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The Radio Amateur's Journal

08240

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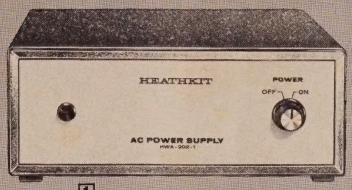
2 HM-2102 VHF Wattmeter helps you know how you're getting out with your HW-202. Has built-in SWR bridge, adjustable sensitivity.

3 HW-2021 hand-held 2-meter transceiver. 1 watt out, 5 receive and 10 transmit channels get you on 2 while you're walking, working, outdoors, anywhere. There's even the HWA-2021-3 auto-patch encoder you can build right in, as shown.

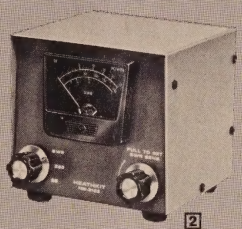
4 HW-202 crystal-controlled 2-meter transceiver. The one used by thousands because of its reliability, performance and low kit-form price!

5 Add up to 8 watts power to your HW-2021 with the HA-201 2-meter amplifier. Withstands infinite VSWR without failure—goes together in an hour or two.

6 The HWA-202-2 tone burst encoder brings even more versatility to your HW-202. Has four tone select buttons to allow the HW-202 to access repeaters. Mounts directly into 202 chassis—not a "Black Box" or cumbersome add-on.



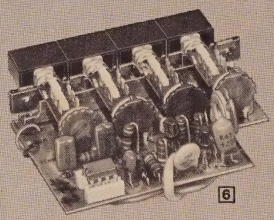
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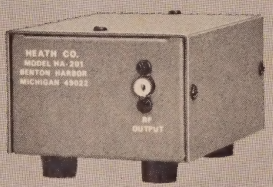

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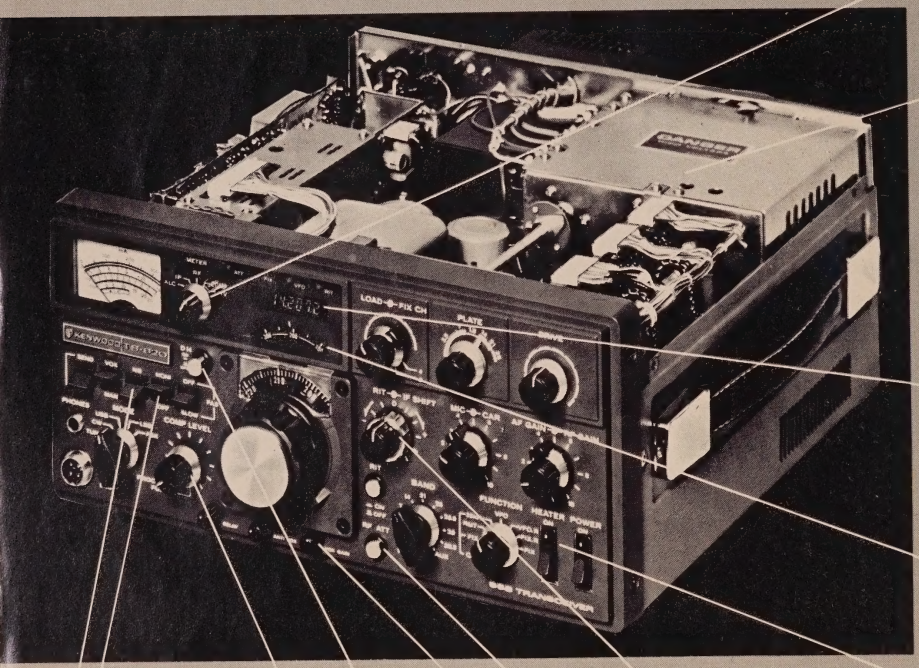
AM-328

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Features

PLL • The TS-820 employs the latest phase lock loop circuitry. The single conversion receiver section performance offers superb protection against unwanted cross-modulation. And now, PLL allows the frequency to remain the same when switching sidebands (USB, LSB, CW) and eliminates having to recalibrate each time.

FULL METERING • During receive, an easy to read meter functions as an S-meter. The same meter displays ALC level, plate current, RF output, and plate voltage during transmit. Includes COMP setting for adjusting the compression level of the built-in speech processor.

FINAL AMPLIFIER • The TS-820 is completely solid state except for the driver (12BY7A) and the final tubes. Rather than substitute TV sweep tubes as final amplifier tubes in a state of the art amateur transceiver, Kenwood has employed two husky S-2001A (equivalent to 6146B) tubes. These rugged, time-proven tubes are known for their long life and superb linearity. The input power of the TS-820 is conservatively rated at 160 W DC, 200 W PEP. Tubes run cool with the aid of a noiseless fan (standard) mounted on the rear panel. The above tube and power combination minimizes the possibilities of TVI and helps to maintain the Kenwood reputation for excellent audio quality.

DIGITAL READOUT DG-1 • (optional) A digital counter display can be employed as an integral part of the VFO readout system. Counter mixes the carrier, VFO, and first heterodyne frequencies to give *exact* frequency. Figures the frequency down to 10 Hz and digital display reads out to 100 Hz. Both receive and transmit frequencies are displayed in easy to read, Kenwood Blue digits.

DRS DIAL • Includes the same satin-smooth planetary drive found on other fine Kenwood models plus special, high-precision gears to add a new "monoscale" feature for easier frequency readout. LSB, USB, and CW operating frequencies can be accurately read from the same pointer.

HEATER SWITCH • The filaments of the three vacuum tubes may be turned off during periods of "receive only".

CW AUDIO CHARACTERISTICS • During CW reception, a special filter is used to alter the audio frequency response to provide a more comfortable, easy to copy tone.

Other features include:
- Built-in 25 kHz calibrator*
- Built-in speaker*
- CW Sidetone and semi-break in*
- Rear panel terminals for linear amplifier, IF OUT, RTTY, and XVTR.
- Handy phone patch IN and OUT terminals*

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NOISE BLANKER • The TS-820 uses an efficient noise blanker circuit, another Kenwood exclusive. A special crystal filter assures unsurpassed efficiency in eliminating unwanted pulse noises.

RF MONITOR • Built-in monitor circuit allows you to hear your own voice by sampling the RF signal. Especially useful for adjusting the RF Processor.

HIGH STABILITY VFO • The VFO, heart of any SSB transceiver, is an exclusive Kenwood design using FET technology.

DIGITAL HOLD • A single pushbutton switch offers the operator unprecedented versatility. The digital hold circuit will lock the counter and display at any frequency, but will allow the VFO to tune normally. Ever wanted to return to a certain spot on the band and forgotten the frequency? That won't happen again with the new digital hold feature on the Kenwood TS-820.

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RF ATTENUATOR • Easy, one touch activation of the attenuator supplies 20 dB of padding on receive.

VOX • A voice-activated microphone circuit is built into the TS-820 with VOX GAIN, ANTIVOX, and VOX DELAY controls placed on the front panel for convenient adjustment any time.

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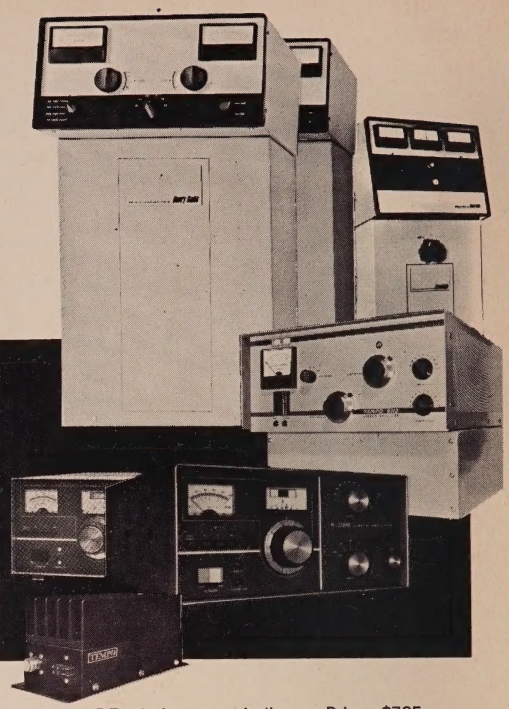
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Zero Bias

To begin my tenure as Editor let me start off by saying that I was introduced to *CQ* years ago as a fledgling Novice at a Hamfest at Lost Battalion Hall in Queens N.Y. during the early 1950's. I was there as a member of the Trylon Radio Club, and hoping like many to win one of the door prizes (I didn't). As I passed one of the booths an arm reached out and blocked my way. A voice started a spiel about a magazine called *CQ*, an inflatable globe that lit up, and all the wonderous joys of receiving *CQ* each and every month. That was how I met Wayne Green who was then Editor of *CQ*. The only sensable way to get free of this entrapment was to give in and subscribe. I got the magazine, my dog ate the globe that Wayne bestowed upon me and the light never worked anyway.

Within the next year I joined the U.H.F. Club of Jamaica where I got to meet a frequent guest speaker, Harry Dannals, then ARRL Hudson Division SCM. It was Harry who got me appointed as OES no. 43 in November of 1956, almost twenty years ago. I was a subscriber then to both amateur publications (Harry does a great job at clubs) even though the League didn't give any premiums my dog could eat.

It was a transitionary period in amateur radio, not the Golden Years and not quite the store-bought package era. Each month as *CQ* came out (and sometimes the other one) my friends and I would trek down to Cortland Street and Canal Street in New York to locate parts to build whatever was featured. Club projects were in vogue and everyone was secretely working on some sort of "Ultimate Rig". A measure of status was that if one person could lift the rig it didn't count, big and ultimate meant Big and Ultimate . . . lot's of iron.

I still have my old 6 meter a.m. rig I built around 1960 using a pair of 5763's to a 6146 and modulated by a pair of 807's. It's under the staircase in the basement gathering some nostalgic dust along with some immense kw power supply which must be dragged across the floor since it's too heavy to lift. A half built linear sits in an open rack nearby the victim of numerous modifications and canabalism of components as technology kept changing and finally surpassed the original idea. My first job after college was at a electronic parts distributor where I could be at the source of supply (at a much better price).

