11-14 (1) 14-16 (2) 14-16 (2) 16-18 (3) 18-19 (1)	07-08 (1) 08-10 (2) 10-11 (1) 14-16 (1) 14-16 (1) 16-18 (2) 19-19 (3) 19-20(4) 20-21 (3) 21-23 (2) 23-00 (1)	21-00 (1) 00-05 (2) 05-07 (1) 01-06 (1)* 01-06 (1)*
McMurda Sound, Antarctica	*Nil*	16-18 (1)	18-20 (1) 20-23 (2) 23-01 (1) 08-09 (1)	00-03 (1) 03-05 (2) 05-07 (1) 04-06 (1)*

CALL 516-883-6223
FOR DIAL-A-PROP

Time Zones: CDT and MDT
(24-Hour Time System)
CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Surope & North Africa	*Nil*	10-14 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	18-20 (1) 20-23 (2) 23-01 (3) 01-02 (2) 02-03 (1) 21-23 (1)* 23-01 (2)* 01-02 (1)*
Northern Europe & European USSR	*Nil*	10-13 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-15 (2) 15-17 (1) 21-23 (1)	20-23 (1) 23-01 (2) 01-02 (1) 22-01 (1)*
Eastern Mediter-ranean & Middle East	*Nil*	10-13 (1)	07-08 (1) 08-09 (2) 09-15 (1) 15-17 (2) 17-18 (1) 21-23 (1)	20-23 (1) 21-23 (1)*
West Africa	12-14 (1)	09-11 (1) 11-13 (2) 13-15 (3) 15-16 (2) 16-17 (1)	07-09 (1) 13-15 (1) 15-16 (2) 16-19 (3) 19-20 (2) 20-22 (1)	20-23 (1) 23-01 (2) 01-02 (1) 23-01 (1)*
Central & East	*Nil*	12-16 (1)	07-08 (1) 16-19 (2) 19-20 (1)	21-00 (1)
South Africa	11-13 (1)	09-10 (1) 10-12 (2) 12-14 (3) 14-14 (2) 15-16 (1)	07-09 (1) 12-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1) 22-00 (1)	20-21 (1) 21-23 (2) 23-01 (1) 21-23 (1)*
Central & South Asia	*Nil*	18-21 (1)	07-08- (1) 08-10 (2) 10-12 (1)	06-08 (1) 19-21 (1)
Southeast Asia	*Nil*	17-19 (1)	07-08 (1) 08-10 (2) 10-13 (1) 18-22 (1)	05-08 (1)
Far East	*Nil..*	15-17 (1) 17-19 (2) 19-20 (1)	07-08 (1) 08-10 (3) 10-11 (2) 11-13 (1) 17-19 (1) 19-22 (2) 22-00 (1)	03-05 (1) 05-07 (2) 07-09 (1) 06-08 (1)*
South Pacific & New Zealand	14-19 (1)	10-13 (1) 13-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	06-08 (1) 08-10 (3) 10-12 (2) 12-18 (1) 18-20 (2) 20-22 (3) 22-00 (2)	00-01 (1) 01-07 (3) 07-08 (2) 08-09 (1) 02-04 (1)* 04-07 (2)* 07-08 (1)*
Australasia	16-18 (1)	13-16 (1) 16-18 (2) 19-21 (1)	05-07 (1) 07-08 (2) 08-10 (3) 10-13 (2) 13-17 (1) 17-18 (2) 10-29 (1) 20-23 (2) 23-01 (1)	02-03 (1) 03-05 (2) 05-07 (3) 07-08 (2) 08-09 (1) 05-06 (1)* 06-07 (2)* 07-08 (1)*
Caribbean, Central & Northern Countries of South America	11-13 (1) 13-16 (2) 16-18 (1)	09-10 (1) 10-11 (2) 11-13 (3) 13-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	06-07 (1) 07-08 (3) 08-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-19 (4) 19-21 (3) 21-22 (2) 22-00 (1)	19-20 (1) 20-21 (2) 21-01 (3) 01-05 (4) 05-06 (3) 06-07 (2) 07-08 (1) 20-23 (1)* 23-05 (2)* 05-06 (1)*
Peru, Bolivia, Paraguay, Brazil,	14-15 (1) 15-17 (2) 17-18 (1)	09-10 (1) 10-11 (2) 11-13 (1) 13-15 (2)	07-08 (1) 08-09 (2) 09-11 (1) 13-16 (1)	21-00 (1) 00-04 (2) 04-06 (1) 01-05 (1)*

Chile, Argentina, & Uruguay		15-17 (3) 17-18 (2) 18-19 (1)	16-18 (2) 18-19 (3) 19-20 (4) 20-22 (3) 22-23 (2) 23-00 (1)	
McMurdo Sound, Antarctica	*Nil*	16-18 (1)	17-20 (1) 20-23 (2) 23-01 (1) 08-10 (1)	00-03 (1) 03-05 (2) 05-07 (1) 04-06 (1)*

Time Zone: PDT (24-Hour Time System)

WESTERN USA TO:

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

Caribbean, Central & Norther Countries of South America	11-13 (1) 13-15 (2) 15-17 (1)	08-09 (1) 09-12(2) 12-14 (3) 14-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	07-08 (1) 08-09 (2) 09-10 (3) 10-15 (2) 15-17 (3) 17-19 (4) 19-21 (3) 21-23 (2) 23-00 (1)	19-21 (1) 21-02 (3) 02-04 (2) 04-07 (1) 20-22 (1)* 22-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina, & Uruguay	13-14 (1) 14-16 (2) 16-17 (1)	09-10 (1) 10-11 (2) 11-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	08-10 (1) 13-15 (1) 15-17 (2) 17-20 (4) 20-21 (3) 21-22 (2) 22-00 (1)	21-23 (1) 23-02 (2) 02-04 (1) 00-03 (1)*
McMurdo Sound, Antarctica	*Nil*	16-19 (1)	07-10 (1) 17-19 (1) 19-20 (2) 20-22 (3) 22-00 (2) 00-01 (1)	01-03 (1) 03-05 (2) 05-07 (1) 03-06 (1)*

QRP [*from page 33*]

meter across the input in order to have control of the amount of energy which reaches the link—the link should be large enough to provide adequate signal level to the mixer stage under weak signal conditions. This will result in overcoupling at strong signal levels, and the pot will enable you to bring the level down to adequate without overloading the mixer and reducing selectivity.

Figure 5 shows a double-tuned input circuit. Both inductances and capacitances are the same, and the capacitors are ganged to achieve proper tracking. Mechanical problems can be easily avoided by simply using Varactor diodes—a single control voltage will suffice for as many stages as necessary, such as double-tuned front end and v.f.o. frequency control, as long as all inductances and capacitances are the same. A multiturn potentiometer can be used to control the voltage supplied to the Varactors from the front panel with excellent bandspread and accuracy.

Figure 6 shows a toroidal double-link tank circuit that this writer prefers because of its superior selectivity in interstage transmitter matching setups. Again, two of these can be placed in series for really excellent isolation of mixer from antenna input with shielding as shown.

Generally, some understanding of the above principles will enable you to improve the effectiveness of your direct conversion receiver. Incidentally, the same principles apply to superhet receivers. In our next installment, we'll show how to achieve a high degree of selectivity in the audio channel of a simple receiver.

73, Ade, K8EEG

will be on the local TV station. Operation will be on all bands c.w. and s.s.b. and a special effort will be made to QSO stations in Bern, Switzerland.

The first *CQ* DX Editor, Herb, W6QD, is still active on the DX bands using indoor dipoles in his "townhouse" home in the Los Angeles area.

Eva, WA2BAV, and George, WB2AQC, have completed a trip to the Balkans where they operated from Club Station LZ2KKZ, TA1YL, TA1OM and YU7. George plans to publish another fine travelogue in a future issue of *CQ*.

DXers in the San Antonio, Texas area have formed the Alamo DX Amigos club. Twelve charter members have joined the club and the major goal will be to help new DXers in operation and station construction techniques. The secretary of the new club is John, W5LPO.

Silent Key

We are sorry to report the death of Dr. H. E. Stricker, W8WZ on June 23, 1974. Doc was the first winner of a *CQ* Single Band WAZ Award in January 1974. He was the recipient of many other DX Awards, served as SCM for Ohio, and a member of the QCWA being first licensed in 1917 as 8WZ gentleman.

Try Chasing Prefixes

The following article appeared in the Northern California *DXer* for February 1974, and voices one of the primary intents of WPX, which is to maintain DX activity on a regular basis.

"A lot of the boys who find the 'new ones' hard to come by are taking up prefix chasing. Sounds gruesome to a lot of ya, huh? Walll, to an old leathery-skinned DXer who can't stand to hear a reef called a country, that may be. Of course, you can always test your 160 meter or 80 meter antennas all day long. Or you can tune aimlessly for something to call . . . or you can call CQ and take potluck. However, if you are running out of things to check, to tune for, and you always get a W9 in answer to your CQ-DX, then why not begin to tune selectively for something new . . . a prefix for example. Read on.

"Now the King of the WPXers has got to be Lloyd, W6KG, who got certificate #1. He must have twice as many prefixes worked as the next 5 people in the world put together. He doesn't even know how many he has now! But back to the much lower echelons we find Rubin, WA6AHF pecking away at the s.s.b. only category and heading for the Honor Roll with another 50 or 100 or so. And Gene, W6TTS is chasing like crazy, too.

"It would be very nice if other prospective WPX chasers would holler on the Cats Net and be identified. As a matter of fact, I'd be willing to bet one of W6MAV's new pair of shoes that most everyone in the club could rifle through his stack of QSL's and find enuf cards to at least get on the basic ladder. Not that you all would want to do this . . . why should you . . . but then for those who might like to think about it, do wot I say . . . you might be surprised. Once you're surprised, you might start looking and tuning selectively for something you have not worked before.

"Talk about surprises . . . how many of you have worked all possible German prefixes? DL, DK, DM, DJ . . . not the special prefixes . . . just the regular ones with all the numbers from 1 through ∅? And how many of you who think you have worked them all actually have the QSL? Ditto 'YV', PY, SP and pick some more. In addition, I know a lot of Good DXers would not think of working a 'W' station on purpose except perhaps as a multiplier. However, check your files sometime and see if you have QSL's from all possible U.S., W, K, WA, WB in all districts. Watch, if you worked Sweepstakes, you probably have, but then try to get their cards . . . which you have to do to play the WPX game . . . you cannot count them until you have the card in hand. The new repeater station WR6ACZ is giving the WPX fellas fits. Rubin is now in the process of printing QSL's for distribution to WPXers . . . at least that was the rumor on the Cats Net other nite.

"This may not be your satchel, but if you're tired of just hunting aimlessly—why not tune selectively with a purpose and try to find a new one?"

QSL Information

A51PN—via W1JFL
AX9O—via K9KXA
GT2BG—via WA2BCK
DU1POL—via W1GVN
(thru Dec. '71 Only)
DJ3DH/ETC—via DL6ME
EA8CR—via K9KXA
FØAYC/FC—via DJØHP
PG7TD—via WA8TDY
FM7WN—via K2KGB
FPØXX—via K1DRN
FPØYY—via K90TB
HC1MM—via WA8TDY
HP1XOD—via K4OD,
P.O. Box 135
Front Royal Va. 22630
HS1YY—via W6YY
KA8AA—via W7PHO
KA8JN—via W7PHO
KB4ERN—via WB4CCU
KC4USX—via W7PHO
KC6BE—via W7PHO
KL2ARW—via WA2UWA
KL7ICL—via KL7 Bureau
OA4DX—via K4OD
OY3H—via W3HNK
PY1ZAL—via K4OD
SM2DWH/S2—via
SM2EKM
PAØIWH—via
P.O. Box 681
Dacca, Bangladesh
TA1OM—via WB2AQC
TA1YL—via WA2BAV
TA2QR—via DJØJO
TKØAA—via TG9GI
VK9YV—via VK6SW
VP1B—via W6FVC
VP2LBH—via K21GW
VP2MHK—via WØMHK
VP2SV—via K3GYD
VQ9ES—via K6WK
WF6OCF—via K6VDP
WH4FLA—via W4OZF
WY6FDA—via WA6MWT
WS1ACR—via W1SYE
YA1OS—via SMØOS
YY5MM—via YV5MM
ZD3O—via OZ1OO
ZD9BO—via ZS2RM
ZD9BR—via ZS2RM
ZD9GA—via ZS2RM
ZF1CQ—via WØOXN
3B8DL—via WA5ZWC
3B8DR—via G3SUW
3D2FM—via K7QTF
3D2KG—via K7DVK
5T5CJ—via W4BAA
7Q7LB—via IØDGB
9X5PT—via VE3BOZ

73, Jerry, WA6GLD

Short Term Predictions [*from page 31*]

Asiatic Russia (UA9) (Figures 6 and 7)

The results for the 14 mHz short path between Asiatic Russia and the East Coast USA in the Spring and Fall are similar and will be discussed together. Though it might have been expected that the circuit to Asiatic Russia would show a strong dependence on the auroral zone (fig. 4) as did the circuit to the Far East, such is not the case. The data suggest that even for a solar flux of 80 and an *Ap* of 20, signals with fair-to-good strength may be heard on the East Coast. The reason for this is that while the path to Asiatic Russia does intersect the zone of maximum occurrence for overhead aurora at two places, it does not lie along this zone as is the case for a significant portion of the path from the East Coast to Far East Asia. Thus, while signals from Asiatic Russia will show the effects of passing through the auroral zone (for example, auroral flutter), this path could open even under conditions when mild ionospheric and magnetic storms are in progress.