My circuitous route to *CQ* took me through working for various electronic distributors in the New York area, wholesale surplus dealers and an exporter of military communications equipment. When I entered the army I wanted naturally to be a radio operator and figured my ham ticket would help. They thought I should learn a new trade and so I spent my time in medical corps (It did qualify me to get into MARCO though). About 12 or so years ago Dick Ross asked me if I wanted to work for *CQ*. I knew Dick for a number of years from the old 6 meter days here on Long Island. So here I am.

I'm a compulsive collector of all sorts of stuff including old magazines. I have a full set of *CQ* (naturally), 73, Ham Radio and need one more issue to fill out my set of QST, (May 1916). By the time you read this I will have scoured the fleamarket at Dayton and will be getting set for the one at Rochester, plus planning what to bring out with me when I go to the LIMARC Fleamarket this June.

I don't have any great changes planned for *CQ* other than to try to get it out as early as possible. The April issue was out in the mail about a week earlier than March and if things go right this issue will be out about a week earlier than April. We've received some very nice comments from our readers concerning the new format and look of *CQ*. Dick and I worked very hard in trying to come up with the new design and it seems to have been worth all the effort.

I wanted also to thank the many people who have called and written their congratulations to me. I consider myself quite fortunate in being able to work at something which I enjoy both as a hobby and a vocation.

Perhaps at some future Hamfest I'll sell a subscription to some fledgling Novice and start someone else on the path to becoming a future Editor of *CQ*.

73, Al, K2EEK

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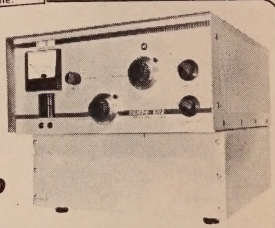
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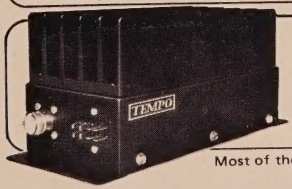
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10W	80W	80A10	$149
30W	80W	80A30	$159

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Drive Power	Output	Model No.	Price
2W	70W	70D02	$270
10W	70W	70D10	$250
30W	70W	70D30	$210
2W	40W	40D02	$180
10W	40W	40D10	$145
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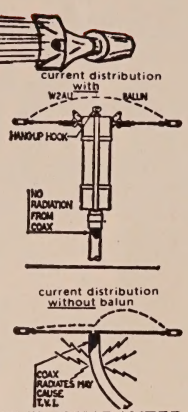
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Our Readers Say

Briar on Target

Editor, *CQ*:

Herb Briar's insightful comments in February CQ Novice column hit the proverbial nail on the head.

I, also, am one of those novices who breezed through an FCC test-oriented training course given by our local Radio Club. After obtaining my license I ran into the very real problems of antennas, and receiver/transmitter operation.

Now, the second hand equipment I bought sits in a pile in a coma - - mute testimony to my hopeful but unsuccessful efforts to make it work satisfactorily. Not only will I probably never obtain a General license which is what I really desire, but I'll probably fade out as a Novice.

I still hope that I will find someone who can give me the books in training and assistance to get all my equipment to work properly. However, except for verbal expressions of encouragement, other club members are too busy to come out and patiently show a total dimwit such as I how to set up and get all this stuff working properly.

Eugene C. Jirak, WN9RTU
Berwyn, IL

Anyone in Gene's area available to give him a hand?

H.A M.S.P.E.A.K.

Editor, *CQ*:

In Bill Dewitts article "Hamspeak" (March p. 28) it sounds like Bill Benson has been listening to too much CB.

Don Kasper, WN9RRD
North Vernon, IN

Novice Note

Editor, *CQ*:

Just a little note of appreciation for putting my picture in the January issue of your Magazine, and also for the Subscription to your Magazine, which I am enjoying very much.

Evelyn I. Fox, WN9QZA
Merrimac, WI

CQ welcomes reader comments. If you have any comments pro or con please let us know. Address your letters to Our Readers Say, CQ Magazine, 14 Vanderventer Ave., Port Washington, N.Y. 11050

The best wide-band trap vertical is now even better.

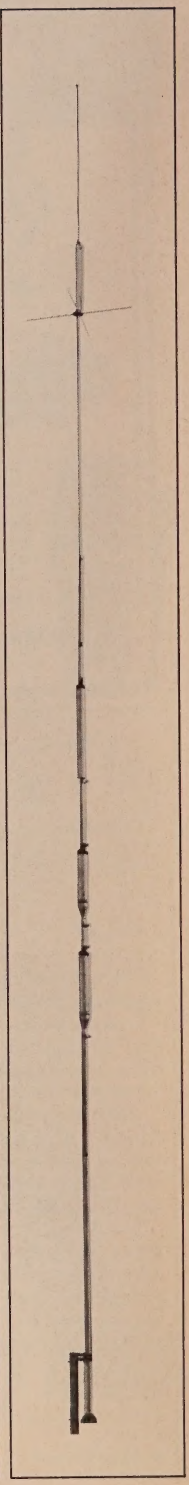
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The Hy-Gain 18AVT/WB gives you true omnidirectional wide-band performance, plus 80-meter capability. And now, we've completely re-engineered the 80-meter coil for even greater performance and added a hefty corona ball to the whip to eliminate signal-destroying corona discharge and noise.

Don't settle for less when you can get true wide-band coverage, superior construction and brilliant performance in one reasonably priced package. The Hy-Gain 18AVT/WB.

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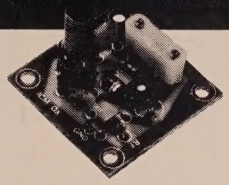
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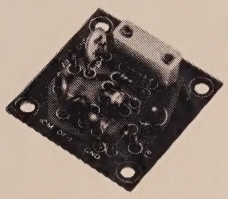
for the experimenter!

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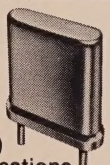
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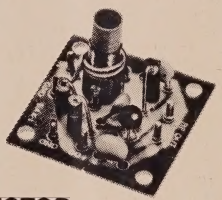


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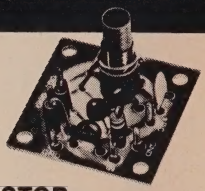
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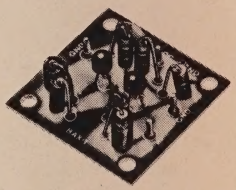
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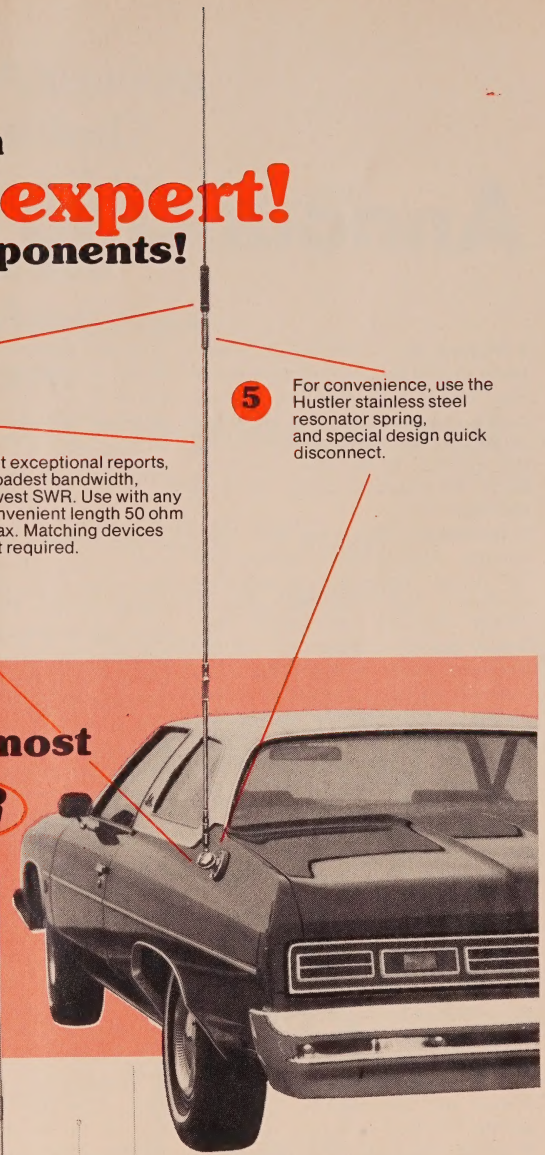
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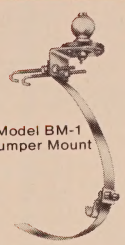
Model SSM-2 Ball Mount



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Announcing

● **Flushing, N.Y.** — The Hall of Science Radio Club is holding their third annual Flea Market & Auction on Saturday June 5, (rain date June 6) at 10 am to 4 pm, at the Flushing Meadow Park. General admission $1.00 Sellers Admission, $2.00. For more information call (212) 699-9400.

● **Warminster, PA** — The Warminster Amateur Radio Club is holding their 2nd Annual "Ham-mart", to take place on Sunday, May 16 at 9:00 am, at the William Tennent Intermediate High School located at Street (Rt. 132) and Newtown Roads in Warminster, PA. Activities include a free FM clinic, flea market, auction, special displays and demonstrations, door prizes, refreshments, and a drawing for a Wilson six-channel HT. Admission, $1.00 per carload, and $2.00 for tailgaters. Talk-in available on 52/52, 16/76, and 69/09. For more information contact Stephen M. Anderman, P.O. Box 113, Warminster, PA 18974.

● **Willow Springs, IL** — The Six Meter Club of Chicago Inc. is holding their 19th Annual Hamfest on Sunday June 13, at Santa Fe Park, 91st St. and Wolf Rd. in Willow Springs, IL. Activities include a Swap and Shop . Food and drinks available. Tickets $1.50 in advance $2.00 at the gate. For more information and tickets write: Don Marquardt, P.O. Box 79, Lyons, IL 60534.

● **Arnold, MD** — The Maryland Mobileers are holding their Sixth Annual Hamfest on Sunday, June 13, at Anne Arundel Community College at 9 am. Registration $2.00 in advance $3.00 at gate. Activities include: Prize drawings, a talk in on 146.10/.70, 146.52, 146. 16/.76. For more information contact, Frank, WA3WAN, 558 Brightwood Rd. Millersville, MD 21108.

● **Akron, OH** — The Goodyear Amateur Radio Club of Akron, will hold their 9th annual Father's Day Hamfest Picnic, on June 20, at Wingfoot Lake Park, one mile west of Suffield, Oh. on County Rd. no. 87. Flea Market, Displays, Shop and Swap, Prizes. Picnic tables available Food and Refreshments. 10:00 am to 6:00 pm.. Admission, $2.00 in advance, $2.50 at gate. For details, write to, Floyd T. Gilbert, 1976 Newdale Ave., Akron, Oh. 44320.

● **Columbia, S.C.** — South Carolina State Governor, James B. Edwards, has issued a proclamation declaring May 10th through May 16th, as Bicentennial Amateur Radio Week. The Holiday VHF Society of Charleston will be operating a special events station "AA4SC" during the 14th, 15th and 16th of May from the Governor's Mansion in Columbia, SC. This station will operate CW/SSB on 10 to 80 meters, PM on 2 meters, and 2 mtr - 10 mtr Oscar satellite communications. A special commemorative certificate will be made abailable to stations making contact with AA4SC. For more information contact Roman J. Downer, 849 Harborview Rd. P.O. Box 12451, Charleston, SC 29412.

● **Belleville, MI** — The Southeastern Michigan Amateur Radio Hamfest will be held on June 6, 6 am till 4 pm, at the Wayne Country Fair Grounds. Swap-N-Shop, Food and Refreshments, Prizes, indoor exhibits. Tickets $2.00 in advance, $2.50 at gate. For more information contact S. Pohl, P.O. Box 1976, Belleville, Mi. 48111.

● **Princeton, IL** — The Starved Rock Radio Club Hamfest will be held on June 6, at the Bureau County Fairgrounds. Camping and trailer space, Food and refreshments, many historical sights of interest. Advance registration, $1.50 in advance $2.00 at gate. For more information send a SASE to Starved Rock Radio Club, RFD 1, Box 171 Oglesby, IL 61348. (815)667-4614

● **Manassas, VA** — The Ole Virginia Hams A.R.C. of Manassas announces its annual "Quality Hamfest" for June 6, at the Prince William County fairgrounds, Rt. 234, 1/2 mile south of Manassas. Talk in on 146.37-97, 147.84-24 and 146.52 Simplex. Featuring, Electronic Flea Market, Ladies and Childrens activities. Door prizes and Food service. For more information write: WA4GVX, 1708 Sharp Dr. Woodbridge, Va. 22191.

● **Old Westbury, N.Y.** — LIMARC is holding its Electronic Flea Market on June 6th (Rain Date June 20th) at the N.Y. Institute of Technology Rte. 25A and Whitney Lane. Items include HI-FI, TV, Communications, Marine, Citizens Band, Amateur Radio, Test Equipment Appliances and Parts. Admission $1.00, buyer, $2.00 seller. For more information call W2KPZ (516)938-5661.

● **Atlanta, GA** — The ARRL Southeastern Division Convention and the Atlanta HamFestival will be held on June 12-13 at Dunfey's Royal Coach Motor Hotel, I-75 at Howell Mill Rd., Atlanta, Ga. Exhibit Hall, Outdoor Fleamarket, Saturday night banquet and dance. For Hotel Reservations contact the Hotel directly toll free at 1-800-228-9494. Individual registration is $3.00 in advance $4.00 at the door; family registration is $5.00 in advance, $6.00 at door. For more information write: Atlanta Hamfestival, 53 Old Stone Mill Rd. Marietta Ga. 30062.

● **Sioux Falls, SD** — The Sioux Falls Amateur Radio Club, Inc. and the Sioux Valley Repeater Assoc. announce the South Valley Ham Picnic to be held on June 12 and 13 at the Sioux Empire Fair Grounds, 1/2 mile east of I-29 and the 12th St. off ramp. Activities include an Eyeball Session, Family-Style meal, A two-meter transmitter hunt, Seminars Contests, Prize drawings. A talk-in will be on 3950 KHz by the S.F.A.R.C. Club Station. Camper and tent facilities available. For further information send a S.A.S.E. to: Sioux Falls Amateur Radio Club, Inc. P.O. Box 91, Sioux Falls, SD 57101.

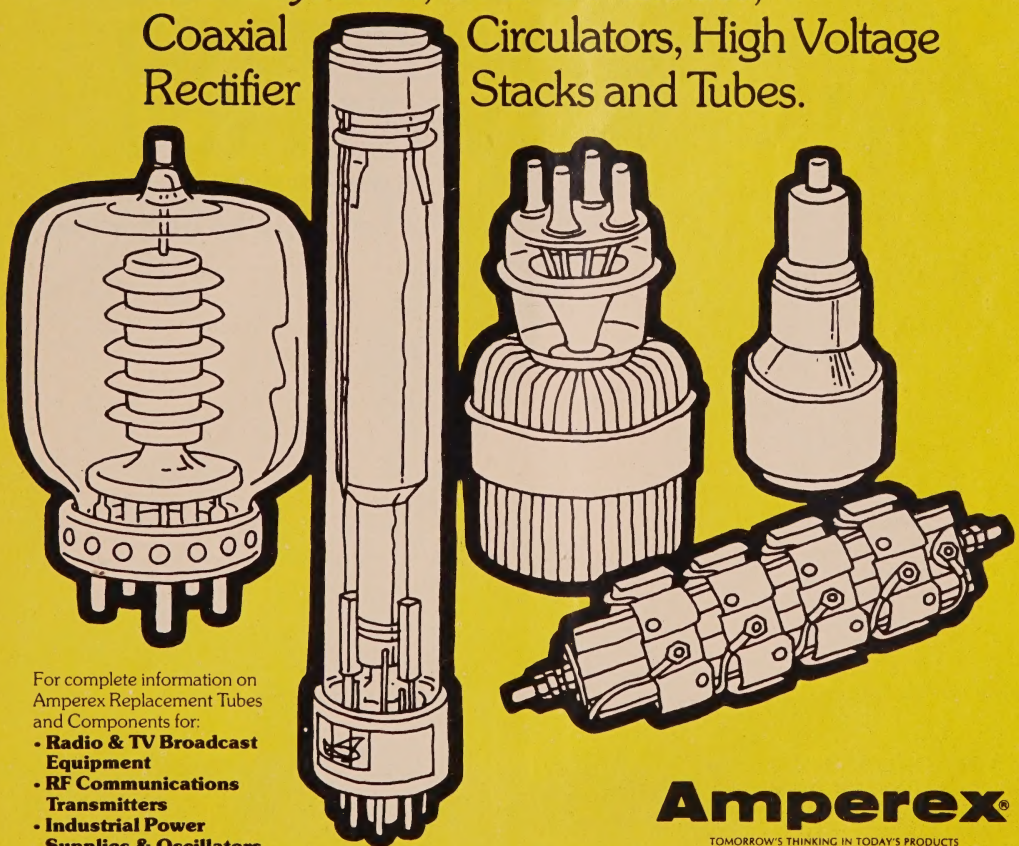
● **Rochester, N.Y.** — The 43rd Annual Rochester Hamfest will be held the weekend of May 21-23, at the Monroe County Fairgrounds near Rochester, Activities include Indoor/Outdoor Flea Market, Banquet, FCC Amateur Tests, Wouff Hong ceremonies and a 2-meter transmitter hunt. Registration in advance is $3.50 at gate $4.00. For more information write Rochester Hamfest, Box 1388, Rochester, NY 14603.

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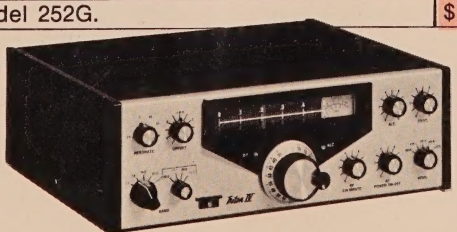
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2.	Instant band change. No tune-up.	Yes				
3.	Covers all ham frequencies, 3.5 - 30 MHz.*	Yes				
4.	Power input, *all* bands, watts.	200				
5.	Sensitivity (10 dB S+N/N), micro-volts.	0.3				
6.	Stability. Max change for 1°F, Hz.	15				
7.	Selectivity, i-f shape factor, 6/60 dB.	1.8				
8.	Direct frequency readout to 1 kHz.	Yes				
9.	Pulsed crystal calibrator, kHz.	25				
10.	Built-in air loaded loudspeaker.	Yes				
11.	150 Hz CW filter option, $25.	Yes				
12.	Incremental (offset) tuning.	Yes				
13.	WWV at both 10 and 15 MHz.	Yes				
14.	Separate receiving capability.	Yes				
15.	Automatic sideband selection, reversible.	Yes				
16.	Full break-in CW.	Yes				
17.	Keying rise/decay time, millisec.	2.5				
18.	Sidetone level and pitch adjustable.	Yes				
19.	Pre-selectable Automatic Level Control.	Yes				
20.	Unwanted sideband suppression, min. dB.	60				
21.	Carrier suppression, min. dB.	60				
22.	Intermodulation distortion, min dB.	30				
23.	Harmonic radiation, min dB.	45				
24.	Built-in SWR bridge.	Yes				
25.	Provisions for driving all linears.	Yes				
26.	LED indicators for Offset and ALC.	Yes				
27.	Ten meter crystals for 28.0-29.0 MHz supplied.	Yes				
28.	Basic 12-14 volt DC operation.	Yes				
29.	Five year pro-rata warranty on final transistors.	Yes				
30.	Plug-in circuit boards.	Yes				
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*160 meter adapter available.



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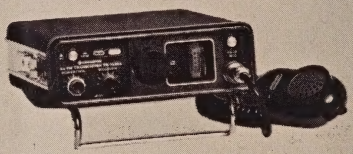
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Kenwood's superb 2-meter FM mobile transceiver. Designed to withstand the most severe punishment while providing consistently excellent performance.



Packed with features like the PRIORITY function... Put your favorite crystals in channel 7, and the 7200A automatically returns to that frequency when it senses activity there. 146-148 MHz coverage, 22 channels, 6 supplied. Completely solid state. Voltage required: 13.8 VDC. Antenna impedance: 50 ohms. Frequency adjusting trimmers on every crystal. RF output power: 10 watts (or 1 watt at low power). Adjustable frequency deviation (factory set at ±5 kHz). Automatic VSWR protection. Receiver sensitivity less than .5 uV for 27 dB. Selectivity: 12 kHz/−6 dB and 24 kHz/−70 dB. Size: 7-1/16" W x 2-3/8" H x 9-7/16" D, 5-1/2 lbs.