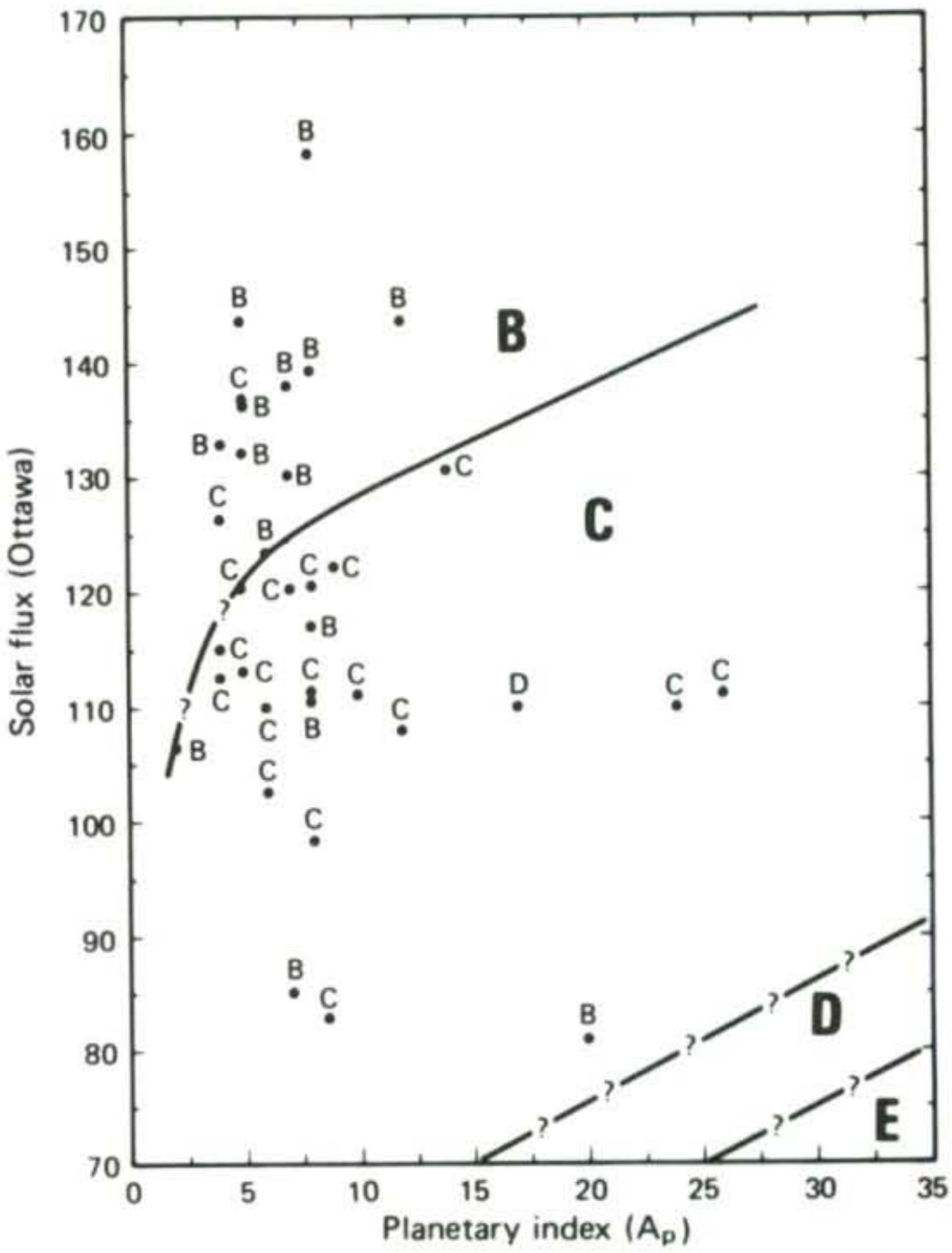


Fig. 6—Circuit Analysis, Asiatic Russia (UA9) to East Coast USA (Virginia), 14 mHz, short path, March/April/May, 1972/1973, 0100-0330 GMT.

Timely Ionospheric Data

If the Amateur Service is to make effective use of circuit-analysis charts such as those described here, we must have *timely* data on the 2800 mHz solar flux and equivalent range index *ap*. If you feel that the National Bureau of Standards should provide these data for use in preparing short-term ionospheric predictions, write the Bureau and request this service! Write:

Mr. D. D. Crombie, Director
Institute for Telecommunication Sciences
Office of Telecommunications
325 Broadway
Boulder, Colorado 80302

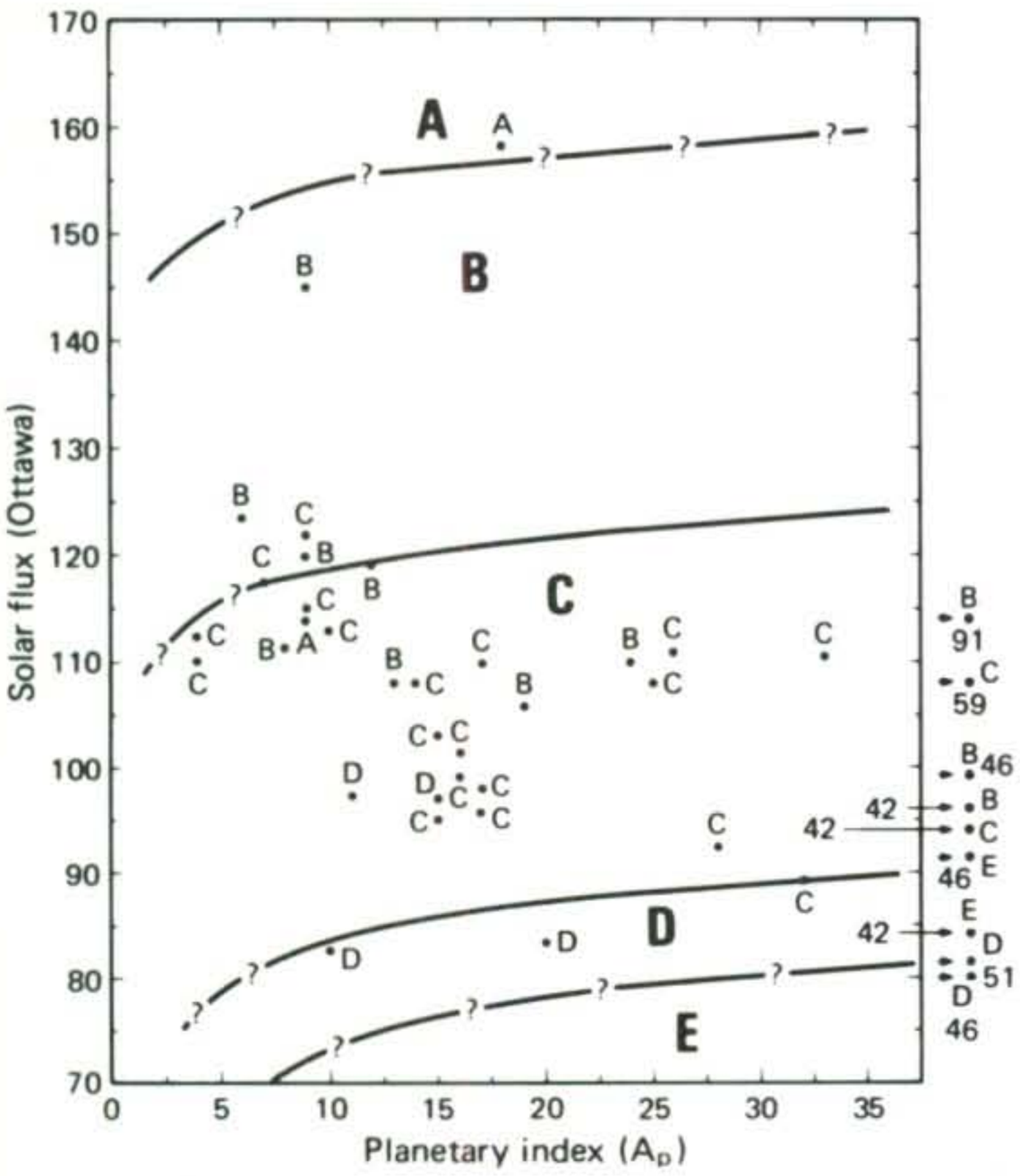


Fig. 5—Circuit analysis, Australia to East Coast USA (Virginia), 14 mHz short path, April/May 1972/1973, 1100-1300 GMT.

Conclusion

The availability of current data on solar flux and solar particle radiation, together with circuit-analysis charts for different bands and circuits, will permit the amateur, and others, to prepare short-term predictions for ionospheric propagation almost as simply as we now obtain the daily weather forecast by telephone. Just watch out, however, for those unexpected "storms"!

Acknowledgements

The author gratefully acknowledges the assistance of Ms. Margo Leftin and Dr. Ernest Smith, Department of Commerce, Boulder, Colorado, in providing data on sunspot numbers, solar flux, and *ap* and *Ap* indices. The constructive and thought-pro-

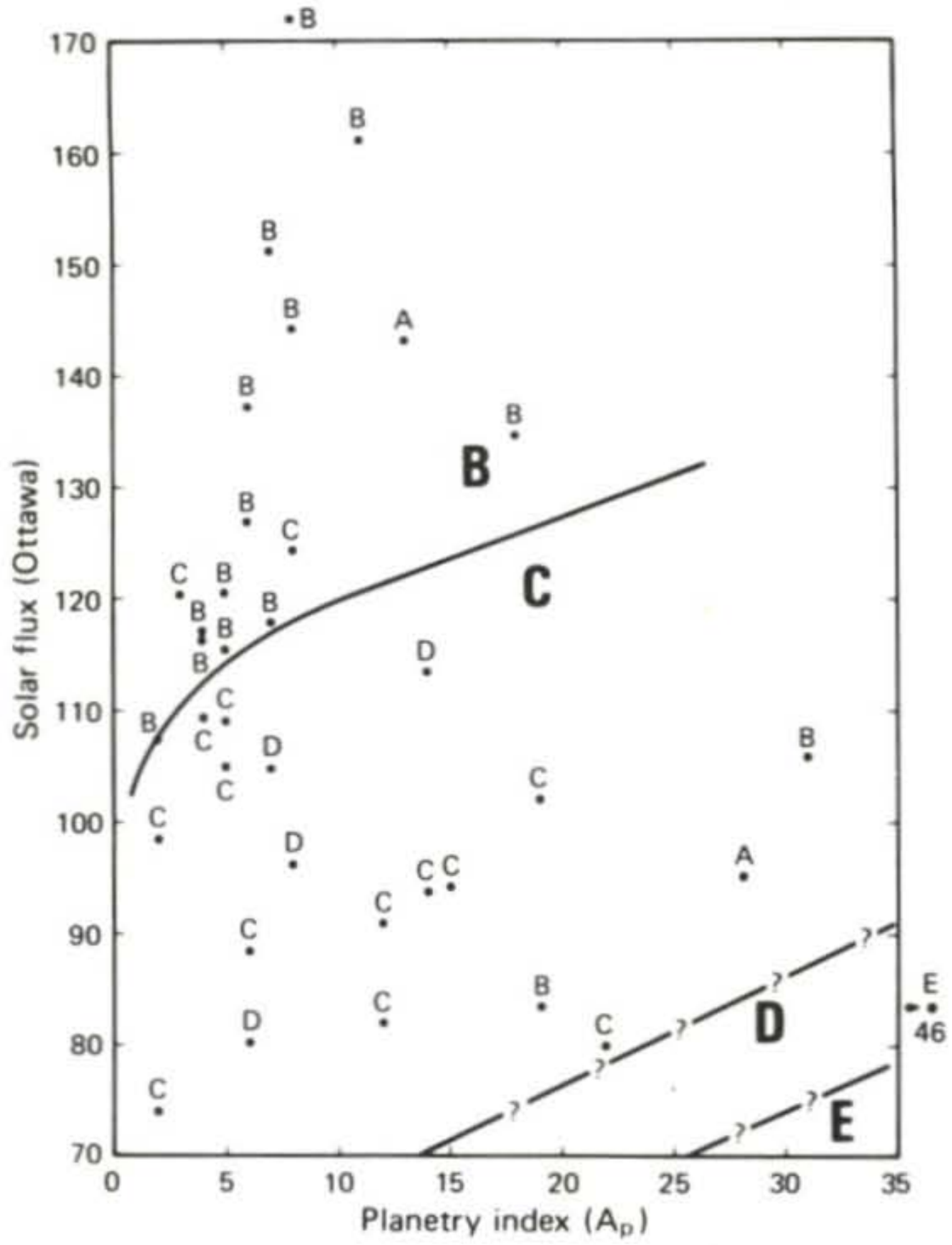


Fig. 7—Circuit analysis, Asiatic Russia (UA9) to East Coast USA (Virginia), 14 mHz short path, August/ September/October 1972/1973, 0100-0330 GMT.

voking comments of Mr. George Jacobs, W3ASK, were of great value in preparing this paper, as were the detailed comments of Mr. Mort Cohen, K3SXQ, and Mr. Steve Jarrett, K4CFB. Finally, I thank Mr. Pat Miller, KV4CI, who recognized that the Amateur Service could use the solar flux and *Ap* index for preparing short-term ionospheric predictions, and who suggested that this study be undertaken. ■

References

Cohen, T.J. and P.R. Lintz, "The Sunspot Cycle, Analysis and Prediction," *CQ*, March, 1974.

Davies, K., "Ionospheric Radio Propagation," National Bureau of Standards Monograph 80, U.S. Government Printing Office, Washington, D.C., 1965.

Feldstein, Y. I., "Investigation of the Aurora," Moscow, 1960.

French, E.E., "Sunspot Louie", in the *West Coast DX Bulletin,* weekly publication of the Marin County DX Group, San Rafael, California.

Jacobs, G., Propagation, published monthly in *CQ*.

Jacobs, G. and S. Leinwoll, see: Special Issue on Propagation, *CQ*, November, 1969.

Lincoln, J. V., Geomagnetic and Solar Data, published monthly in the *Journal of Geophysical Research,* Space Physics Series.

Viezbicke, P. P. (Editor), NBS Frequency and Time Broadcast Services, NBS Special Publication, U.S. Government Printing Office, 1973.

Announcements [*from page 8*]

national Hamfest willl take place in the Eri County Fairgrounds, in Hamburg New York. Giant Flea Market, Picnic Facilities and Equipment Displays, including CQ Magazine, will be available. Admission is $2.50 at the gate and all children under 12 years of age are admitted free. For reservations and information, contact: Lin Brownell, WB2HCL, 210 Buffalo Street, Hamburg NY, 14075. (716)649-3106.

Mount Clemens, Michigan

On September 22, 1974 the ANSE CREUSE ARC will hold a Swap'n'shop at L'Anse Creuse Central Jr. High School, 3800 Reimold Rd., Mt. Clemens, MI. There will be free parking and admission is $1.00.

State College, Pennsylvania

The 17th Annual Pennsylvania QSO Party will be held September 14-16, 1974. The same station may be worked on different bands/modes. Multi-op stations are counted as a separate category. Mail all logs to: Nittany Amateur Radio Club, Inc. P.O. Box 60, State College, PA 16801. The deadline is October 15, 1974 post marked midnight.

West Ghent, New York

The Northeastern States 160 Meter Amateur Radio Association is holding its annual fall meeting at Kozel's Restaurant, West Ghent, NY (near Hudson, NY) on Saturday October 5th. All amateurs welcome. Flea Market, dinner, & prizes. For reservations write: S.B. Leland, (W1JEC) Box 44, West Granby, CT 06090. Dinner tickets $5.75 per person.

South Sioux City, Nebraska

The 1974 MIDWEST DIVISION CONVENTION will be held this year at the Marina Inn in South Sioux City, NE, October 4-5-6. Pre-registration for the Convention is up to October 1rst at $6.00. Send registrations to W0EQN, Cliff Taylor, 3818-5th, Ave., Sioux City, IA, 51105.

Philadelphia, Pennsylvania

The Mount Airy VHF Radio Club's annual Pack Rat HAMARAMA is Sunday October 6th at the Bucks County Drive-In Theater located on Rt. 611 in Warrington, PA. For further information send SASE to K3MXM, Lee A. Cohen, 8242 Broodside Road, Elkins Park, PA 19117.

Winnipeg, Manitoba

Hamfest '74'' will be held October 5th and 6th at the International Inn, Winnipeg, Manitoba. For more information write: The Winnipeg Amateur Radio Club, P.O. Box 352, Winnipeg, Manitoba, Canada R3C 2H6.

Williamsburg, Virginia

The Southern Peninsula Amateur Radio Klub (SPARK) of Hampton, VA will sponsor a Special Events Station at Experimental Aircraft Association's, Chapter 156, Fly-in to be held on Saturday and Sunday, October 5th and 6th, 1974, at Williamsburg-Jamestown Airport. The special call of WJ4EAA has been requested from the F.C.C. for the event.

his hair down and says in his letter (quote) I think the whole problem goes back to the basic reluctance of some amateurs to read beyond the ARRL license manual. In addition, the ham often needs a little short course on how to get the most for your money and how to get the best results for your purchase (unquote)".

Pendergast said nothing, so I continued. "A lot of fellows don't realize that when they erect a vertical antenna, regardless of whether it is a 3-bander, or whatever, that *they have only half an antenna*. The ground system makes up the other half, and is as equally important as the antenna!

"Every amateur using a vertical antenna should read the series of articles by Jerry Sevick, W2FMI, which have appeared in *QST* over the past year or two. He explodes a lot of the myths about vertical antennas. His measurements show that a *good* ground return system can improve the performance of a vertical antenna by about 8 decibels, and that's the equivalent of adding a linear amplifier to your exciter!

"Jerry says his experiments show that, aside from lightning protection, the use of a ground rod with a vertical antenna is of questionable benefit. I agree completely with that. It is extremely difficult, if not impossible, to get a good, low resistance r.f. ground connection with a ground rod and the only alternative is for the user of a vertical antenna to go to a radial system of some sort, even if the antenna is ground mounted on a short post."

"The effective conductivity of sea water, which is assumed to be a good ground, is about 5000 millimhos/meter. In the United States, ground conductivity varies from 4 millimhos/meter in dry, sandy areas such as Nevada to 30 millimhos/meter in moist, farmland-type ground. And as a matter of fact, the moist ground isn't so good, either. In one instance, measurements were made over moist farmland in comparision against salt water.

The moist farmland didn't do so well . . . down about 5.3 decibals, in fact. The loss over ordinary urban ground is anybody's guess.

"While the user of a vertical can't do much about ground loss in the far-field of his antenna, he can do a lot about ground loss in the immediate vicinity of the antenna. And, as Jerry's articles show, a good radial system is the key to good operation. You can use a ground rod if it makes you happy, but you had better back it up with some radial wires.

"At the *very minimum*, at least one radial wire is required for each band or the antenna just won't work. I discussed this in my July *CQ* column. You can get by with a single radial wire for 10, a single one for 15, and a single one for 20, all tied together at the base of the 3-band vertical antenna. Now, *Hy-Gain*, for example, recommends a minimum of *two* radial wires for each band. Each radial, you understand, is a quarter-wavelength long at the operating frequency. Many designs, however, show four quarter-wavelength radials as the recommended minimum. Personally, I don't think there is much difference in performance between one, two or four radials".

I paused, and Pendergast asked, "What does W2FMI recommend?"

"Well, it seems to me that his data showed that 10 radials were a great improvement over 4, and 40 radials were a great improvement over 10. Using 100 radial wires was about 8 decibels better than using 4 radials."

"Well, what do *you* do at your summer home?", asked Pendergast.

"I use a vertical antenna there, a sixteen foot whip for 20 meters," I replied. "The ground is fairly flat, with no real, metallic obstacles around the antenna. The antenna is mounted on a post driven into the ground, and the base of the whip is only about six inches above the grass. I have 8 radial wires, made of 16'6" lengths of insulated hookup wire. These are insulated at the free end, and the other end has a copper alligator clip on it.

"When I'm not on the air, the radials are rolled up and tossed under the house. When I go on the air, I take them out, spread them over the lawn and clip them to the shell of the coaxial connector that is attached to the base of the vertical antenna.

"The whip is attached to the post with wing nuts, so when we leave the place, it only takes a few seconds to remove the whip and stow it away."

"And how does it work?", asked Pendergast.

"As well as can be expected", I replied. "I can't compete with DXers using elevated beams, but I can work a lot of DX and I have a lot of fun with it. Maybe I could pick up a few more decibels by adding more radial wires, but eight is a nice, round number and not too messy."

I got up as Pendergast started to walk towards the door.

"I admit, the vertical antenna can't compete with a good beam. But the ionosphere, is a great leveler of signals and sometimes you are surprised. Last spring I pulled 9N1MM, Father Moran in Nepal, out of a pile-up using this vertical, so the antenna must be doing some good".

Pendergast paused as he opened the door. "The vertical has some distinct advantages", he said. "It is inexpensive, unobtrusive and takes up little space. Sometimes it is the only antenna that the amateur can put up, because of property restrictions or other problems. After all, that's the game to play if it's the only game in town". ■

for 1500 Hz while holding down the VIDEO TEST key. This completes the keyboard's adjustments, except for the grey scale adjustments, covered later.

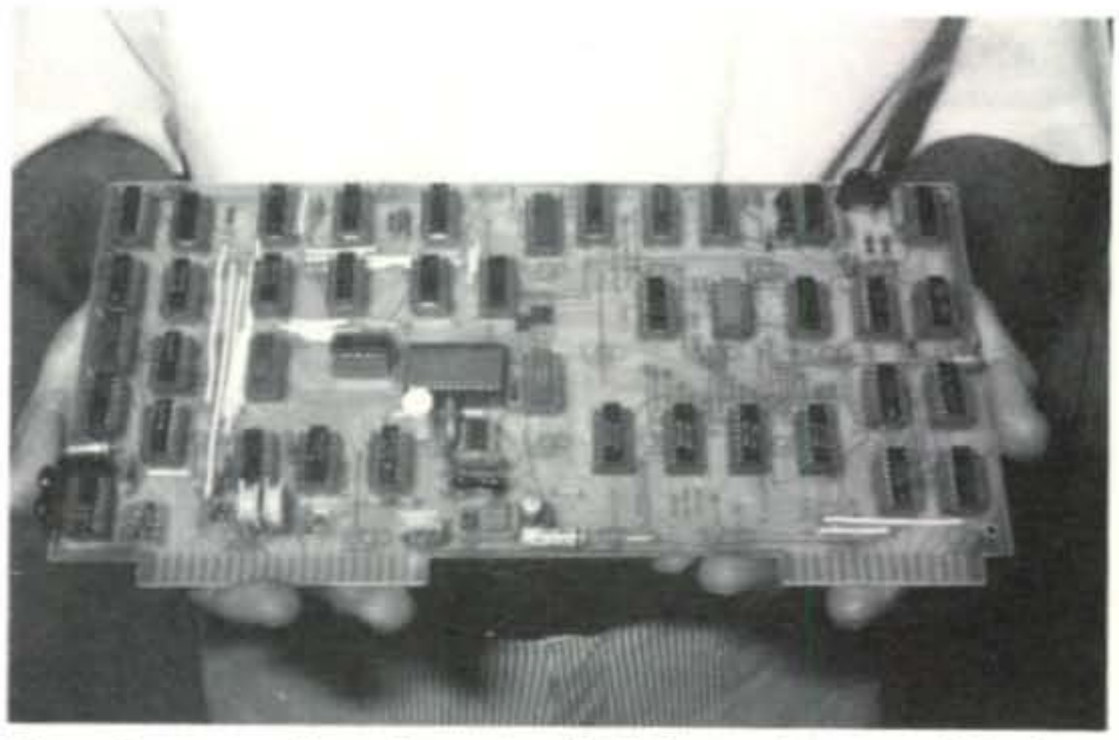
Keyboard and Encoder Testing

The next section to be made operational is the keyboard and encoder. Since different designs can be utilized, the best place to look for a final analysis would be the point where the encoder's output interfaces to the Catch Registers (IC_1, IC_2, and IC_3). To simplify life, a temporary short should be applied so that as each key is held closed, the output ASCII bit sequence as shown in fig. 4 will appear on the output lines. If the 100K resistor on the encoder is shorted out to +5, and 6 LED's are temporarily connected to the 6 output bit lines from the encoder through ~390 ohm resistors to ground, the keyboard and encoder can be checked for proper operation in a few minutes. A light means a "1" on the special ASCII chart of fig. 4, and no light means "0" for that bit. The suggested temporary test circuit is shown in fig. 7.

Read Clock Testing

Once you have the output section working and the encoder going, you are well on your way to success. The next section to make operational is the Read Clock section. Plug in IC's 25, 26, 29, and 30. Check for 960 Hz at pin 11 of IC_{25} when "60 HZ PICTURE" is selected, and 1066.6 Hz when "50 HZ PICTURE is selected.

Then plug in IC's 24, 27, 28, 32, 34, 35, 38, 39, 40, 41, and 42. If an SSTV monitor is connected to the output from the keyboard, a raster should now be painted on the screen. Pressing the BLACK BACKGROUND key will make it dark, and pressing the WHITE BACKGROUND key will make the screen go white. Tapping the "1



Nearly completed main P-C board assembled on one of the pre-drilled boards available from W8OZA. For details see parts list on page 80.

LINE," "3 LINE," or "FULL FRAME" key will make the screen display a 1/5th frame, 3/5th frame or complete frame, respectively.

After a smashing success like this, try out the world, and plug in IC_{22}, the character generator chip. If all is correct so far, the screen should now show 30 "?" marks on the screen.

Write Clock Testing

Plug in IC's 1 through 4 and 14 through 20. Put an oscilloscope probe on pin 11 of IC_{20}. Press the ERASE key and you should see pulses approximately 15 kHz in frequency (exact frequency is not important) as long as you hold down the ERASE key. If you depress any key, you should get a single 20 μs, pulse at pin 12 of IC_{17}, although it takes a very fast, high quality 'scope to see this pulse, as well as a very short negative going pulse resetting the Catch Registers on pin 11 of IC_{14}.

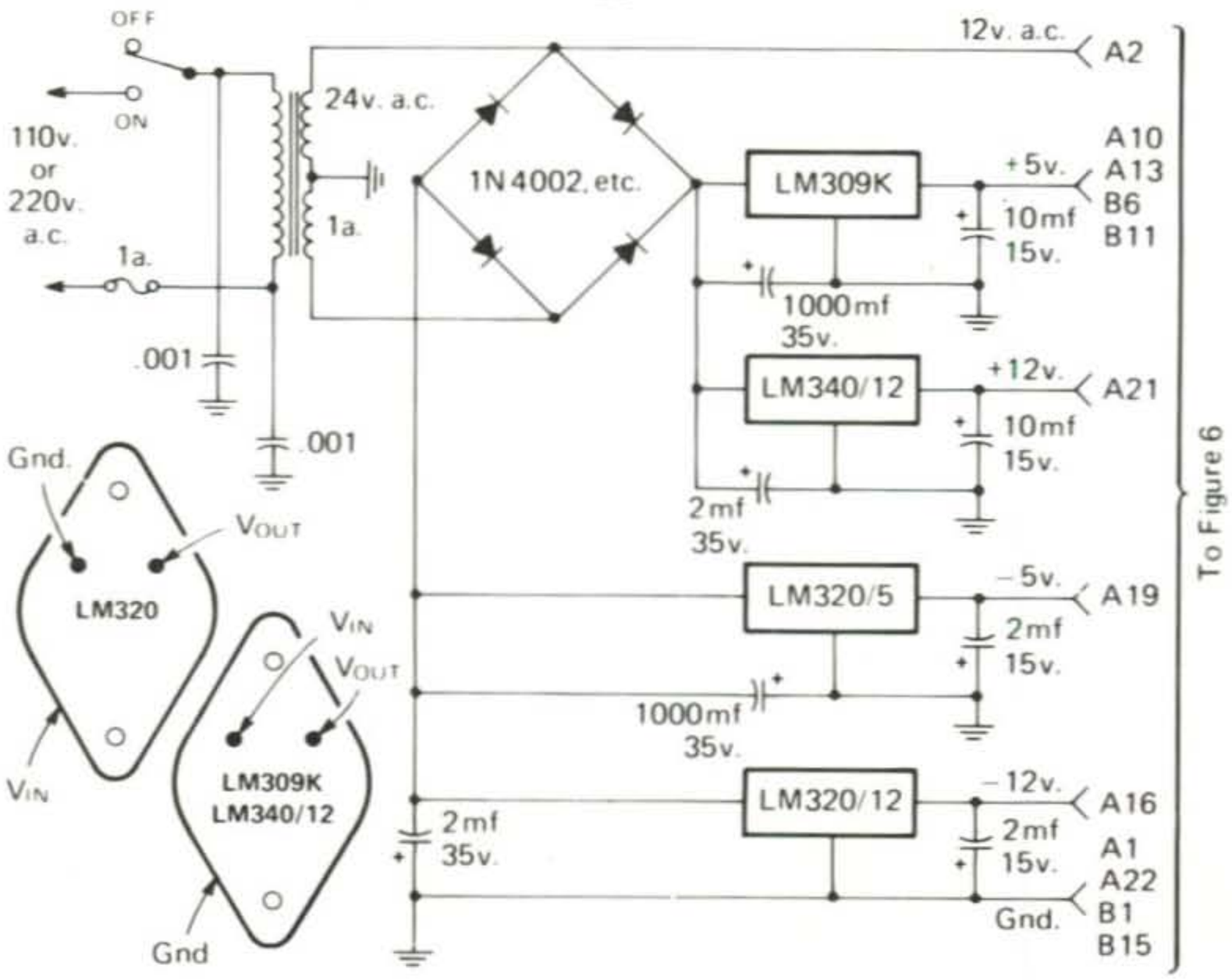


Fig. 9—Power supply for the SSTV keyboard.

SSTV Keyboard Parts List

CAPACITORS

C_1, C_4, C_6, C_{23}-C_{27} ..... .01 Disc Ceramic
C_2, C_{15}* ..... .01 Mylar
C_3, C_9* ..... .0047 Dipped Silvered Mica
C_5, C_{11}, C_{13} ..... .001 Dipped Silvered Mica
C_7* ..... 10 mf., 15v. Tantalum
C_8* ..... 1 mf., 15v. Tantalum
C_{10} ..... 10 mf, 15v. Elect. (Radial Leads)
C_{12}* ..... .047 Mylar
C_{14} ..... 5 mf, Elect. (Radial Leads)
C_{16}* ..... .0033 Mylar
C_{17} ..... 100 mf, 15v. Elect. (Radial Leads)
C_{18}-C_{22} ..... 3.3 mf., 15v. Tantalum

RESISTORS (¼ Watt)

R_1, R_2, R_6 470
R_3, R_4, R_7, R_{28}, R_{40}*, R_{42}*, R_{43} 10K
R_5, R_{18}, R_{23}, R_{24}, R_{44}, R_{45}, R_{46} 1K
R_8, R_9, R_{10}, R_{11}, R_{12}, R_{13} 2.2K
R_{25}, R_{38} ..... 5K PC Pot
R_{15} ..... 2K PC Pot
R_{16}* 22K
R_{17}* 18K
R_{19}* 1.8K
R_{20}*, R_{30} 3K
R_{21}*, R_{34}* 12K
R_{14}, R_{22} ..... 10K PC Pot
R_{26}, R_{29}, R_{41}* 4.7K
R_{27} 100K
R_{31}* 5.6K
R_{32}, R_{33} 220
R_{35}* 2K
R_{36}* 9.1K
R_{37}* 1.2K
R_{39} 4.3K

INTEGRATED CIRCUITS

IC_1, IC_2, IC_3, IC_4, IC_{14} 7400
IC_{15}, IC_{32}, IC_{37}, IC_{40} 7489
IC_5, IC_6, IC_7, IC_8 7404
IC_9, IC_{21} 7450
IC_{10}, IC_{11} 74157
IC_{12}, IC_{13} 74122
IC_{16}, IC_{38}, IC_{42} 74123
IC_{17} 7430
IC_{18} 7493
IC_{19}, IC_{24}, IC_{25}, IC_{27}, IC_{28}, IC_{29}, IC_{30}, IC_{34}, IC_{39}
IC_{20} 7490
IC_{22} (Signetics) 2513
IC_{23} 74151
IC_{26} 565
IC_{31}, IC_{36} 7401
IC_{33}, IC_{41} 7410
IC_{35} 7473
IC_{43} ..... 1558 or 5558
IC_{44} 566

DIODES and TRANSISTORS

D_1, D_2, D_3 ..... 1N914, etc.
Q_1 ..... 2N3568, etc.