Complete with dynamic mike, DC power cord, mobile mount, mike hanger, auxiliary connector and external speaker plug. Amateur net... $249.00.

The perfect companion to the TR-7200A is the PS-5 AC/DC power supply. Together they provide an efficient and handsome base station. The PS-5 is complete with a digital clock and automatic time control feature built in. Amateur net... $79.00.

the TR-2200A

Kenwood's high performance portable 2-meter FM transceiver... completely transistorized, rugged and compact.

12 channel capacity. Built in telescoping antenna can be easily replaced, or stored in carrying case. Connector for external antenna also. External 12 VDC or internal ni-cad batteries, complete with 120 VAC battery charger. 146-148 MHz frequency coverage. 12 channels, 6 supplied. Battery saving "light off" position. Hi-Lo power switch (2 watts −400 mW). Sensitivity: 0.5 uV or less/26 dB S+N/N. Built-in speaker. Size: 5-3/8"x 2-5/16"x 7-1/8", 3-3/4 lbs.

Complete with Dynamic mike, O-T-S carrying case, all cables, speaker/headphone plug and 10 Ni-Cad batteries. Amateur net... $229.00.

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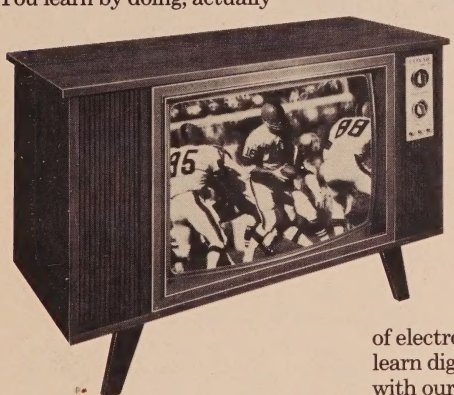
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Two years after the lava stopped flowing Icelandic amateurs return to put Heimaey Island on the air.

TF7V-HEIMAEY ISLAND, ICELAND

BY OLAFUR AXELSSON, TF3AW

The very dramatic cover photo was taken by TF3KM on the first days of the eruption on Heimaey, in the Westman Islands portion of Iceland. It is estimated that over 250 million square meters of lava and ash were deposited by this eruption and that temperatures reached 1080 degrees Centigrade. The lava is still very hot under the ash and will take considerable time to finally cool down. Those inhabitants who chose to return have devised methods of using this heat now to warm their homes.

The fact that Iceland is divided into 6 call areas is not generally known to many foreign radio amateurs. Except for one station located in area 5 (North Iceland) all Icelandic amateurs are located in area 2 (West Iceland) and area 3 which is Reykjavik and its surroundings. Other call areas are 4 South, 6 East and 7 Westman Islands.

It is obvious that contacts are rare with areas outside of the capital, though efforts have been made several times to operate in the "quiet" areas. The total number of QSOs with these areas is not likely to have offered foreign radio amateurs a big chance.

Discussions

In the beginning of 1975 six amateurs in Reykjavik discussed the possibility of announcing an expedition to one of these "quiet" areas. The Westman Islands were for many reasons considered the most desirable spot.

As a result of our discussions a decision was made to set out for an expedition to Heimaey in July, to commemorate the second anniversary of the cessation of the volcanic activity on Heimaey. In early June our plan was ready and we only had to wait for government permission for the TFs AC, AW, AX, KD, SB and SE to operate a temporary station under the callsign TF7V.

Several long days passed before we got the go-ahead. A ship was scheduled to sail from the mainland on the 8th of July, giving us ample time to begin operations at midnight on the 11th.

On the afternoon of July 8th TF3AX drove around Reykjavik in his Citroën H van, loading 1400 lbs. of equipment: two HW-101 transceivers, one Kenwood TS-520, one Sommerkamp 288, one 8m QRP, two 2m link stations, four 12AVQ, one 18AVT, one 14AVQ, 600m & antenna wire, one tent 330 sq. ft. two small tents 60 sq. ft., one 1.5 KW generator, gasoline, food for the group for six days and finally 30 lbs. of luggage for each member.

One problem still remained; no insurance company would insure our equipment after our arrival on the island. The reason was that strong winds could be expected and the overall situation was uncertain. However we were offered insurance against theft, which in a way was very kind, but we thought it would be cheaper to trust each other.

The Eruption In 1973

It must be explained that the story of Heimaey over the last two years was not that of a peaceful and friendly island. All 5000 inhabitants were evacuated from Heimaey on the morning of the 23rd of January



An enlargement of an Icelandic stamp issued to commemorate the great eruption on Heimaey Island.

1973 when a severe volcanic eruption started. The lava stream was moving in the direction of the town, followed by frequent earthquakes. All available ships transported the people to the mainland and everything not needed for that trip, was left behind. The lava finally stopped only a few yards from the harbour and by then the southernmost part of the town was under lava and the rest covered with ash.

Gradually the inhabitants returned to their island, some finding nothing but 30 ft. of hot lava instead of their houses. The ash has just now been removed.

Maybe this was not an appealing place for an insurance company when dealing with a bunch of amateurs.

To The Island

In spite of all insurance problems, a heavily loaded Citroën van was on its way at 3 p.m. heading for the harbour on the south coast, Thorlakshofn.

Upon our arrival there we were told that we were one day too late, the ship had left the day before. For some reason we decided to wait until the scheduled time of departure, before giving up. Much to everyones delight, the ship came sailing into the harbour exactly on time. Later we found out that the schedule had been altered a few days before. The voyage lasted four hours. While aboard the ship every one enjoyed a great meal, which worried the author a bit as he had been chosen as cook for the expedition. On approaching the Westman Is. we had a nice view of the islands, 13 in all. Heimaey is the biggest one, 10 km from the mainland. This is the only island where people live all the year round. Surtsey could be seen in the distance, but that island was born during an eruption in 1963.

When finally the ships crane managed to haul the van ashore, we drove to Storhofdi, a 330 ft. high cliff on the southernmost part of Heimaey. At midnight we erected the two small tents which we were to sleep in, using all available tie-downs although at that time it was calm with a dense fog.

As a safety precaution the lighthousekeeper on Storhofdi had already offered us a small room in the lighthouse. Since this was midsummer, it did not get dark at night and the lighthouse was not in use.

We transported all the equipment into the lighthouse, where the lighthousekeeper had cleared the room for us. He showed us various instruments which were located in the house. A seismometer was recording continuously, giving warning of possible outbreaks from the volcano. We also located some u.h.f. equipment which was in operation. We did not then bother about possible r.f.i., and went to sleep in our tents.

The First Day

It was late when we woke up and much to our surprise the weather was still calm and the sun was shining brightly. This was indeed our lucky day and we finished raising the big tent and the V-beams. Late in the afternoon we had just finished hammering down the almost circus-like tent stakes,—for all the tie-downs, — when the lighthouse-keeper came to inform us that the seismometer was indicating something very unusual. The first reply he got was a hearty laughter. As it turned out, the sensing unit for the seismometer was in a black box at the bottom of a deep hole close to our tent. We tested our theory regarding this "black box" by jumping close to the hole while watching the seismometer. The recording paper was not wide enough to record this test!

Most of the time we could expect to get the 220v power for our equipment from the lighthouse generator, but as a stand-by we had our 1.5 kw portable generator.

We tested the antennas from the lighthouse as one operating position and also from the tent as the other operating position. Our intention was to work separately from the two locations. Later we found out that this presented some r.f.i. problems. The transistorized equipment, in particular, gave us a hard time there. Our initial tests were, incidentally, also recorded on the seismometer, through r.f.i. this time. We had some discussion regarding a possible connection between the seismometer and the u.h.f. equipment and we decided that this was most likely only a receiver, which could not forward any information.

In the evening we had the 220v supply to both locations (tent and lighthouse) and a local contact was made with Reykjavik. On the 10th we still had the same weather and in the evening we were already ahead of our plan. We had been warned that the weather in Heimaey was rain 300 days a year and windy all the time. The rain was specified as horizontal-type, never the usual vertical-type. By now we were curiously waiting for this experience. Local visitors from the town told us in wonderful detail what would become of our equipment and where we would find our tents after a "normal" day on Storhofdi.

Snafus

Every expedition is full of snafus and although still calm, ours was no exception. We found out that voltage drop made it necessary to retune some transmitters. We had a few guests that were continuously falling over and breaking radials spread all over the place from the vertical beam. 600 meters of antenna wire measured in Reykjavik reached only 250 on Storhofdi. Additional food was ordered by air-freight but the plane could not land because of fog, which lasted only for a couple of hours. The chief cook and bottle washer was getting afraid of being eaten himself, when finally the food arrived.

The Operation

We all woke up early on the 11th, for this was the

big day. All antennas were tuned and a few minor problems were solved. In the afternoon we went to the town to have a look at the salvage work being carried out to save houses and remove ash. Many nations had sent help to the inhabitants in the form of ready made houses and other equipment. Everybody was working hard to build up what had been lost in this war against the volcano. It was surprising how much had been done already.

In the evening TF7V was on the air. Our first QSO was c.w. with UK5WAA at 16:08 on 14 MHz. The operator was TF3AW. The first s.s.b. contact was on 14 MHz with UK3ABO at 19:40. (TF3SB) The first U.S.A. contact was with K2RAP at 19:58 also on 14 MHz. The first 80m contact with U.S.A. was however on the 13th at 03:50, W1PIV and the operator on c.w. was TF3AX.

The operation continued until the 14th, and conditions were not at all favourable most of the time. Early morning on the 13th, conditions were exceptionally good, and we were able to go about calling each of the call areas in the U.S. without a single instance of QRM from an uncalled station. We would not have been able to work nearly as many stations without such a spirit of co-operation. Also we discovered that owing to nearly zero noise level, weak signals which would not have had a chance at our home QTH, could be heard clearly.

We were all very happy during these few days of operation and it seemed that a surprising number of amateurs knew about our expedition. Most amateur magazines could not print any information at such a short notice, and we feared that only a few could have known of our activities. The fact was that the story had gotten around all the way from Barbados Is. and Equador to Svalbard. We were very glad to hear how effectively the few amateurs that knew of our expedition, had gotten the word around.