*Value considered somewhat critical for proper operation.

PC BOARDS

Semi-Kits—Keyboard or Camera Scan Converter: from W8OZA.
Main Board—Cut and drilled with detailed logic description. $28.50 pp. USA: Russ Sievert, W8OZA, 1411 Lonsdale Rd., Columbus, Ohio 43227.
Main Board—Uncut and undrilled with detailed logic description. $20.00 pp. USA: Jim Oldaker, K7OLO, 2930 Sorrel Way, Eugene, Oregon 97401.
Encoder Board—$5.00 pp. USA: K7OLO.

The final operation is to plug in the rest of the IC's. If all is perfect, powering up and looking at the screen display of the keyboard's output will show an unpredictable pattern of 30 characters. Press the erase key and the screen should go blank. Now enter up to 30 characters and they should appear on the screen. Try all of the various stunts that the keyboard can perform.

Memory Testing

The final adjustment is to set the grey scale. Tapping the WHITE BACKGROUND key and holding the HORIZONTAL GREY SCALE key closed should give 3 stripes of grey scale. The leftmost bar is 2300 Hz and the characters are 1500 Hz. R_{14} adjusts the middle bar, and R_{15} adjusts the bar on the right. I use my Audio Frequency Spectrum Analyzer (AFSA) (Suding, *73 Magazine*, Dec. '72; *SSTV Handbook*) to set these two potentiometers to give an evenly split grey scale over 4 shades, but they can be set by watching a correctly adjusted monitor.

Troubles

Those dozen or so amateurs now using an SSTV keyboard like this one trace their initial problems to one or more of three sources. They are shorts, missing connections, and bad IC's. It was rather amusing to note the feverish long distance phone calls to me followed by a period of intense quiet, finally culminating in a rather embarrassed letter stating one or more of the mentioned troubles. The most common point of error is in the memory sections, due to the large number of connections. A number have found bad 7489's and 2513's to be their trouble. Bad 7489 IC's generally show up as "wrong characters" on the screen. Bad 2513's generally show up as missing or extra dots on certain characters. Shorts appear as doubled characters, and strange pattern sequences.

Credits

I would like to thank Don Miller, W9NTP, for suggesting this project. My keyboard was used by Don to win the 1974 SSTV DX Contest. Russ Sievert, W8OZA, and Jim Oldaker, K7OLO, helped immeasurably in the PC board design and the final schematic drawing. Finally, I would like to thank a large number of hams who suppressed their giggles when I was sending some "mighty strange characters" while wringing out the design. ■

Cop's Column

[*from page 52*]

620 ohm series resistor. Through the use of the Q_3 and Q_4 emitter followers, the filter's requirement for a Hi-Z load is also met.

Performance

Fig. 5 shows the same identical frame of noisy incoming video as viewed on two different monitors. The picture on the left was reproduced on a triggered sweep monitor using sync processing techniques similar to those just described. The right hand monitor used phase-locked horizontal sweep, and a sync separator which stripped sync from the demodulated video. With a high input signal-to-noise ratio the difference in jitter level tends to disappear, and the jitter gets close to zero in both monitors. With heavy QRM from heterodynes and voice signals, again the difference tends to disappear since there is no useful video or sync at all when the interference is strong enough to "capture" the limiter. The biggest difference is seen in these marginal situations where "snowy" video indictaes a low S/N from the receiver.

Please do send on your own solutions to the jitter/stagger problem.

Vy 73, Cop, WØORX

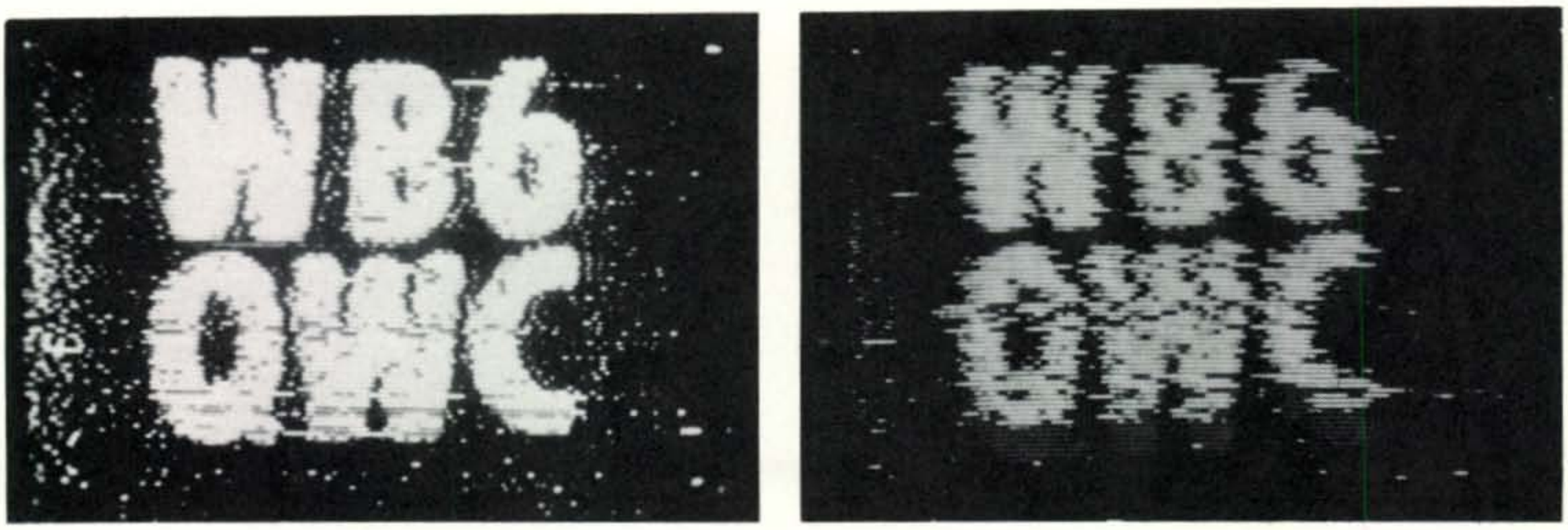


Fig. 5—Performance comparison under low S/N conditions. See text.

HAM SHOP

FREE TO CQ SUBSCRIBERS

Advertising Rates: Non-commercial ads are 10 cents per word including abbreviations and addresses. Commercial and organization ads are 35 cents per word. Minimum charge $1.00. No ad (non-subscriber) will be printed unless accompanied by full remittance. Free to CQ subscribers (maximum 3 lines per month). Recent CQ mailing label must accompany ad. Free ads published on a "space-available" basis only.

Closing Date: The 15th day in the second month preceding date of publication. Because the advertisers and equipment contained in Ham Shop have not been investigated, the Publishers of CQ cannot vouch for the merchandise listed therein. Direct all correspondence and ad copy to: **CQ Ham Shop, 14 Vanderventer Ave., Port Washington, New York 11050.**

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.

LOOKING FOR old Lionel trains. Interested only in "O" gauge, excellent to like-new condition. Primary interest is locomotives prior to 1952, but will consider complete sets or more recent models. Am willing to buy outright for cash or swap radio gear to meet your needs. Write Dick Cowan, WA2LRO, c/o CQ Magazine, or call 516/883-6200.

Did you know that supplements to the book, "CQ YL," are available? They bring the book up to date with YLRL Officers through 1973 and the 6th YLRL Convention, held at Long Beach in May '72. If you have a copy of "CQ YL" and would like to add the new supplements (the pages are "slotted" so they fit directly into the "CQ YL" spiral backbone), drop a note with your request to author/publisher, W5RZJ, Louisa Sando, 4417 - 11th St., NW, Albuquerque, NM 87107. Please enclose two 8 cent stamps to cover cost of mailing. The one and only book about YLs in ham radio, "CQ YL," contains 21 chapters, over 600 photographs. Order your autographed copy, or a gift copy, from W5RZJ, $3.00 postpaid.

COLLINS: R390 Digital Receiver, Exc. Mech & Elect. I will ship, $525. B & W no. 374 Dummyload and wattmeter, (0 to 1500) Mint, $90. Swan, Phone patch, mint, never used, $35. K6OVN, 1157 Palms Blvd., Venice, CA 90291. (213)392-8765.

FOR SALE: ECS8 Vacuum Variable, 2 to 8 mmf. Ideal for neutralizing capacitor, $17 postpaid. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

CLEGG FM-27Bs at prices I dare not publish. W0NGS, Bob Smith Electronics, 1226 9th Ave., North, Fort Dodge, IA 50501. (515)576-3886.

FCC test answers updated any class, $5; Specify. Dixie Tec, Box 8352 Savannah, GA 31402.

SURPLUS. Giant bargain-packed catalog, $1. Etco Electronics, Dept. CQ, Box 741, Montreal A, H3C 2V2.

HIGH GLOSS QSL CARDS: From $8.95/1000. Full color catalogue, $1.00. Lijon Graphics, Box 48, East Longmeadow, Mass. 01028.

ANTIQUE Flame Proof Key. Dated 1921, $12.95 PPD; W.E. Sounders, $25.00 PPD, or will trade for your duplicates. Walt Jackson W5ZYA, 909 N.E. 11th, Grand Prairie, TX. 75050.

MIX pleasure with pleasure at the Hamburg International Hamfest, Niagara Falls on September 21. For information contact Lin Brownell, WB2HCL, 210 Buffalo, Hamburg, NY 14075.

FREE QSL SAMPLES - Samcards, Dept. Q, 48 Monte Carlo Dr., Pittsburgh, PA 15239.

FOR SALE: Spectra Physics 2.0 mw071-2 HeNe laser tube, brand new with power supply schematic $110.00. WA2NDM, 5 Melville Rd., Great Neck, NY 11023.

FOUNDATION FOR AMATEUR RADIO annual Hamfest Sunday 20th October, 1974, at Gaithersburg Maryland Fairgrounds.

NEED: BC-923 receiver. Part of SCR-808 and SCR-828 Radio Sets. State condition and price. R.A. Gann, Box 40357, Everman, TX 76140.

BUY-SELL-TRADE: Write for monthly mailer, give name address, call letters. Complete stock of major brands new and reconditioned equipment. Call us for best deals. We buy Collins, Drake, Swan etc. SSB & FM. Associated Radio 8012 Conser, Overland Park, Kansas 66204. (913)381-5901.

MASSACHUSETTS HAMS: Large supply of two meter crystals and accessories in stock. Authorized Icom, Genave, and Standard Distributor. Only ten miles south of Boston. Kensco Communications Inc., 46 Pearl St., Quincy, MA 02169. (617)471-6427.

WANTED: New or like-new condition used Regency 500 (CB282) transceiver. Also want Regency TMR-4H Monitoradio Scanner. Patrick Carmody, 120 Rambling Road, no. 31A, Battle Creek, MI 49015.

TECH MANUALS: For Govt. surplus gear, $6.50 each: URM-25D, URM-32, R-220/URR, R-274/FRR, R-390/URR, TS-497B/URR, TS-382D/U, LM-21, PRC-10. Thousands more available. Send 50 cents (coin) for large list. W3IHD, 7218 Roanne Drive, Washington, DC 20021.

FOR SALE: Drake 2-C Amateur/SW Receiver w/ noise blanker, xtals for SW & CB bands in switch box. Excellent condition. All for $170, or make offer. Will sell separately. Howard Campbell, Box 982, WB4IVF, Panama City, FL 32401.

BOEHME 5C TU Book Needed. Buy or copy. Pay reasonably. WB4YKK, 1468 Kempsville, Norfolk VA 23502.

RUBBER ADDRESS STAMPS: Free catalog. 45 type styles. Jackson's, Box 443F, Franklin Park, IL 60131.

CLEGG 99er, 6 meter transceiver, good condition $50. W9OEF, Jean P. Gagnon, 520 Clark St., Iowa City, Iowa 52240.

INFORMATION in depth on any HF signal, 2 items $1. Also, specialized frequency lists. Comint Research, Box 45, Mentor, OH 44060.

FREE Crystals with the purchase of any 2 meter FM radio. Write for our deal on the rig of your Drake, Regency, Standard, Icom, Alpha, Ken

FREE Crystals with the purchase of any 2 meter FM radio. Write for our deal on the rig of your choice. Factory authorized dealers for Collins Drake, Regency, Standard, Icom, Alpha, Kenwood Tempo, Genave, Swan, Clegg, Ten-Tec, Midland, Telex, Hallicrafters, Venus, Hy-Gain, CushCraft, Mosley, and Hustler. For the best deal around on VHF or HF gear, see us first or see us last, but see us before you buy. Write or call us today for our low quote and become one of the many happy and satisfied customers of Hoosier Electronics, R.R. 25, Box 403, Terre Haute, Indiana 47802. (812) 894-2397.

WANTED: January 1952 issue CQ to complete my file. Reply with price. Herb Becker, W6QD, 8703 La Tijera Blvd, Los Angeles, CA 90045.

COLLINS: 75A4 Filters 3.1, $20.00. C.W. Rogers Box 338 Manasquan, 08736, NJ.

Swan: 500C with 117V Power Supply and Vox, C.W. Rogers Box 338 Manasquan, NJ 08736.

QSLs Second to none, Same day service. Samples-airmailed 25 cents. Ray, K7HLR, Box 331, Clearfield, Utah 84015.

CINCINNATI HAMFEST: 37th annual - Sunday, September 15, 1974 at the New Stricker's Grove on State Rt. 128, one mile west of Ross (Venice), OH. Flea market, contests, model aircraft flying, food and beverages all day. $7.00 covers everything. For further information: Ray Clark, WB8BUF, Box 1521, Cincinnati, OH 45201.

FOR SALE: Hallicrafter SR2000, very good condition. Will deliver up to 200 miles. Bob Smith, - W5FRC, 422 Summit, Richardson, TX 75080.

WANTED: QST 1921; January, February, December; 1922: March. All letters answered airmail. Jock, ZL2GX, 152 Lytton Road, Gisborne, New Zealand.

FOR SALE: Hal ST-6 Circuit Boards (7). All components mounted but boards not interconnected. Includes 0-1 MA meter, special Hal xfmr and all 88 mh. toroids, $135. WA8VFK, 314 So. Western Ave., Springfield, OH 45506.

CALCULATOR: MITS 908M Factory wired, original box. Has memory, squares, roots, reciprocal, %, price, $85. H. Marhoff, P.O. 569 Largo, FL

WANTED: Old radio magazines before 1930. Call Books, Handbooks, Radio & Wireless Books as well as old radio receivers and equipment. Old vacuum tubes before 1920; Top prices or trade. Erv Rasmussen 164 Lowell, Redwood City CA 94062.

WANTED: Call letter license plates, for collection. Will pay postage. Art Phillips, WA7NXL, 3401 N. Columbus Blvd., 5-0, Tucson, AZ 85712.

SELL: Hallicrafter SR-500 xcvr. 500w. P.E.P. 80, 40, 20m. AC and DC P.S., Mic., Man, $425. FOB. WB9JHS, 6092 Chase Ave., Downers Grove, IL 60515.

W5OBB has a new address. Mac now lives at 1701 Westside Drive, Sherman, TX 75090.

FOR SALE: Star 700E rcvr & Star 300 Watt pep xmtrs, excellent condition. Sacrifice at $395. Silbert, P.O. Box 77, White Sulphur Springs, NY 12787

COLLECTORS: Kilbourn & Clark head set. Probably 1918. $7.50. FOB. Heavy German Headset, adjustable diaphragms. $5.00 FOB. Douglas, 2254 Pepper Dr., Concord CA 94520. W6CUG.

FOR SALE: 4-1000A's used, guaranteed, $25.00, Chimneys, $9., PL172's used, guaranteed, $40., Chimneys, $6. B and L research microscope w/ many accessories, write for details. Trammell, 1507 White Oak Court, Martinsville, VA 24112.

WANTED: Sonar-Mono-Bander for 10 meters. State price and condition. Henry Vander, WA2SIX, 66 Meridian Rd. Levittown LI, NY 11756. (516) 735-5804.

FOR SALE: TR-4 NB, $390. Adcom mobile supply $69.00. Hustler Mast and 10/15/20/40, $35., Fisher 175 and Garrard Turntable in cabinet with G.E. Speakers, $195.00. 42 inch Mahogany Drop sided table, $50.00. Several solid state 12 volt Power Supplies, RTTY Station and Antennas. Pick up only W2FWV, 427 Plymouth Avenue, Fall River, MA 02722.

STATION SELL-OUT: Heath DX-60 and Hallicrafters S-120A, nice rigs. WN9MAM, 1522 Vance Ave., Ft. Wayne IN 46805.

WANTED: XCU303, xtal calibrator & detector for NC-303. W4KFF, 407 Stirling Court, Columbia, SC 29101.

WANTED: Winter Edition, 1946 Call Book. Reasonable. Walt Carr, W3LDD, R. 2, Box 193, Havre De Grace, MD, 21078.

WANTED: Cabinet and matching speaker for Collins 75A3, W2HLF, 16 Henry Circle, Rochester, NY 14624.

WANTED: Any equipment, books, or manuals on cryptography. L. Kruh, WN2TSD, 17 Alfred Rd., W. Merrick, NY, 11566, or call collect, (516)-378-0263.

ESTATE SALE: Galaxy GT 550, AC PS & spkr, $375. Patch, $30, Remote FFO, $50. SASE for complete list, including many high power parts, or call (201)445-8066. Rick Scielzo, 19 Longview Dr., Waldwick, NJ 07463.

WANTED: Xtal pack for SB401. Victor Schorn, Rt 5 Box 323-B, Florence, AL 35630.

SELL: Practically unused 75S3B, with spare 800 filter and extra coverage xtals, new condition. $600.00. W4AIS, 306 Thornwood Drive, Taylors, SC 29687.

WANTED: 801 or a 10Y(VT-25) tube in good condition. Urgent. Contact Emmett Hoops, 300 Windsor Place, WN2RRM, Brooklyn, NY, 11218.

SELL: Hallett shielded ingnition system for GM V-8 $10. WA5KZE, 6702 Spring Brook, San Antonio, TX 78249.

FOR SALE: Laff Audio Gen. $30. Kodak Verifax copier model F, w/ACC, $65.; Johnson Viking mobile trans. 75-10 MH (Kit) $50.; All FOB, R. Wendel, 160-20 Grand Central Parkway, Jamaica, NY 11432.

EVERY SHACK should have a legible wall clock. We got em. 12 or 24 hour battery or electric, 8" or 12". Steve, WB5BNM, 1524 N. OK, Shawnee, OK 74801.

WANT: HQ-140XA or HQ150, Please state condition and price. W. Bolin, K4APL-6, P.O. Box 2784, Lancaster, CA 93534.

FOR SALE: RTTY model 15 page printer, $70, you pick up or shipping extra. Also other RTTY gear. Ed Bienstock, 3730 Nautilus Ave., Brooklyn NY 11224.

SELL: Tempo One transceiver and AC/one power supply, less than 20 hours operation, original cartons. $300, plus shipping. LT JG, USN, Giambastaini, WB2CTK, USS Puffer, SSN652, San Francisco, CA 96601.

FOR SALE: AC adapters, 6VDC 150MA, Standard plug, Brand new, $3.00, postpaid. K2MFY, 2 Nutley court, Plainview, NY 11803.

DXers: Reward for information leading to receipt of QSL from FR7AM/G, Glorioso Is. Operation, March 1972. K9WEH, 201 Marion, St., Prospect Heights, IL 60070.

FOR SALE: Heathkit Cheyenne, 90 watt, VFO, AM-CW with A.C. power supply, $50. WA2PCL, 101-23 Lefferts Bl d., Richmond Hill, NY (212)-849-8458.

WANTED: Swan phone patch, Vox, speaker and no. 508 VFO, also Heath MP-10 converter and voltage monitor. T. Coddington, WB6AWC, 7825 Scotts Valley Rd., Kaleport, CA 95453.

WANTED: Used Yagi Antennas. State price, and condition and specifics. W5NMU, Pat Sonneil, MD 305 Silver belle, Pkwy, Lafayette, LA 70501.

WANTED: Small vacuum relays Jennings RB, RJ or RF series or equiv. W4YHD, 6800 Hampshire Road, McLean, VA 22101.

WANTED: Narrow band mechnical filters and conversion parts for Collins 75A2. Tom Lopez, K2GMF Mt. Sinai, NY 11766. (516)573-1261.

SELL OR TRADE: RTTY equipment Tri-Ex 88 ft. crank up tower. Swan 500 with AC supply, Swan FM 2x with AC supply. L. Basham, W7TCT, 735 Caves HWY, Cave JCT, OR 97523.

KW1 owners & Enthusiasts: Join the KW1 club! J. Lowenstein, W7JI, 235 E. 15th St., Tempe, AZ 85281.

FOR SALE: DX-100 xmtr, $60. Ameco TX-62 xmtr, $80. Both in good condition, no shipping. F. Kurz, W9VTQ, P.O. Box 347, Zion, IL 60099.

WANTED: Any type of insulator, write, WB2UVB, 15 E. Camden Ave., Moorestown, NJ 08057.

SALE: Magnum-6 speech processor, for TR-4. Never used. $125., will ship. W6TCQ, 5014 Mindora Dr., Torrance, CA 90505.

SELL: Plate xfmr, 3600-0-3600 at 1 amp, $35; 1.7 Amp, $50. with 110/220 primary & FOB. W0AIH, Paul Bittner, 304 W. 17th St., Grand Island, NB 68801.

SELL: Hickok DP160/DMS3200P 80 MHz counter & frame with Heath 1B-102 scaler. Best offer over $500.00 plus shipping. W2LXC, 163-10 20th Ave., Beechhurst, NY 11357.

WANTED: Robot Fast Scan monitor and magnum six for Collins. Mike Ludkiewicz, 143 Richmond Road, Ludlow, MA 01056.

FOR SALE: Federal foto enlarger 4X5, Heath SWR AM2 $8. Sears 35MM F2.5 shutter stuck, $10. WANT: Vertical and beam. Frentz, Deerwood, MN 56444.

FOR SALE: DX60, like-new, several crystals, manual, $55.00. Dow TR relay, $15.00 Pick up both for $60.00. Joe Petix, WB2PUG, 3 Salem Court, Syosset, NY 11791.

FOR SALE: Twoer, $25. APR4 Head TN19, 300-1000 MHz, $25. Motorola Permakay filters & other two way parts, SASE for list. W. Adams, 9707 Hansford, Austin TX 78753.

FOR SALE: ANTEC ANT. Transmatch, 1 KW CW., $65, with manual. WB6VNR, (213)346-5871.

WANTED: Collins 35C-1 10w pass filter. Richard R. Adachi, P.O. Box 146 Moffett Field, CA 94035.

QSL CARDS ON GLOSSY CARD STOCK: 20 cents for sample. The Print Shop, P.O. Box 353 Lockport, IL 60441.

SELL: Bell & Howell model 34 oscilloscope, new. Jesse Newton, 1071 Prosser Ave., Prosser, WA 99350.

SELL: Janel 2 meter Converter, unused Manual & Carton List, $85.00 sell for $59.00 plus shipping. Full years QST & National Geo, $5.00 plus shipping Joseph A. Kramer, Box 246, Earlville, IL 60518.

FOR SALE: Tubes receiving type used, 25 cents each plus postage. SASE for list. Trans. Variable, 100 mmfd 1/8 spacing and 3/16 $3.00 each. W6BLZ, 528 Colima St., La Jolla, CA 92037.

FOR SALE: Swan600T & 600R phone patch in speaker mike, $800.00. Jack P. Johnson, P.O. Box 26037.

300 Watts and Fully Solid-State

"How Sweet It Is!"

Yes, with enough DX power out of a completely solid-state transceiver to work the world, another plateau in amateur radio development has been achieved. Swan's new SS-200A has a nominal power input rating of 300 watts P.E.P. into a 50 Ohm output load on suppressed carrier single-sideband transmissions. It has this, plus all the excellent solid-state features Swan introduced more than a year ago:

• Broadband transmitting circuits that eliminate transmitter tuning on 10, 15, 20, 40 and 80 meters • Infinite VSWR protection • Minimized front-end overload, distortion, and cross-modulation • Variable VOX gain control • Noise-blanker with variable threshold control • CW with semi-break-in and monitor • 25 kHz calibrator • I.F. derived AGC with fast attack and controlled decay action • And, more! It's all in this new SS-200A transceiver, requiring only a nominal 13.5V DC power source — an ordinary 12V automobile battery!

A home station, like the one demonstrated by Emerson Kasmer (WA6TNV) above, can be easily equipped with SS-200A accessories. Illustrated at the right is a PS-20 matching 110V AC power supply. In the center, a 610X crystal controlled oscillator sits atop an SS-208 VFO. Kas holds a Swan 444 desk mike with a locking PTT bar. For more information on this excellent American-made transceiver, and other Swan products, visit any authorized Swan dealer or write to Swan for our latest "World of Amateur Radio" catalog.

Just think about it for a moment, with a Swan SS-200A in your ham shack, you too will be able to relax and say . . . "How sweet it is!"

WHEREVER THERE'S VALUE IN AMATEUR RADIO, YOU'LL FIND SWAN ELECTRONICS

SS-200A Transceiver	$799.95
PS-20 AC Power Supply	$159.95
SS-208 VFO	$189.95
610X Crystal Oscillator	$ 54.95
444 Desk Microphone	$ 35.95

DEALERS THROUGHOUT THE WORLD
or order direct from

SWAN ELECTRONICS
A subsidiary of Cubic Corporation
Home Office: 305 Airport Road • Oceanside, CA 92054
Telephone: (714) 757-7525

THE BEST PRACTICAL DEVELOPMENTS IN AMATEUR RADIO

PROPAGATION: Looking for the latest available forecasts? Try MAIL-A-PROP, a weekly propagation newsletter prepared by W3ASK. Annual subscription $30, postpaid. Send sase for sample to MAIL-A-PROP, P.O. Box 86, Northport, NY 11768.

QST MAGAZINES 1942 to 1974 (500) copies. CQ Magazines 1947 to 1974 some missing. Radio News Radio Electronics, Electronics World, 500 copies. "73" Magazines, 62 on some missing. $100 for lot or will break up, Cash & Carry. Dupont, 15 Fitchdale, Bedford, MA 01734.

FOR SALE: Counter-Heath IB-1101, 115 MHz, $200.00. Crystals-Motorola Two meter, $8.75 Write for list. Harry McCollum, K5FPI, 1010 West First St., Mt. Pleasant, TX 75455.

WANTED: Small Sony TVs, Radios, computers, Old Scientific and Historical Books, and antique mechanisms. Littell, RR2, Arcanum, OH 45304.

FOR SALE: Magazines, CQ/73/QST/Ham Radio, Send SASE to E. Guimares, RFD 2, Box 480, Middlesboro, MA 02346.

TRADE: 16 inch Broadcast type transcriptions for Ham Gear, or 4 for a dollar in pre-1964 silver coins. W9UIS, 15401 Orchard Lane, Oak Forest, IL, 60452.

FOR SALE: Swan 350-C with VX-2 VOX, xtal calib, factory aligned Feb. $375. J.R. Reagan, Colonial Village, Winston Salem, NC 27103.

MUST SELL: Hammarlund HQ100 Receiver. In good condition, $80; or best offers. WN7YDM, Jay Woods 2900 26th St., Bellingham WA 98225.

EARLY RADIO books & magazines for sale or swap. "Principles of Radio", Henney, 1938, 3rd Ed., $2. Stamp or S.A.S.E. for list. K8IKO, Box 222, Worthington, OH 43085.

FOR SALE: Collins KWM-2A, 312B5, PM-2, SM-3, speech processor, only 14 months old. $1,450. WA9HEU Rt. 2, Box 284 Marinette, WI 54143.

SELL: Swan 350, 117XC Power Supply, Ball-Joint, all Hustler Resonators, Cables & Plugs. Complete, Mint condition, make reasonable offer. M. Freedman, 1010 S.W. 16th St., Plantation, FL 33317.

SALE: Eight brand new power transformers. All good useable voltages, $1.50 each or $10.00 for the lot plus shipping. K8OUQ 268 Annis Court, Chillicothe, OH 45601.

FOR SALE: FT-101 (Late, 160m), Fan, C.W. filter, $500. SW-500, 117-xc, $325. SR-C 146A, Charger, $250. SR-C 826M, P.S., $275. Weston 4440 DVM, $175. Henry 2K, $400. James Craig, 29 Sherburne Ave., Portsmouth, NH 03801.

ANTIQUE COLLECTORS: 1923 Signal Corps wireless receiver range - 40 to 1000KC. Used with external crystal or built-in 201-A detector. Send SASE for details, R. McCormick, 7310 Whitehall Drive., Dayton, OH 45459.