A Visit To TF7V

At 10 o'clock that morning, we had a visit from the Science Institute in Reykjavik. An Icelandic professor accompanied by a foreign geologist had flown to the island. We immediately jumped to the conclusion that the u.h.f. "receiver" had been transmitting all our private seismological misinformation. Whereupon we apologized for all of the trouble. The professor looked at us quietly for a moment and then told us that he knew nothing about this. If we had caused this for sure, we should just write our explanations on the recording paper and forget the whole thing.

Our public relations officer Gudjon, TF3AC, was preparing for a meeting with the local reporter from Radio Reykjavik and we had to return to our operations. That evening we had, thanks to him, a great report on the radio, and as a result Gudjon had to write an article for most of the newspapers.

Coming again to the r.f.i. difficulties between the two locations, the main problem was that the tent had to be located too close to the lighthouse. The only level spot was about 250 ft. north of the lighthouse, where the vertical beam was placed near the tent. This happened to be inside the north V-beam from the lighthouse. The result was that only the vertical beam (to the west) and the east V-beam could be used simultaneously. Conditions are, however, rarely favourable to the east and west at the same time. The only solution was to work separate band and different mode, which decreased the number of possible QSOs.

Kristinn, TF3KD designed our vertical beam, the one with all the radials, or man traps, as we called it. This antenna, consisting of four 12AVQ's, seemed to give excellent results, but could only be directive east or west. Wind was our main concern and this antenna was therefore considered very suitable.

On the 14th of July we had to stop operating and start preparing for our return trip to the mainland. The lighthousekeeper had been helping us a great deal all the time and we had the opportunity to give him a hand shearing his sheep that evening. How the sheep could walk around and live on this nearly vertical cliff was unbelievable. It seemed that their feet must be at least 5" shorter on one side, for them to be able to stand upright.

The following day we left the island with very happy memories of an enjoyable stay, thankful to all those who had helped us, thereby making the whole operation possible.

While our ship was turning outside the harbour, we got the last look at the island in the midnight sun, and the volcano which will continue to send its white peacesmoke in the air for the coming centuries.

QSL Information

For the information of all those who made contact with TF7V, all QSL cards have been sent, either direct when requested or via the bureau. In case of none delivery, please contact our QSL Managers TF3AC or TF3SB. ■



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A Single Element Delta Loop Antenna for 15 and 20 Meters

BY HARRY K. BOURNE, ZL1OI

Many amateurs living in urban areas are frustrated by their inability to erect a Yagi beam or a quad owing to space or height limitations, or aesthetic considerations. In such a situation I have obtained considerable success on the 14 and 21 MHz bands with a wire delta loop antenna, one which is efficient, unobtrusive, has a low wind resistance and is light in weight. This type of antenna is much simpler to construct than a quad as the supporting structure is less elaborate, and it is less susceptible to wind damage. The delta loop antenna has an advantage over a dipole for DX transmission as it produces a strong lobe of radiation at a low angle even when mounted close to the ground. Although it will perform well at a low mounting height, as in any other antenna, the performance will improve with height.

When a delta loop antenna is close to the ground its operating performance depends on interference between the direct radiation and that reflected from the ground, so that for maximum efficiency, the surrounding ground should have good conductivity. If the ground conditions are not good, the performance of the antenna may be degraded to some extent. Any obstructions around the antenna may distort the directional pattern and attenuate the low angle radiation and thus degrade the performance.

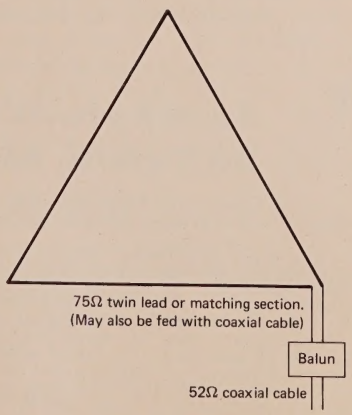


Fig. 1—A Delta loop, base down. It may also be fed directly with coaxial cable.

Two possible configurations of the delta loop antenna are shown in figs. 1 and 2. In fig. 1, the simplest arrangement, the antenna, constructed entirely of wire, requires only a single central support, which may be a mast or tree. Good low angle radiation characteristics are obtained by feeding the antenna at one end of the base. The impedance of the loop is approximately 100 ohms and it may be fed with 75 ohm coaxial cable without introducing a serious mismatch, the shield of the cable being connected to the base of the delta. The base should be not less than ten feet above the ground and should be higher than trees or other obstructions around the antenna.

The configuration of fig. 2 is to be preferred in locations where there are obstructions near the antenna which might attenuate the low angle radiation. In this case the delta is reversed, with the base at the top. Again, the antenna may be constructed entirely of wire and may be supported between two masts or trees. However it is more convenient to use a base consisting of a boom of aluminum tubing which may be supported from the center from a single mast, as shown in fig. 3. The antenna may be rotated by swinging the boom around. A strong lobe of low angle radiation is obtained by feeding the antenna at the vertex, which is at the bottom, an arrangement which is very convenient as the antenna need be lowered only a few feet to make the feed point accessible from the ground and to enable the length to be trimmed to obtain resonance.

This form of the antenna may also be fed with 75 or 52 ohm coaxial cable. If 52 ohm cable is used, minimum s.w.r. may be obtained by inserting a quarter wavelength matching section of 75 ohm twin lead between the loop and the coaxial cable. However this is not essential, as even with direct feed by 52 ohm coaxial cable, the s.w.r. is acceptably low. This antenna is balanced with respect to ground, and it should be connected to the coaxial feeder through a 1 : 1 balun to preserve symmetry and avoid distortion of the radiation pattern.

The writer has tested both configurations, and in his particular location he has found that of fig. 2 to be the better, probably owing to its greater effective height as the center of area and the positions of the current maxima are higher above the ground, and screening from surrounding trees and foliage is reduced. In the fig. 1 configuration, the base of the antenna was below the trees and these caused distortion of the radiation pattern and attenuated the radiation to some extent.

A single element delta loop for operation on 14 and 21 MHz bands, with the base-up configuration, has given better results in both transmission and reception than those obtained with any other single element antenna tested by the writer. The arrangement used at ZL1OI for the 14 and 21 MHz delta loop is shown in fig. 3. The antenna is supported by a 32 foot high water pipe mast. A boom of aluminum tubing 26 feet long forms the top section or base of the delta for 14 MHz, and the two sides are of wire hanging from the ends of the boom to form a V. The delta loop for 21 MHz, made of

Freq. (MHz)	*Base** (ft.)	*Sides* (ft.)	*Match. Sect.†* (ft.)
14.050	26′	22′9″	14′6″
21.100	16′6″	15′6″	9′6″
28.100	12′9″	11′6″	7′3″

*Aluminum tubing telescoping from 1 inch diameter through ¾″ to ⅝″ diameter.
†75 ohm twin lead.

Table I—Dimensions for Delta Loop Antenna

wire, is mounted inside the 14 MHz loop and is supported from it with insulators at the top corners. Either loop may be connected through a coaxial switch to a single 52 ohm coaxial feeder, or each may be connected to its own separate feeder, with a 1 : 1 balun connected between the loop and the feeder, or between the feeder and the end of the twin lead matching section if one is used. The writer has used lighting cable,[1] which is light in weight and flexible, for the V section of the antenna. The delta loop has a relatively broad bandwidth so that quite thin wire may be used without sacrificing bandwidth.

Although a wooden mast rather than a metal one, is probably to be preferred to avoid distorting the directional characteristics of the antenna, the writer has not observed any adverse effects from using a metal mast, probably due to the fact that the antenna is symmetrical with respect to the mast and to the ground.

The dimensions of the antenna elements for operation at the low frequency end of the bands are given in Table I. The tuning of the full wave

[1]In the U.S. this material is ofter referred to as "zip cord."

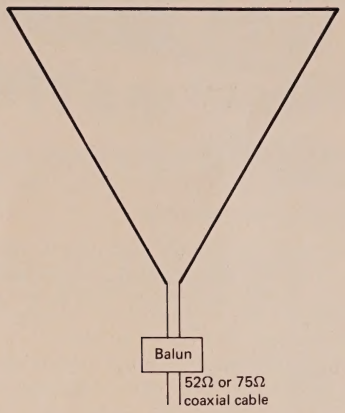


Fig. 2—The Delta loop shown base up.

loop is relatively broad and its approximate length may be calculated from the formula

$$L = \frac{1005}{f}$$

where f is the frequency in MHz and L is the length in feet. The three sides of the delta may be made equal in length, but if it is desired to increase the height of the feed point above the ground, the base of the delta may be made slightly longer than that of the two sides as shown by Table I.

The sides should initially be cut a little longer than that indicated by calculation so that they may be trimmed to resonate at the desired frequency. Resonance may be measured by joining the ends

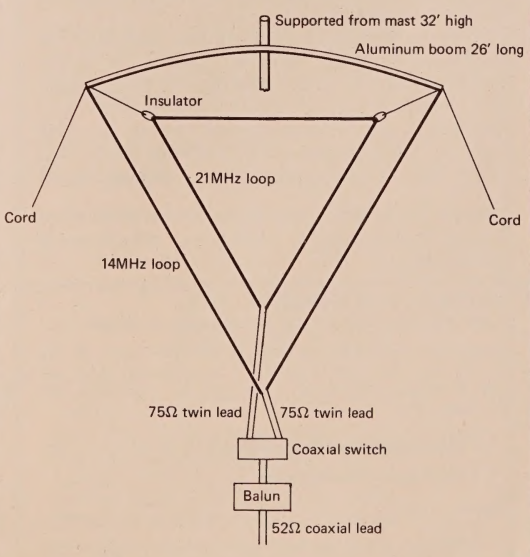


Fig. 3—A 14/21 MHz Delta loop antenna. Dimensions of the loops are shown in Table I. A matching section may be used instead of the 75 ohm twin lead.

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of the loop through a two turn coil which may be coupled to a grid dip oscillator. The length may be finally adjusted to give minimum s.w.r. at the required operating frequency. The s.w.r. may be measured at the transmitter end of the feeder if the length of the feeder is a multiple of half a wavelength. This will ensure that the s.w.r. will be the same as that obtained by measuring it at the antenna end of the feeder.