WANTED: Pair of 813's and sockets. State price in first letter. K0JPZ, 4375 Upper 145th St., W Rosemount MN 55068.

SELL: Mint Heath HO-10, $65. Or trade for Drake RV-4. G.E. Woods, WA4UWL, 928-B, Caldwell Lane, Nashville, TN 37204.

SELL OR TRADE: Collins R388(5153) rcvr, teletype M28KSR. Write answer back. Offers? J. Cress, 4322 Blauvelt Rd., Grand Island NB 68801.

FOR SALE: Model 19 teletype with TD and table, $80. HT-40, xtals, Mike, Manual, $50. William Blaine 4132 Haverhill Dr., NE, Atlanta GA, 30305.

RECEIVERS: FM, SCA, Multiplex for background music. McMartin & Browning, $25 to $65. S.A.S.E. for specs., W4JGO, 643 Diamond Rd., Salem, VA 24153.

FOR SALE: 75S3B/500, 32S3, 30L-1, 516F2, All Round Emblems practically new. Orginal cost, $3331.00 plus tax, available for $2331.00 (firm) FOB 367 Northwest, Vacaville, CA 95688.

FOR SALE: New Millen 51002, dual section, 15kv, 6 pos., r.f. switch, $15. Larry Strasser, WTFM, 173-15 Long Island Expressway, Fresh Meadows, NY 11365.

WORKED SOUTH AMERICA certificate. Work all 13 countries. Send list and $1.00. HCI TH, 4805 Willowbend Blvd., Houston, TX 77035.

SELL: Hallicrafter, HT-32 in mint condition, w/ manual. Original owner. You arrange transportation. $165. W1JSS, (617)762-5252, Westwood, MA.

FOR SALE: Waters Reflectometer no. 369 new. $55.00. Eico Resistance Capacitance Bridge, no. 950, $15.00. Lafayette HA 750 6 meter xcvr new. $80.00. Lafayette HA 1200 AM Xcvr, $125.00 National XCU27 Calibrator, $22.00. Ameco PT Tranceiver preamp, $35.00. Free Lists. Colella, WA2HQD, 105-18 131rst St., Richmond Hill, NY 11419. (212)641-2559.

FOR SALE: RTTY Essco TU Solid State less P.S., $50.00. Bob Massey, Box 4501, Norton AFB, CA 92409.

JOIN: Flying Hams' Club, 1680 members, information. Pilots, air/ground communicators. Write, FHC, Box 385, Bonita, CA 92002.

LINEAR BUILDERS: Send SASE for Lo-priced list of HI-power Goodies. R.D. Mace, W6RW, 8600 Skyline Drive, Los Angeles, CA 90046.

FOR SALE: Heathkit, SB-301; SB-401; SB-200, Model 26 teletype; Model 14 TD; Model TG-16 tape perforator, All in very good condition. All $550. W1GLR, 133 Oxbow, Guilford, CT, 06437. (203)453-6107.

WANTED: Kodak 616 size "Vigilant" camera in good working condition. Also 4X5 press camera with backs. WA8MLV, 1008 Englewood Dr., Parma OH 44134.

FOR SALE: Clegg FM-27B & A.C. supply, $370. Drake TR-6 with RV-6 & all extra filters & N. Blanker, $725. Clem, K8HWW, 33727, Brownlea, Sterling HGTS, MI 48077.

MID HUDSON BIKE CLUB: Invites your participation. For details, P.O. Box 1727 Poughkeepsie, NY 12600.

FOR SALE: Sencore FE-23, F.E.T. Multimeter new, never used. Cost-$80.00, Sell-$55.00. Additional information on request. Fred J. Gassier, WDX2OBU, 60-45 60th Drive Maspeth, Queens, NY 11378.

SELL: New Dycom VHF probe, $4.00; New commercial 0.1 watt 2m FM xmtter with .34 xtal & mike, no case, $30.00. W5QNQ, 2025 O'Donnell, Las Cruces, NM 88001.

SELL: Pierson PR-15 Rec. Manual, $.50. W. Becht, W6IRK, 625 Tufts Ave., Burbank, CA 91504.

MORSE TELEGRAPH CLUB INC: Invites both Morse ane International Telegraph Operators to join our organization. Dues, $3.00 yearly. Write, C.D. Combs, 547 West Jackson Blvd., Chicago, IL 60606.

FOR SALE: National NCX-D DC power supply, $55.00. Or swap for Edwards Digital Multimeter kit. H. Chinn, W1ADG, 238 Blue Rock Road, South Yarmouth, MA 02664.

SELL OR SWAP: Large selection of used books, courses, reasonable price. Donald Ryan, Star Route Box 301A, So. Plymouth, NY 13844.

WANTED: Omega Antenna, noise bridge, TE7-02, 1-300 MHz, Albert Lawrence, WB2KWZ, 157 Fayette St., Palmyra, NY 14522.

FOR SALE: Galaxy V MK3 A.C. supply, A1 shape $270. Or trade for SB313 or like gen. cov. rcvr. WB8DLX, 3633 U.S. Rt., 422, Southington, OH 44470.

WANT: HA-2, 100V w/160, 600L, SB2-LA & inverter, book for VFO-matic. Sell: SX-99, teletype gear, R4B crystals, WA9CYW, Box 247, Cannelton, IN 47520.

KP4BDL needs Alaska and N.D. for WAS. Skeds appreciated. Box 22758 San Juan, 00931.

FOR SALE: Brand new filament transformers in factory boxes, Four Merit, Four Thordarson, 5vct 30a, $10 each. One Thordarson 7.5vct, 51a (good for pair 4-1000A) $15. Amperex 5868 tubes, use same socket and chimney as 4-1000A, with spec. sheet and fil. transformer, $50. pair. Shipping charges, extra. Bill Taylor, K8TBW, P.O. Box 485 Bettsville, OH 44815.

SELL: Swan 350 with AC supply; $325.00 Heath DX60A with BFO HG-10; $65.00; Tower, beam, rotor, and other station equipment. Send SASE for details. WA5TJU, 5222 42nd St., Lubbock, TX, 79414.

SELL: Clegg99, $65. National NC183D with spkr. $100. Heath 0-7 scope, $30. Manuals incl. Ted Tsucalas, 162-23 96th St., Howard Beach, NY, 11414.

SELL: Drake TR-4 with NB; AC-4; mint, Both, $495. Heath HD-10 Keyer 2 mo. old $30. Box 2230 Pikeville, KY 41501. WN4GWZ, (606)432-5351.

FOR SALE: Sears Slide Projector, automatic, remote control, good condition. $40. Charles Smith, Box 543, Conyers, GA 30207.

FOR SALE: Aerotron 6N15 2 meter FM transceivers, 1 ch, 10 watt, tube, 115, 12, or 6 volt operation, $85.00, without xtals, working OK. J.L. Cason, WB4CCU, P.O. Box 73, New Bern, NC, 28560.

SELL: Hallicrafters SX-140 with xtal cal., $70, or will trade for Heath HR-10B or HW-7. WN2UFW, 113 Zoa Ave., Johnson City, NY 13790.

WANT: W8FYO, keyer paddle, Triex t-15 tower, no junk. W6MAR, 2020 Rick Springs, Escondido, CA 92025.

12 Button Touch Pads-Covers: Write, Autopatch systems Ltd. Box 291 Western Springs, IL 60558.

FOR SALE: Copies of the complete Phillips code book, of 62 pages. $10 postpaid via insured mail. Dr. Hess, W6CK, Box 19-M, Pasadena, CA 91102.

NEED: Schematic or manual, 6m AM xcvr, Utica 650. Contact Jim, 1302 S. Praire Ave. Arlington HTS., IL 60005.

WANTED: HRO coils, coil F, 480-960KC. Coil G, 180-430KC. Coil H, 100-200KC., for HRO-50T or HRO-7. Jess B. Lebow Jr., K8LJQ, 355 Mower Rd., Pinckney, MI 48169.

WANTED: Amplifier-Multiplier R.F. AM-1178/GRC or TRC "D"-band head. C. Milazzo, WB2OZA 716 Calhoun Ave., Bronx NY 10465.

FOR SALE: National NC270, $85, NC183, $85, Viking 122 VFO, $20, Heath VF1-VFO, $20., Globe DSB-100 incl. CW, $10. All good operating condition. W4PRK, 5106 Sylvan Road, Richmond VA 23225.

WANTED: Heathkit OL-1(3" general purpose scope), working condition. Price to W3EAI, J.R. Henrich, RD2, Box 76, Mertztown PA 19539.

WANT: 30MC Counter, Digital VM, small sig. gen. to 30 MC. WB6AJR, Box 405 Duarte, CA 91010.

WANT: VFO-matic book, SB2LA & inverter 100V w. 160, 600L. Sell: teletype setup. WA9CYW, Box 247, Cannelton, IN 47520.

SALE: Due to poor health, DX100B-HQ110 with clock. Needs minor work. VOM meter, and extras all for $100. (pick up). K3BDA, Ed, 2004 Philadelphia Ave., Chambersburg, PA 17201.

FOR SALE: SB102 New 400 Hz filter factory, align. Disability forces sale, $375.00. Gil Seiler KGGIF, 126 Boas Drive, Santa Rosa, CA 95405

SELL OR TRADE: 1926 MHz TWT and components. Don Bostrom, K6YFZ, 18406 Delano St., Reseda, CA 91335.

FOR TRADE: SB-630 station console in very good condition, trade for Collins 312B-4 console. For sale: one new pair of Eimac 7203/4CX250B, for $25.00. G.L. Myers, WB6RVH, P.O. Box 2903, Lancaster, CA 93534.

DEALERS & HAMFEST TRADERS: Write for discount prices on 30 AMP Filament Chokes for GG Linears. New, not surplus. Satisfaction guaranteed. V. Murrell, K4HHA, At 6, Newport, TN 37821.

SELL: Antique Weston 155 meters Mirror scale; also Acousticon patent 1907; Robert Ireland, Pleasant Valley, NY 12569.

WANTED: Components or complete units for AN/ARC-65 or AN/ARC-21. WA9CKP, Irvin Kanode, 158 W. Indiana Ave., Nappanee, IN 46550.

TRANSFORMERS REWOUND: Jess Price, W4CLJ, 507 Raehn St., Orlando, FL 32806. (305)425-7251.

SELL: FM Sumont 2m mobile on 155MHz, All cables less case 4 freq. 80w, $45.00 you ship. R. Sieffert, Box 30 RR6, New Castle, IN 47362.

FOR SALE: Mint condition, Ham-m w/control box. used 3 months. $95.00. Keith Teague, P.O. Box 65 Alma, AR 72921.

WANTED: Back issues of amateur radio magazines, used correspondence courses, military technical manuals, advise, W. Russell, 9410 Walhampton, Louisville, KY 40222.

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

GLADDING 25 (2mtr FM), loaded with repeator crystals and 12 button touch tone pad. Best offer or trade for 75 or 40 mtr mobile or SSTV system WB5EDV, 2420 Dutton Ave., Waco, TX 76706.

FOR SALE: Drake CC-1 cabinet with CPS-1 supply and scc-1 xtal, $60. Vanguard model 407-6 & 2 meter converters, $27. each 14MHz IF. Vito Iacopelli, WB2WTJ, 1720 77th St., Brooklyn, NY 11214.

WANTED: Old crystal sets and old battery radios of the early 1920's. Need not be in working condition. Advise model and price wanted. McKenzie, 1200 W. Euclid, Indianola, Iowa, 50125.

WILL TRADE: First class FCC license course, want to buy old radios & parts. T.G. Soukup, WA1AWX, 161 Bob Hill Rd., Ridgefield, CT, 06877.

FOR SALE: 150 foot tower. Best offer. R. Zurawski, WA8FVD, Rt 2 Box 646, Menominee, MI 49858.

ATTN: OHIO VALLEY HAMS, Wheeling Emergency Net meets every Tuesday night at 7:00pm EST on 16/76 (Wheeling Repeater). All Hams invited to check-in. T.W. Sommers, WA8ZNC, RFD 1 Box 137 Bridgeport, OH 43912.

HEATH TWOER: w/man., ground plane, 12 el. beam and masts, xtals, mike. $45. Pick up only. W6SVO, Tom (213)588-5832.

TRADE: Yaesu FT-101B, new for Collins, Drake, or F.M. gear. Don Burns, 4410 Reading Rd., Dayton, OH, 45420. (513)256-0345.

WANTED: Tuner and power xfmr for RCA CTC15 TV Chassis. Either or both. Erwin Donadt, W2IOZ, 168 Cedar St., Cliffside park, NJ 07010.

WANTED: Millen solid state grid dipper, LED type counter, LED digital VM. Don Dressen, 17 Woodlyn Lane Bradbury, CA 91010.

SELL: Heath HD 11 Q Mult $10, FOB., EMC502 Sig Gen, $15, FOB. Knight G30 GDO, $20, FOB, list SASE. WB9BXX, Box N, Gridley, IL 61744.

WANTED: Wireless gear, old radio receivers, misc. parts, catalogs, etc. regardless of condition. Horvath, 522 Third St., San Rafael, CA 94901.

FOR SALE National NC-190 Gen Cov Rcvr, Manual, carton, $110. Radio Handbook (Orr) 18th Ed. $7.50. ARRL Hints & Kinks, Bols. 4,5,6, 7 & 8; $12. ARRL Enamled Emblem (Rare) $4. G. Rulffs RFD 1, Sebago Lake, Maine 04075.

FOR SALE: Xmtr T18 2.1-3MC, T21 5.3-7MC, $10.00 each new, Heqth 3" scope model 10-17 never used, $69.00. Eico ST-40 stereo new, $69.00 Garrard SL95, cover, cartridge, auto base mint, $100.00, W5SYB, 5000 Hall, Amarillo, TX 79109.

SELL OR TRADE: Hammarlund HQ-180AX and HA-800B Lafayette rcvr. for test equipment. S. Powers, 41 Elsie Rd., Brocton MA 02402.

SELL: Heath counter scaler, cashiers check, freight collect, $299.95. WA5CMC, in call book.

FOR SALE: QST, 1952 through 1973. Most bound best offer. M.J. Fein, W2AH, Scarborough Manor, Scarborough, NY 10510.

SACRIFICE: Lakeside pix tube rebuilding equipment with supplies like new. W1NWW/WB4GPM, 2883 S.R. 590, Clearwater FL 33519.

GOT ANY TOUCH-TONE PADS? Will buy in quantity if priced right. W7UD, 3637 W. Grandview, Tacoma, WA 98466.

FOR SALE: 10m beam, $15.00 2-4-400A new, $20.00 Ea. Local only. W6PZX, 549 Valvedre Dr., So. San Francisco, CA 94080.

FOR SALE: Swan 500C only used 6 months, excellent, $325.00. A. Vail, 29 Prospect St., Amityville, NY (516)691-3642.

SELL: Fet rcvr preamps 25db gain, 80-10 meter use w/any rcvr. kit, 6.95 ppd. WA2SLX, Alan Burg 2970 Bronx Park East, Bronx, NY 10467.

SELL: Matched 6 JB6 tubes, $10.50 per pair, P.P. Max J. Fuchs, 11 Plymouth Lane, Swampscott, MA 01907.

CHESS BY RADIO? The B.H.S. Radio Club and CHESS CLUB would like to have matches over-the-air with other high schools. F. Wasti, B.H.S. Radio Club, Brockton High School, 470 Forest Ave. Brockton, MA 02401.

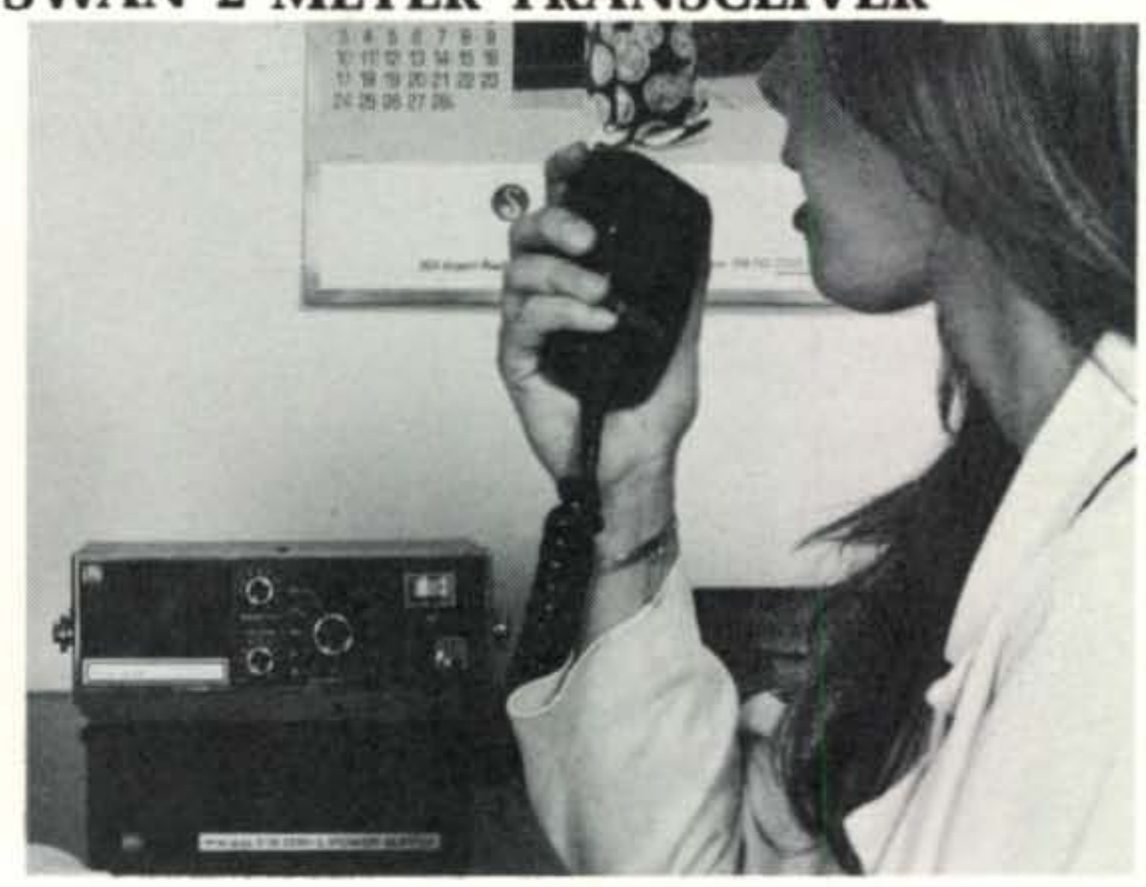
FOR SALE: 2 valuable antique general coverage receivers, excellent condition. Howard 435 & Hallicrafters S-38C. Make offer. J. Manion, 1208 W. Fairview, Dayton, OH 45406, WB8CZX.

Military Receiver, R-392/URR. .5-32 MHz. Digital Readout. GC., $140.00. G. Gleicher, 96-04 57th Ave., Apt 6D, Rego Park, NY 11368.

FREE ANTENNA

WITH YOUR PURCHASE OF A SWAN 2-METER TRANSCEIVER

FM-2XA Mobile



FM-1210A Base

Order A Complete FM-2XA Or FM-1210A Transceiver And Swan Will Include a 2-Meter FM Antenna

At No Extra Charge!

Here is a great opportunity to join the fun on 144 through 148 MHz. Whether you choose the FM-2XA or FM-1210A for a mobile or fixed-station installation, you will get an excellent 10-Watt FM unit with a built-in speaker, dynamic microphone, mounting bracket and hardware plus, absolutely free, a matched 2-Meter antenna.

Both transceivers work directly off 12V DC for mobile use and are equipped with matching 110V AC power supply for home use. The FM-2XA has a 12 channel capacity with 3 channels installed. An independent switching feature gives the FM-1210A up to 144 channel combinations and comes with 4 transmit and 4 receive crystals installed.

The following packages are available during this special limited offer:

#1—FM-2XA Mobile Station. Includes Snap-Pack AC Power Supply PLUS a FREE Swan MD-4 mobile 2-Meter whip antenna. Please specify your choice of roof or deck type mounting. **$299.95**

#2—FM-1210A Mobile Station. Includes Pedestal AC Power Supply PLUS a FREE Swan MD-4 mobile 2-Meter whip antenna. Please specify your choice of roof or deck type mounting. **$359.95**

#3—FM-2XA Fixed-Station. Includes 110V AC Snap-Pack Power Supply PLUS a FREE 3 dB gain, 2-Meter vertical antenna for your home installation. **$299.95**

#4—FM-1210A Fixed-Station. Includes 110V AC Pedestal Power Supply PLUS a FREE 3 dB gain, 2-Meter vertical antenna for your home installation. **$359.95**

We strongly suggest that you place your order now with a participating Swan dealer, or you may order direct from the factory with the coupon below, as this offer may be withdrawn without notice.

Gentlemen:

Please ship me, collect, the 2-Meter package I've checked. ☐ Full payment Enclosed. ☐ 20% down payment enclosed, ship C.O.D. ☐ 10% down payment enclosed, charge to my Swan Credit Account #_____. (California residents please add sales tax.)

☐ #1—FM-2XA Mobile — $299.95
☐ Roof ☐ Deck

☐ #2—FM-1210A Mobile — $359.95
☐ Roof ☐ Deck

☐ #3—FM-2XA Fixed-Station — $299.95

☐ #4—FM-1210A Fixed-Station — $359.95

Name: _____

Address: _____

City: _____ State: _____

Zip: _____ Call: _____

Mail Coupon to:

SWAN ELECTRONICS
A subsidiary of Cubic Corporation
305 Airport Road • Oceanside, CA 92054

You may reserve your package by calling Area Code (714) 757-7525.

current flows. As the gate voltage increases (in the reverse bias direction) drain current decreases until at some value of V_{gs}, the device cuts off.

Operating and biasing this type of FET can therefore be done in a manner similar to a vacuum tube and some typical methods are shown in fig. 5.

The MOSFET is a bit different from the junction FET and there are two versions available. Fig. 6 shows the gate voltage/drain current characteristics of the two different types.

The depletion mode MOSFET is similar to the JFET in that current flows when the gate-to-source voltage is zero. An increase in gate voltage (in the reverse bias direction) also decreases the current flow, however an increase in gate voltage in the forward biased direction increases the current flow even further. Circuitry and use is similar to the JFET.

This type of MOSFET is usually employed where the very high input impedance of a MOSFET as compared to a JFET are required as well as a normally "ON" device. Note that this device easily operates around zero gate voltage, unlike the bipolar transistor.

This brings us to the enhancement mode MOSFET. By referring to fig. 6 again we can see that at zero gate voltage, this device is "OFF". Only when the gate voltage increases in the forward bias direction does the device begin to conduct. In fact, conduction actually

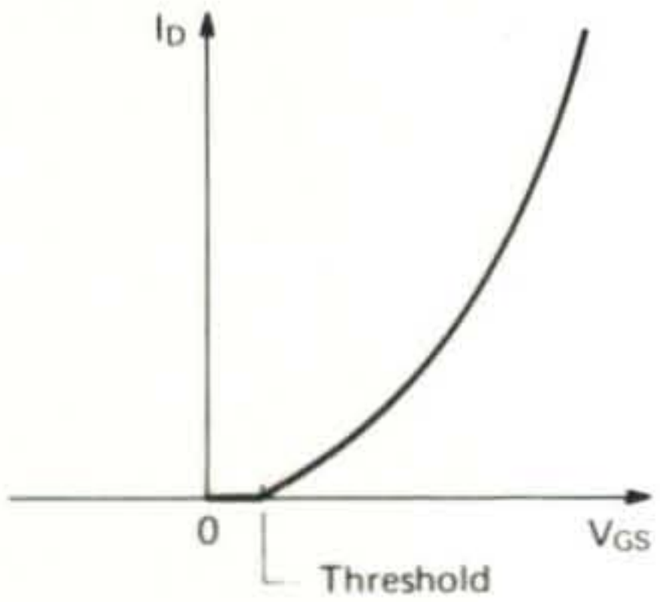


Fig. 6—Comparison of the two major types of MOSFET's.

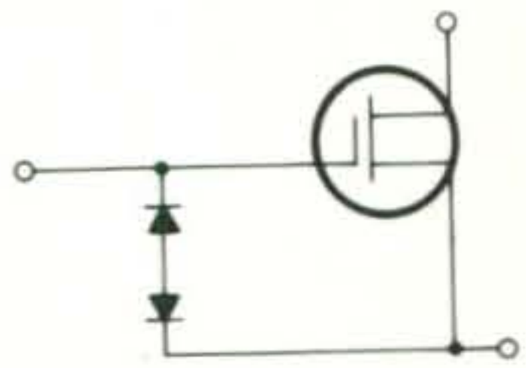


Fig. 7—A diode protected MOSFET.

occurs above some threashold valve, similar to a bipolar transistor. Enhancement mode MOSFET's usually exhibit very little current flow when cut off and it is for this reason that they are the devices chosen for use in the new low power CMOS logic families now being developed.

A full explanation CMOS logic will be a future topic in this column. JFETS can be used and handled in a manner similar to conventional transistors but MOSFETS due to their ultra-high input impedances cannot. When the current required by a gate is only 1×10^{-13} amperes, it is quite easy to see that for all practical purposes, it is an insulator. Therefore static electricity produced by almost any of the synthetic materials such as nylon, dacron, etc. can easily build up to thousands of volts and, if brought in contact with the gate of a MOSFET can easily and quickly destroy the device. Many MOSFETS produced today have incorporated built-in zener diodes to protect against just such an occurrence. Fig. 7 shows the schematic of a typical protected gate MOSFET.

When using a device of this type therefore, no special precautions are necessary. There are many MOSFETS without these diodes however, especially the ones with extremely low noise figures as required in r.f. amplifier service.

When using such a transistor, wrap a short length of #24-30 buss wire or a single strand of stranded wire around all leads as shown in fig. 8 while handling and soldering the device into circuitry. When the transistor is fully connected, the lead may be removed. RCA is one manufacturer that now supplies such an arrangement on all unprotected MOSFETS.

Also, *never* but *never* plug a non-protected MOSFET into or remove one from a circuit with the power on. If the static electricity doesn't "get it", a voltage spike certainly will.

A very good series of technical notes on FETS of all kinds is available from Motorola Semiconductor Products, P.O. Box 20912, Phoenix, Arizona 86036 upon request for those who wish more detailed information.

Ask for AN211A, AN219, AN231, AN410, AN423, AN462 and AN478.

73, Irv, WA2NDM

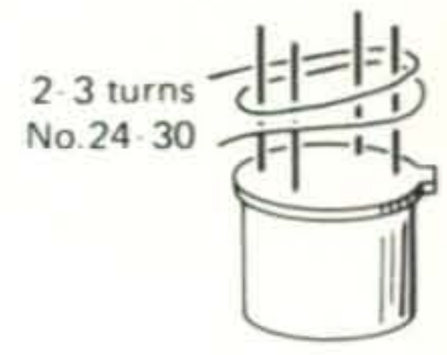


Fig. 8—A method of shorting unprotected MOSFET's when installing them.

MOBILE ANTENNA ORDER FORM

SWAN ELECTRONICS
A subsidiary of Cubic Corporation

MAIL TO:
SWAN ELECTRONICS
305 Airport Road
Oceanside, CA 92054

SHIP TO:

NAME: _____ AMATEUR CALL: _____

ADDRESS: _____

CITY: _____ STATE/ZIP: _____

PLEASE SHIP THE FOLLOWING HIGH QUALITY FIXED ANTENNAS:

QTY.	MODEL #	DESCRIPTION	UNIT PRICE	AMOUNT
	45	Heavy Duty 5-Band Mobilecoil Antenna with manually operated vertical switch. 1000 Watt power rating. 6 foot adjustable stainless steel whip with Kwik-On connector. Unbreakable LEXAN® center post.	$84.95	

Custom Series 35 antennas, power rated at 2000 Watts, are of Heavy Duty design with interchangeable coils. Select components to suit your type of installation.

	35-6	6 foot stainless steel Whip Section. Includes Kwik-On connector.	$12.95	
	35-15	15 Meter Coil Section.	$22.95	
	35-20	20 Meter Coil Section.	$24.95	
	35-40	40 Meter Coil Section.	$26.95	
	35-75	75 Meter Coil Section.	$28.95	
	35-18	18 inch Base Section.	$ 9.95	
	35-36	36 inch Base Section.	$10.95	
	35-48	48 inch Base Section.	$11.95	
	Kwik-On	Stainless steel connector for quick removal of any mobile antenna coil or whip.	$ 7.95	
	MD-4	2-Meter Mobile Whip with distinctive molded transformer. 5/8 wave; 3 dB gain. Stainless steel whip.	$21.95	
	BMT	Deluxe Antenna Bumper Mount. Chrome finish.	$26.95	
	RMD	Mobile Antenna Roof Mount.	$ 5.95	
	TMD	Mobile Antenna Trunk-Lid Mount.	$ 9.95	

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

SUB–TOTAL	
CALIF. SALES TAX (Residents Only)	
TOTAL	
DOWN PAYMENT	
BALANCE DUE	

Method of payment (Check one):

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

SIGNATURE: _____ DATE: _____

Be a Part of It All

Join AMSAT—The Radio Amateur Satellite Corporation. Your $5.00 annual dues bring a handsome membership certificate and the quarterly publication "AMSAT Newsletter." Write AMSAT at P.O. Box 27, Washington, D.C. 20044.

EXPLOSIVE POWER

Here is all the dynamic powerful performance needed to punch through QRM, *without an accessory amplifier*. SWAN's 700CX Champion transceiver lets you enjoy a more responsive value-packed ham station, for less cost-per-watt, than any other rig in its class . . . less than 86¢ per watt if you have your own power supply . . . less than $1.05 per watt with SWAN's 117-XC deluxe AC power supply with matching cabinet and built-in speaker . . . and, less than 98¢ per watt with the 117-X AC power supply.