With such poor conditions prevailing recently on the 28 MHz band, no provision has been made for operating on this band. However the 14 MHz loop will resonate as a 2 loop on 28 MHz. Tests made by the writer show that the antenna loads up well on this frequency but no opportunity has yet arisen to test the antenna properly on this band. If desired, an additional full wave loop for 28 MHz may be mounted inside the 21 MHz loop and fed by a separate feeder as before. Suitable dimensions for this loop are given in Table I. The resonant frequency may be affected slightly by the proximity of the 21 and 28 MHz loops so that the lengths may require slight adjustment.

The delta loop is bidirectional, with a front to side ratio of about 9 db and it should therefore be oriented in the desired direction. Two mutually perpendicular directions are generally satisfactory in practice, and these may be obtained by swinging the boom around by light cords attached to it. At the location of ZL1OI in Auckland, New Zealand, the antenna is oriented to give radiation to the northeast for North America, and to the northwest for Europe.

Good DX results have been obtained on the 14 and 21 MHz bands. Direct comparisons have been made on hundreds of contacts by switching over between the delta loop and a quarter wave vertical ground plane antenna used as a standard. An improvement of 3 to 6 db in signal strength is generally obtained in transmission and reception using the delta loop, the actual gain depending on prevailing propagation conditions which affect the radiation angle and the angle or arrival of the received signals. Results also appear to depend to some extent on the type of antenna used at the distant station.

On reception, background noise from man-made and power line interference is much less than that received on the inherently noisy vertical antenna. The amount of reduction depends on the nature of the interference. It is quite common to find that signals which are unreadable when using the vertical antenna, may be copied with ease with the delta loop. The directional properties of the delta loop are also advantageous in reducing interference from directions other than from that of the desired signal.

(continued on page 68)

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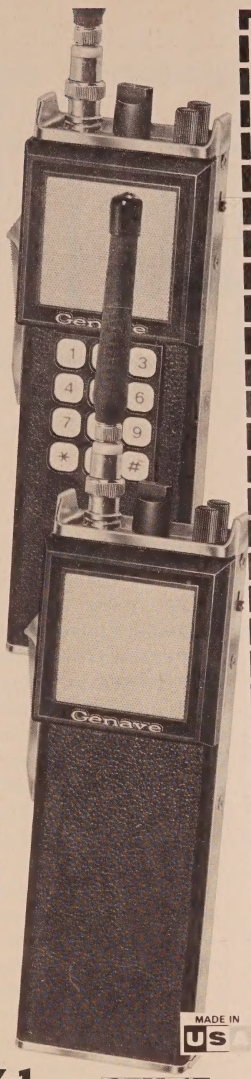
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An Audio Powered Noise Clipper

BY CLAYTON LASTER, W5ZPV

Most of the QRN encountered in the lower h.f. amateur bands (primarily 75 and 40 meters) can be reduced to a minimum level by the use of a transistorized audio powered noise clipper. This simple device, which can be constructed in one evening, will be a valuable addition to any station. Unlike many noise suppression or clipper circuits which involve complex modifications to the average receiver, this "little dude" can be quickly inserted in the speaker circuitry. Also, this noise clipper will be particularly valuable for fone patch operation. It helps to eliminate the useless, annoying interference for unexperienced listeners at the distant end of the patch.

Most of the noise or external interference associated with amateur operation in the 75 m and 40 m bands can be traced to two general categories. The first is of a continuous nature, consisting of overlapping pulses and often designated as "hiss". This type of interference is normally caused by man-made machines such as industrial machinery, short wave diathermy equipment, d.c. and a.c. series wound electric motors, and fluorescent lighting. The second type of interference is that of impulse noise. This normally consists of high energy peaked signals of short duration with some finite time of silence between the signals. Impulse noise may occur on a periodic basis such as interference generated by an auto ignition system or it may be randomly generated. Atmospheric interference falls into this latter category. This is normally the prime source of interference in the 75 m and 40 m bands, especially during night time operation.

The transistorized audio powered noise clipper, shown in fig. 1, is designed to operate in 4 to 8 ohm receiver speaker output circuits. The original circuit which was designed to operate in 600 ohm radio telephony circuits was developed by Mr. Merle Converse, Southwest Research Institute, and Mr. Ray Welty, USAF, Kelly AFB, both in San Antonio, Texas. The author added 600-to-8 ohm line transformers for impedance matching and substituted Motorola HEP transistors for the JAN (militarized) transistors. The use of the 600-to-8

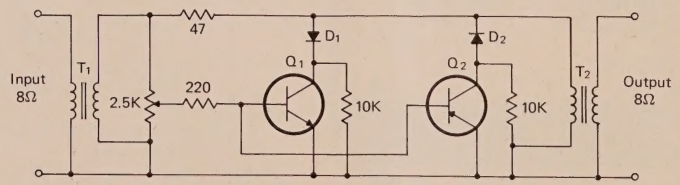


Fig. 1—Schematic for an audio powered transistor noise clipper.

T_1, T_2—600-to-8 ohm transformers (Archer 273-1379 or any transistor radio output transformer with 500-to-4 ohm impedance may be used)
Q_1—2N2222 NPN transistor (HEP 55 or Archer RS-2009)
Q_2—2N2907 PNP transistor (HEP 52 or Archer RS-2023)
D_1, D_2—1N270 signal diode (HEP 134 or 135 may be used)

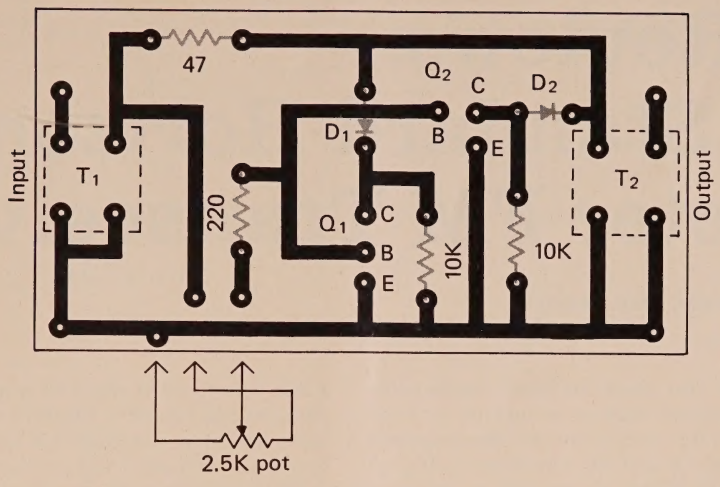


Fig. 2—Printed Circuit Board Layout for Audio Powered Noise Clipper.

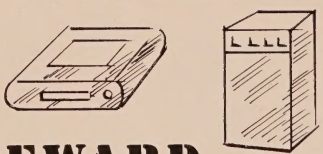
ohm impedance matching transformers provides for two requirements. In order to use this noise clipper in 4 to 8 ohm speaker circuits, an 8-to-600 ohm transformer must be used on the input side and a 600-to-8 ohm transformer must be on the output side. The second need for this change in impedance is that the voltage levels in the 8 ohm circuit may not be high enough to allow the noise clipper to operate effectively. Tests made by the author showed that the voltage clipping level has a minimum level of approximately 1.5 volts, peak-to-peak.

The circuitry in fig. 1 is quite straight forward. Two transistors, powered by the audio power contained within the signal, will short out signal peaks which exceed the threshold established by the 2.5K potentiometer. The diodes are used to isolate the positive and negative clipping circuits represented by the NPN and PNP transistors, respectively. The adjustment of the 2.5K potentiometer is left to the descretion of the user. Normally, a desired audio operating level can be established and the potentiometer needs little or no further adjustment. However, it is to be noted that adjusting the potentiometer to a no clipping level effectively removes both transistors from the circuit and the noise clipper presents very little insertion loss in the speaker audio circuit. If fone patch operation is anticipated, the author recommends that the potentiometer be made convenient for adjustment in order to compensate for widely varying signal conditions.

Fig. 2 shows a suggested layout for a printed circuit card for the noise clipper. However, other amateurs may want to use point-to-point wiring and possibly perf board assembly. Either way will be just as effective. Since the noise clipper operates at audio frequencies, location of the components are not critical. If the fone patch is left connected to the receiver's audio speaker circuitry, the noise clipper can be installed inside the fone patch cabinet or in a small mini-box located adjacent to the fone patch. ■

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CQ Reviews: The Standard Horizon 2 2-Meter FM Transceiver

BY HUGH PAUL, W6POK

Over the past few years Standard Communications has established itself as a supplier of moderately priced v.h.f. equipment to the business, industrial and marine markets. Commensurate with this growth has been the acceptance of Standard products by the amateur fraternity. While the latter group represents a much smaller market, it is one that Standard would logically pursue, since the company's commercial product line lends itself, both in design and price, to amateur use.

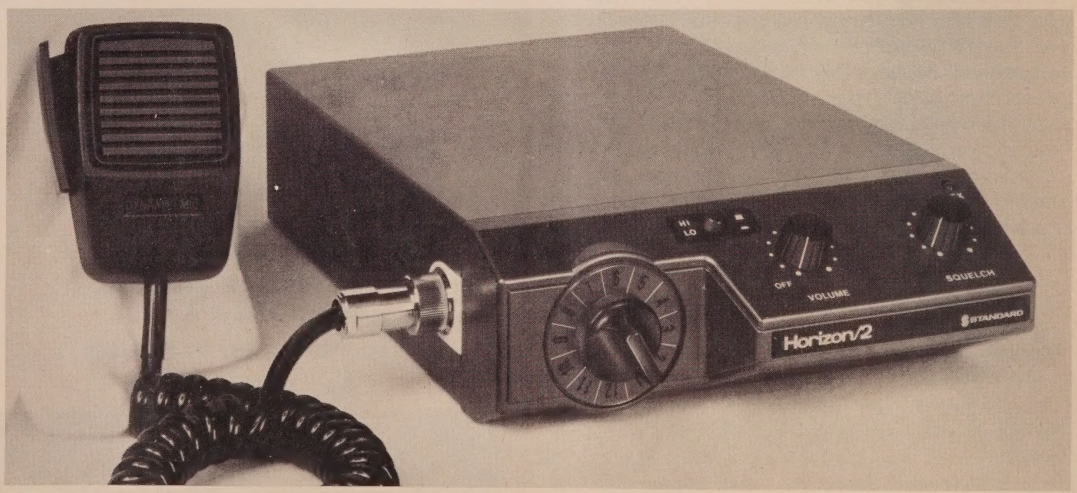
Their current offering, the Horizon 2 is almost identical to the Horizon 25 marine radio-telephone. Measuring 6½ × 2⅜ × 9¾ inches and weighing only four pounds, the Horizon 2 is a unit that will mount in any automobile. With provisions for twelve channels, the unit comes with crystals for three channels and is rated at 25 watts output.

Styling is most attractive and convenient, with volume, squelch and hi-low power switch mounted on the top of a sloping front panel. The speaker measuring 2 × 3 inches is mounted on the bottom of the front panel, thus the sound is directed downward. This could prove to be a negative factor in a noisy mobile situation, however with three watts of audio available, a large 8 ohm external speaker can overcome most any noise problem.

The transceiver is constructed on one large phenolic circuit board, mounted in an aluminum frame. The entire chassis, with the front panel attached, slips into a sturdy sheet metal case.

The unit that was supplied to me for testing, did not include the mobile mounting bracket that is normally part of the Horizon 2 package. I have seen the bracket and can state that it is a cut above the average. The bracket is a sheet metal plate that can be affixed to either the top or bottom of the transceiver. The design is such that there are no exposed nuts that a prospective thief can readily get at without first removing the transceiver from its case and then employing a special wrench to loosen the mounting studs. While the design is not theft proof, it is a deterrent that could well discourage the less professional thief.

The instruction book for the Horizon 2 is good in



The Standard Horizon 2 2-meter transceiver. Two basic controls are on the sloping front panel, volume and squelch.

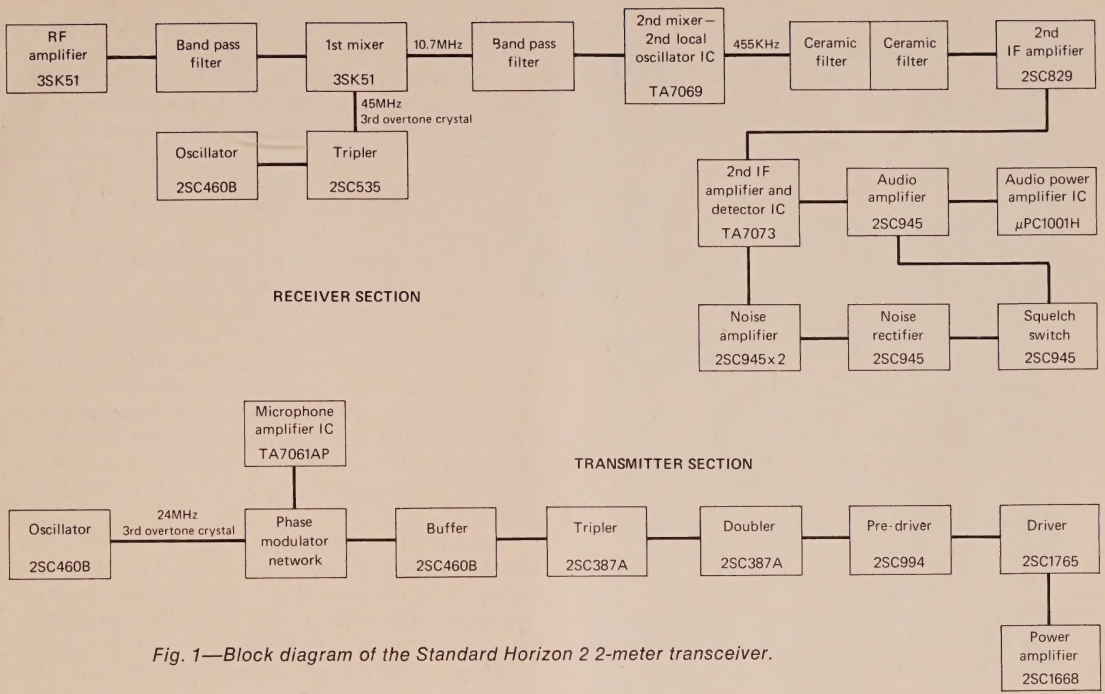


Fig. 1—Block diagram of the Standard Horizon 2 2-meter transceiver.

most respects. It includes a large schematic diagram, complete parts list and alignment data, as well as a print showing the PC board layout. Omitted are a few details, such as the frequency of the second i.f. and the basic information concerning crystal frequencies and specifications.

Standard manufactures their own crystals in their Los Angeles facility. They stated to me, they would not guarantee performance of their equipment, when crystals of other manufacture are used in the Horizon 2. Past experience with other Standard equipment has proven most satisfactory, when using crystals supplied by other manufacturers.

The Receiver

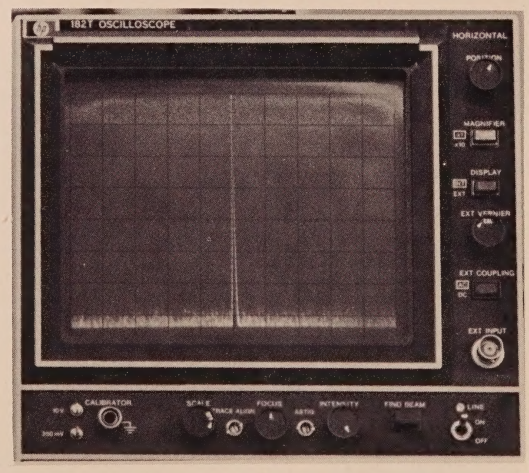
The receiver is a dual conversion type, with a first i.f. of 10.7 MHz and a second i.f. of 455 kHz. The r.f. amplifier and first mixer stages employ the popular 3SK51 MOSFET. An IC serves as both the second mixer and the second local oscillator.

Following one stage of 455 kHz i.f. amplification, another IC serves as an i.f. amplifier and ratio type detector. A third IC functions as the audio frequency power amplifier and provides three watts of audio into an 8 ohm load.

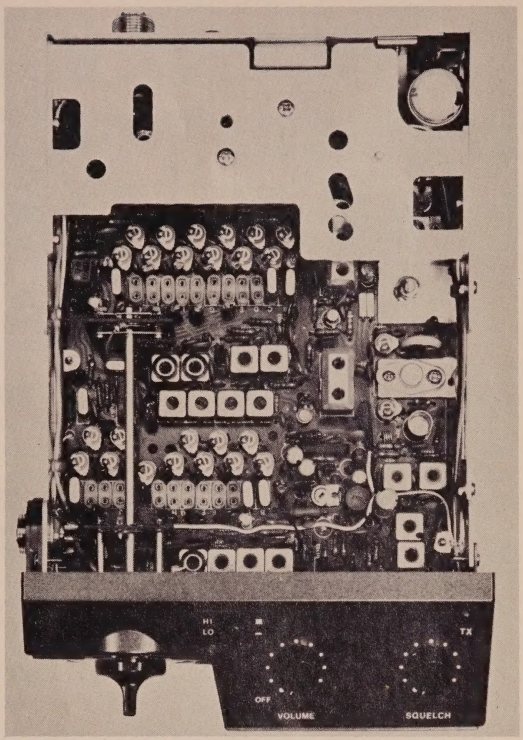
The manufacturer's specifications for receiver selectivity are a bit sketchy, but tests indicated a bandwidth at the −6 db point to be a little over 12 kHz and at the −60 db point it was 26 kHz. These test points were selected to allow comparison with the published specifications of other manufacturers.

Basic selectivity of the receiver is determined by the 10.7 MHz band pass filter, following the 1st mixer and by two 455 kHz ceramic filters in tandem, following the 2nd mixer. The ceramic filters consist of 4 sections each.

There are three tuned circuits proceeding and two following the r.f. amplifier. Overall selectivity is sufficient for most applications. Cross-modulation



The spectrum analysis illustrates a sweep width of 10 MHz per division, and a vertical scale of 10 db per division. All that is noticeable is the carrier, the "grass" below is too far down to be considered.



The transceiver is constructed on one large phenolic circuit board, mounted in an aluminum frame. The entire chassis, with the front panel attached, slips into a sturdy sheet metal case.

and inter-modulation was not a problem, but was experienced at one location, while operating mobile. It was not severe enough to inhibit communication.

Sensitivity of the receiver is excellent. 20 db of quieting was achieved with .28 micro-volts applied. Squelch opened with .14 micro-volts. These figures compare well with published specifications of .5 microvolts maximum for 20 db of quieting and .3 micro-volts maximum to open squelch.

Each crystal position has an individual trimmer capacitor for precise frequency adjustment. Stability is good and well within the claimed .001%.

Standard has included a toroid filter to eliminate alternator whine in the receiver. My car is quite good in this respect anyway, so it was difficult to determine the filters effectiveness in problem cases. No whine whatsoever was experienced while driving at high speed, with the squelch cracked all the way open.

The Transmitter

Frequency stability of the Horizon 2 is rated as plus or minus .001% from −20 degrees C to +50 degrees C. Standard's single channel 890L, business band transceiver employs the same circuit in the transmitter section as the Horizon 2, but its stability is rated at .0005% throughout the same temperature range. I don't know if the difference in stability ratings is due to crystal tolerances, oscillator component tolerances or the fact that the Horizon 2 uses a crystal switching network. I do know that frequency stability of the unit tested was excellent at prevailing ambient room temperature. Drift for the first hour after turn on was less than 200 cycles.

The transmitter is phase modulated, with audio supplied by an IC microphone amplifier. Modulation characteristics could best be described as of good communications quality. Some voices do not sound as natural as they do on other transceivers currently being tested. These units employ direct modulation of the oscillator, which may account for some of the difference. The microphone provided with the unit may also be responsible. Unfortunately, I was pressed for time and did not try any other mikes on the unit.

Some of the advertisements for the Horizon 2 rate the power output at 25 watts. The instruction book rates the power out at 20-25 watts. On the unit tested, power was measured with a Bird thruline wattmeter as 22.7 watts, with 13.5 v.d.c. applied. In the low power position .7 watts was measured. Based on the instruction book, power output was within specification.

Spurious and harmonic attenuation is rated by the manufacturer at better than a −65 db. Spectrum analysis showed the second harmonic was down from the carrier by a −64 db.