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

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

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

WM-1500 In-Line Wattmeter $64.95

700CX	Champion Transceiver	$599.95
117-XC	110V AC Power Supply	$124.95
117-X	110V AC Power Supply	$ 79.95
510-X	Crystal Oscillator	$ 54.95
508	External VFO	$189.95
VX-2	Plug-In VOX	$ 44.95
FP-1	Telephone Patch	$ 54.95
Mark II	Linear Amplifier	$749.95

DEALERS THROUGHOUT THE WORLD
or order direct from

SWAN ELECTRONICS
A subsidiary of Cubic Corporation

Home Office: 305 Airport Road • Oceanside, CA 92054
Telephone: (714) 757-7525

THE BEST PRACTICAL DEVELOPMENTS IN AMATEUR RADIO

Customize Your QTH With Quality Accessories From Swan Electronics

CRYSTAL CONTROLLED OSCILLATOR
10-channel unit for Swan transceivers designed for fundamental crystals up to 22 MHz. Selector switch and vernier control. Model 510X plugs into 250C, 300B, 700CX or 600T. Model 610X plugs into SS-15A or SS-200A transceivers.
510X or 610X **$54.95**

IN-LINE WATTMETER
Four easy to read scales of 0 to 5, 50, 500 and 1500 watts. Forward or reverse reading. Accuracy is better than 10% full scale on frequencies from 2 to 30 MHz. Design impedance is 50 ohms. Directivity is better than 30 dB.

WM-1500 ..... **$64.95**

TELEPHONE PATCH, HYBRID
Easily and quickly connects between your receiver/transmitter and the telephone lines. Separate transmitter and receiver gain controls. Low loss transformers give exact voice reproduction for high quality telephone patches.
FP-1 ..... **$54.95**

HIGH QUALITY MICROPHONES
Dependable for penetrating QRM, these microphones provide exceptionally fine voice reproduction. Press-to-talk action. Durable construction.

444 Desk Type with locking bar switch . . **$35.95**
404 Hand-Held Mike with coiled cord . . **$24.95**

PLUG-IN VOX
Hands-off operation with extremely smooth voice operated relay action. Delay, anti-trip, and gain controls. Semi-break-in CW capability. Plugs directly into 250C, 300B, 600T or 700CX.
VX-2 ..... **$44.95**

SUPER-SELECTIVE I.F. FILTER
16-pole quartz crystal. 2.7 kHz bandwidth. 1.28 Shape Factor. Ultimate rejection in excess of 140 dB. None other like it. May be installed in 300B, 700CX, 600RC, SS-15A or SS-200A for an additional $70 when purchasing these units.
SS-16B "Do it yourself" **Kit** **$89.95**

EXTERNAL FREQUENCY CONTROL UNIT
Provides for separate transmitting and receiving frequencies. Ultrasmooth dual-ratio planetary tuning with full band coverage from 10 through 80 meters. Model 508 for 300B or 700CX. Model SS-208 for SS-15A or SS-200A transceivers.
508 or SS-208 ..... **$189.95**

MOBILE MOUNTING DEVICES
Mobile installations take on a custom look with these kits. All necessary hardware and parts are included. For the 300B or 700CX: **Model MTK** mounts unit over hump or under dash . . . **$9.95; Model GMTK** dash mount . . . **$5.20** For the SS-15A or SS-200A: **SS-MTK** . . . **$16.95** **SS-GMTK** dash mount . . . **$11.95.**

DEALERS THROUGHOUT THE WORLD
or order direct from
SWAN ELECTRONICS
A subsidiary of Cubic Corporation
Home Office: 305 Airport Road • Oceanside, CA 92054
Telephone: (714) 757-7525

See the complete selection of quality amateur radio equipment accessories at your authorized Swan Electronics dealers, soon!

THE BEST PRACTICAL DEVELOPMENTS IN AMATEUR RADIO

ALL SOLID-STATE
160 WATT MONOBANDER
SSB/CW — CHOOSE 40 or 80 METERS

SWAN's newest and most powerful single-band transceiver. Perfect for mobile use, operating directly from any standard 12V DC battery with a minimum of current drain. No transmitter warm-up time or intricate tuning is necessary. Simply turn the monobander on, dial your frequency and immediately 160 watts P.E.P. input is working for you.

Novices and experienced hams, alike, will appreciate the simplicity and practicality of this newest development in the state-of-the-art for amateur radio. SWAN's MONOBANDER's feature infinite VSWR protection from mismatched antenna loads, as well as an easy to see Transmit LED indicator on the S-meter face to let you know when your signal is getting out.

Select the MB-40A for 7.0 to 7.3 MHz operation, or if you prefer the 3.5 to 4.0 MHz band, you may choose the MB-80A. Whichever you select, one of new 160 watt models or the new improved 75 watt MB-40 or MB-80, you are assured of the superior engineering, workmanship and service that only SWAN ELECTRONICS can give you. Here is excellent performance in a handsome package that blends well with every automobile interior.

See the powerful MONOBANDER at your authorized SWAN dealers showroom this week—*you'll be glad you did!*

MB-40A or MB-80A (160 watt).....**$329.95**
MB-40 or MB-80 (75 watt) **$299.95**
MBCW (Optional CW Monitor) .....**$ 19.95**
SWAN 404 Microphone.....**$ 24.95**

DEALERS THROUGHOUT THE WORLD
or order direct from

SWAN ELECTRONICS
A subsidiary of Cubic Corporation

Home Office: 305 Airport Road • Oceanside, CA 92054
Telephone: (714) 757-7525

THE BEST PRACTICAL DEVELOPMENTS IN AMATEUR RADIO

READER SERVICE

To obtain literature from advertisers, simply check the number next to the name of each advertiser listed below whose product or service is of interest to you.

SEPTEMBER, 1974

1 Amateur Electronic Supply
2 Amperex Electronic Corp.
3 Arnold's Engraving
4 Arrow Electronics
5 Atlas Radio Inc.
6 Cole Devices
7 Collins Radio Co.
8 Columbia Electronics, Sales, Inc.
9 E-Z Way Products, Inc.
10 Eimac, Div. of Varian
11 Electronic Distributors, Inc.
12 Emergency Beacon Corp. (EBC)
13 Globetrotting Via Amateur Radio
14 Greenlee Tool Company
15 H & L Associates
16 Heath Company
17 Henry Radio
18 Hy-Gain Electronics Corp.
19 International Crystal Mfg. Co.
20 Jan Crystals
21 LA Electronix Sales
22 Lafayette Radio Electronics
23 Midland Electronics Company
24 Millen, James, Mfg. Co., Inc.
25 Mor-Gain
26 Mosley Electronics, Inc.
27 New-Tronics Corporation
28 Palomar Engineers
29 Ramco Electronics
30 Rohn Manufacturing
31 SAROC Convention
32 Savoy Electronics, Inc.
33 Scientific Radio Systems
34 Sentry Manufacturing Company
35 Space Electronics Co.
36 Swan Electronics
37 T.R.I. Corporation
38 Telrex Communication Engineering Laboratories
39 Tucker Electronics Co.
40 Unadilla Radiation Products
41 VHF Engineering
42 Wilson Electronics
43 World QSL Bureau
44 Yaesu Musen USA Inc.

CQ Reader Service
14 Vanderventer Ave.
Port Washington, N.Y. 11050

Name ..... **Call** .....

Street Address .....

City ..... **State** ..... **Zip** .....

ADVERTISER'S INDEX

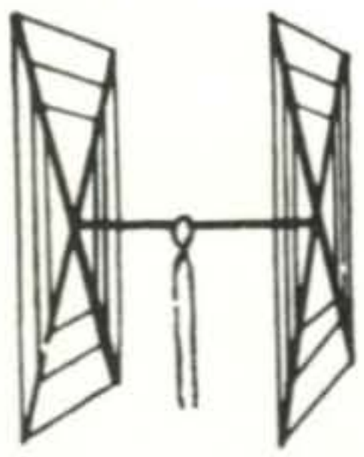
Sept. 1974

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

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

A POWERFUL ANTENNA
Can help you serve mankind; extend the hand of friendship to the whole world; render help in emergencies and further the cause of peace.

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

10-15-20 CUBICAL QUAD	$45
10-15 CUBICAL QUAD	$40
15-20 CUBICAL QUAD	$42
TWENTY METER CUBICAL QUAD	$35
FIFTEEN METER CUBICAL QUAD	$34
TEN METER CUBICAL QUAD	$33

(all use single coax feedline)

BEAMS

The first morning I put up my 3 element Gotham beam (20 ft) I worked YO4CT, ON5LW, SP9-ADQ, and 4U1ITU THAT ANTENNA WORKS! WN4DYN Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history!

Each beam is brand new; full size (36' of tubing for *each* 20 meter element, for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; ⅞" and 1" alumnium alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.

A POWERFUL ANTENNA
Can help you serve mankind; extend the hand of friendship to the whole world; render help in emergencies and further the cause of peace.

2 EL 20	$29.	4 EL 10	$28.
3 EL 20*	$35.	7 EL 10*	$42.
4 EL 20*	$42.	4 EL 6	$28.
2 EL 15	$25.	8 EL 6*	$38.
3 EL 15	$29.	12 EL 2*	$35.
4 EL 15*	$35.		
5 EL 15*	$38.		

*20 Boom

ALL-BAND VERTICALS

Effective low-angle, omnidirectional radiation, easy assembly and operation. No guy wires needed. Occupies little space. Can be installed at ground level, exceotionally rugged, broad-banded, low initial cost. No maintenance, proven and tested design. Guaranteed Gotham quality at low Gotham prices.

V40 vertical for 40, 20, 15, 10, 6 meters $22.95
V80 vertical for 80, 75, 40, 20, 15, 10 6 meters $24.95
V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters $26.95

A POWERFUL ANTENNA
Can help you serve mankind; extend the hand of friendship to the whole world; render help in emergencies and further the cause of peace.

"SASE for FREE literature and beam and quad gain formulas.

"HOW TO ORDER: Send money order (bank, store or United States) in full. We ship immediately by best way, charges collect, DEALERS WRITE."

GOTHAM
2051 Northwest 2nd Ave., Miami, Fla. 33127 Dept. CQ,

SEND FOR NEW CATALOG

GREGORY ELECTRONICS CORP.

The FM Used Equipment People.

249 Route 46, Saddle Brook, N. J. 07662
Phone: (201) 489-9000

GENERAL ELECTRIC T.P.L. SOLID STATE TWO-WAY RADIOS

(Specify frequency range)
FE/RE 52, JA1, 2, or 3 series, 25-50 MHz, 12 volts, 35 watts, front or rear mount, fully solid state receive, 3 tubes in transmitter, fully narrow band, complete with accessories **$178**

FE/RE 53, JA6 series, 150-174 MHz, 12 volts, 35 watts, front or rear mount, fully solid state receive, 4 tubes in transmitter, fully narrow band, complete with accessories **$198**

(specify frequency range)
FE/RE 72, JA1, 2, or 3 series, 25-50 MHz, 12 volts, 100 watts, front or rear mount, fully solid state receive, 4 tubes in transmitter, fully narrow band, complete with accessories **$288**

FE/RE 73, JA6 series, 150-174 MHz, 12 volts, 80 watts, front or rear mount, fully solid state receive, 3 tubes in transmitter, fully narrow band, complete with accessories **$298**

MOTOROLA

T53GGD, 150-170 MHz., 6/12 volt, 50 watts, dynamotor power supply, transmit narrow band, receive wide band, less accessories **$36.00**

T51G or T51GGV, 40-50 MHz., 6 or 12 volt, 50 watts, vibrator power supply, fully narrow band, less accessories **$58.00**

D43GGV-3100, 150-170 MHz., 6/12 volt, 30 watts, vibrator power supply, front mount with "private line" (less reeds), fully narrow band, with accessories **$88.00**

FMTRU41V, 150-170 MHz., 6/12 volt, 10 watts, vibrator power supply, front mount, transmit narrow band, receive wide band, with accessories **$48.00**

R.C.A.

CMFT50, 25-54 MHz., 12 volt, 50 watts, transistorized power supply, partially transistorized receiver, fully narrow band with accessories **$128.00**

CMCT30, 150-170 MHz., 12 volt, 30 watts, transistorized power supply, fully narrow band, complete with accessories **$98.00**

YAESU

Your assurance of Performance and Quality

YAESU **FTdx401-B** Transceiver

More For Your Money

FTdx401	$599.00
Built-in AC Power Supply	No charge
Built-in WWV 10 MHz Band	No charge
Built-in Noise Blanker	No charge
25 and 100 KHz Calibrators	No charge
VOX	No charge
Clarifier	No charge
Break-in CW with Sidetone	No charge
1 KHz Readout	No charge
Selectable SSB	No charge
6 Month Warranty by Dealer	No charge
Cooling Fan	No charge
AM Position	

Total only $599.00

Amateur Price Net
Price Subject To Change

Tomorrow's Transceiver Today: 20 tubes plus 50 silicon semiconductors, passive crystal filter (6 pole), velvet smooth tuning, superb noise blanker, standard electrical parts. This is truly the best buy in the amateur field today. See your local dealer for brochure & demonstration.

Factory Service is available even after your warranty has expired for the cost of labor and parts.

YAESU

YAESU MUSEN USA INC.
7625 E. Rosecrans Avenue, Unit #29
Paramount, California 90723 Phone 213-633-4007

This month EIMAC celebrates 40 years of delivering what you need.

No company can survive four decades without anticipating what the customer needs and giving him what he wants. Over the years EIMAC state-of-the-art advancements have changed the state of the world. Here are some highlights:

1934

EIMAC started with the 150T triode, the first reliable high frequency power tube. A whole family of triodes followed.

1940

EIMAC produces the 304TL multiple triode, the heart of World War II pulsed radar equipment.

1943

EIMAC provides quantity production of the secret Zahl tube (VT-158), the "radar tube that changed the war."

1942-1945

EIMAC leads the world in mass production of VHF pulsed power tubes for military radar: over 125,000 tubes per month!

1946

EIMAC introduces the 4-250A family of tetrodes for HF and VHF operation.

1948

EIMAC introduces the external anode 4X150A tetrode for HF and VHF service, followed by the 4X150G coaxial-based version for ECM service.

1955

EIMAC produces the first ceramic-metal tetrode, the 4CX5000A, for broadcast and FM service.

1957

EIMAC introduces the 4CX1000A high gain, external anode tetrode for single sideband HF linear amplifier service.

1961

EIMAC produces the 3-400Z and 3-1000Z high-mu triodes for cathode driven linear amplifier service.

1962

EIMAC introduces the first high power family of 35-100 kW tetrodes for broadcast service.

1966

EIMAC develops the 4CX1500B focused tetrode for high linearity service.

1970

EIMAC produces the 8877 external anode VHF triode for cathode driven service.

1973

EIMAC develops the two-megawatt X-2159 tetrode and the X-2176 triode, the world's most powerful tubes.

1974

EIMAC introduces a new family of 900 MHz high-mu triodes for land mobile communications.

The next 40 years will be even better.

Eimac®
division
varian