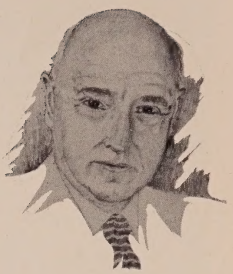
The spectrum analysis photograph printed here, illustrates a sweep width of 10 MHz per division. The vertical scale represents 10 db per division. The reason you don't see anything other than the carrier and some grass is because all spurious is so far down, that for all practical purposes it doesn't exist. Most commendable, the Horizon 2 is among the very best in this respect.

The final r.f. power amplifier transistor (2SC1668) is well heat sinked and protected by a drive control circuit that senses a high v.s.w.r. While the power amplifier can withstand a high v.s.w.r., it cannot tolerate a no load situation for any extended period.

Power supply voltage is not critical. The rig can operate with as little as 11 v.d.c. and as much as 15 v.d.c. Some transceivers on the market are not as tolerant of supply voltage as the Horizon 2. More than one amateur has purchased a new mobile rig, installed it in the car and then wondered why it failed during the first 25 miles of mobile operation. I would recommend that you check the voltage regulator output, when in the charge condition. I have seen some in excess of 16 volts. The vehicles marketed by Chrysler Corporation seem to be the worst offenders. I would also suggest that you let a qualified

(Continued on page 63)

In Focus



BY BILL DEWITT, W2DD

Fast Scan Slow Scan Innovator

The Earlybirds in every field of endeavor generally turn out to be interesting people with a lot of drive, a desire to learn, and having a kind of curiosity that makes them want to try new things—and perhaps contribute to their further development.

Among slow scan's Earlybirds is Warren Weldon, W5DFU, of Tulsa, Okla. It was my good fortune to meet Warren at last year's Hamvention. Because Warren's innovative use of SSTV and his achievement in the design of a monitor and other equipment typify the imaginative approach of those I call Earlybirds to new communications capabilities, "In Focus" brings you a closer look at W5DFU and what he's doing down there in Tulsa-town.

An executive of American Airlines involved in maintenance operations, Warren is a Senior Member of the IEEE, Member of the American National Standards Institute, and a Fellow of the American Society for Non-Destructive Testing. He is the author of numerous articles on airline maintenance, and has addressed groups all over the U.S. on the subjects of airlines electronics and non-destructive testing.

Although Warren says, "I have a 59 year old vacuum-tube mind that is struggling to cope with brand new solid state tricks—" what he's doing with TV proves that he's really right on top of today's technology.

I am going to skip all detailed reference to the r.f. end of W5DFU's station and direct your attention to his unusual combination of slow and fast scan equipment—and what he's doing with it.

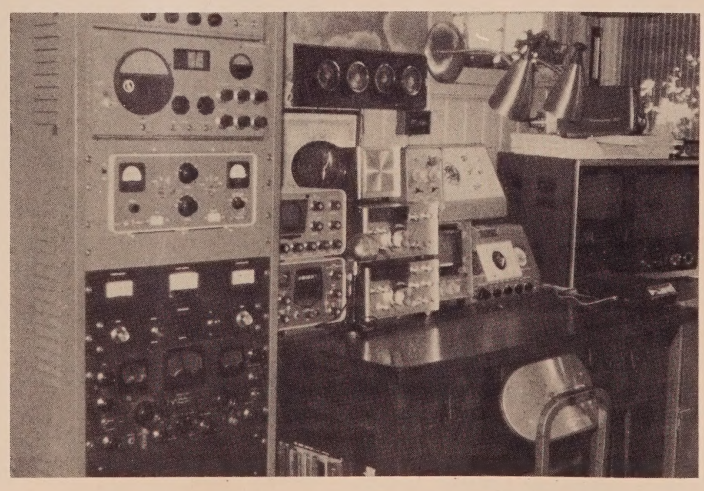
Warren's equipment includes the following: a homebrew W6MXV monitor, W0LMD fast to slow scan converter, two commercial fast scan cameras, a Hitachi Memory Vision TV set with frame grabbing feature, and a (prize winning) W5DFU designed Direct Viewing Storage Tube monitor. An RCA CMU-15 with video modulator is used for 427 MHz transmissions.

But that doesn't quite say it all! Atop a 50 foot tower, Warren has installed a weather-proofed camera with a Zoomar IV lens. (WOW!) The camera is completely remote operated by a telephone dial-joy-stick control (with 8 motors). A Sun sensor prevents the camera from looking into the Sun, and there is even a windshield electric heater and wiper to clear the view during storms!

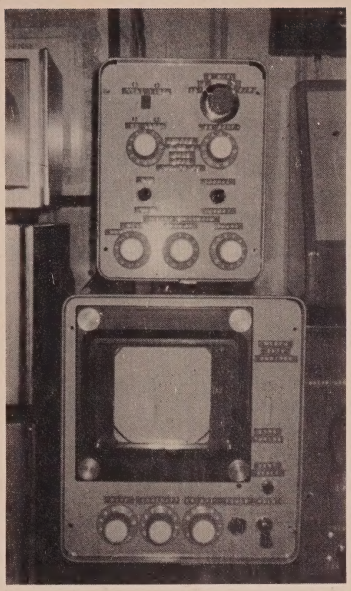
It goes without saying that mounting a 110 pound unit with azimuth and direction control on a tower is in itself somewhat of an achievement. Warren mounted garage door tracks on the tower, built a dolly to run on the tracks, installed a winch to raise the dolly, and provided a "V" block steady-rest at the top to take the load off the winch cable. Now *THERE'S* the true essence of home-



Warren Weldon, W5DFU looks anxious to tackle the flea market.



General view of W5DFU station set up. Note the dual screens of the Hitachi Memory Vision TV set at extreme right.



Front view of direct view storage tube monitor constructed by W5DFU.

brewing!

Why mount a TV camera on a 50 foot tower? Well, as Warren says, "We live right smack in the middle of Tornado Valley. My home is on top of a hill that overlooks the entire city of Tulsa. Some time ago, I reasoned that it would be helpful to the weather bureau if they could see (by TV) the severe storms in this area and compare their TV sightings with a simultaneous radar display. This would be an added link in the storm watch already maintained by a local amateur net with control at the weather station."

Warren has provided the U.S. Weather Information Service people with a TV receiver modified to receive 427 MHz transmissions. In progress pictures of a storm can be transmitted live or frame-frozen on the Hitachi Memory Vision unit for replay. This latter capability is of value because it permits the study of cloud structure during a storm, day or night.

Using an SSTV camera to view the frozen frames on the Hitachi Memory Vision screen, Warren has taped lightning strike scenes. Pictures like the one shown in fig. 8 provide an exciting departure from the mundane "Rig hr—" slow scan exchanges seen too often on the bands.

Neighbors of W5DFU have not accused Warren of "voyeur" tactics, but there have been some good-humored questions about just what he's doing with his "loftie-lookie camera"!

The accompanying photos of Warren's Direct View Storage Tube Monitor belie his comments about a "vacuum-tube mind". The compact design made possible by the use of circuit boards and solid state technology is proof of the careful and effective work that Warren put into this project.

There's just one other item I'd like to mention in this little vignette concerning W5DFU. Warren is a modest fellow and it took a lot of persuasion to get the pictures and personal details included here from him. However, in my opinion, the innovative use of what IS available, the ingenious design and fabrication of what *WAS NOT* available, and the willingness to take part in public service effort, all deserve more than passing recognition.

Warren, you're doing a terrific job. Congratulations, and keep it up!

SSTV Versus Duty Cycle— And All That Stuff

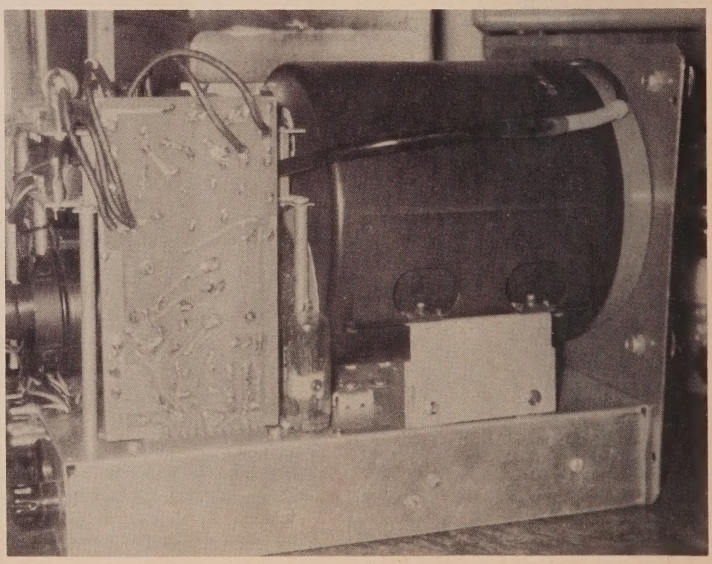
As many slow scanners using transceivers with sweep tube finals have discovered, it pays to think about slow scan's 100 per cent duty cycle before you lean too hard on the gain control. For those just getting into SSTV, it is advisable to check the instruction book for your transceiver/transmitter to see what power is allowable for slow scan transmission. Ratings given for a.m. or RTTY operation are generally applicable to SSTV.

The advent of all solid state transceivers such as the Heath HW/SB 104s or Atlas 210X/215X series raises the same question all over again.

Atlas Radio is quite specific on this point. The instruction book states, "For RTTY/SSTV operation, the input should be controlled for a meter reading of 6.5 amps (for 90 watt input). Heat sink temperature is always the limiting factor on power input, and should be monitored from time to time." Reference is then made to the fact that when the heat sink becomes uncomfortably hot to the touch, the input should be reduced further or the transmissions shortened.

The Heath Company simply does not recommend the use of the HW104 or SB104 for RTTY or SSTV. Since these transceivers do not have an input monitoring ammeter, there is a risk of wiping out the four final amplifier transistors with 100 per cent duty cycle operation at full power. The risk of such a disastrous wipe-out can be eliminated by installing an ammeter in series with the 12 v.d.c. supply and holding the input to about 40 watts.

This power level is sufficient for many contacts and is adequate to drive most present day linears to four or five hundred watts input for more competitive operation. If you have any suggestions related to the



Left side view of W5DFU monitor.

use of solid state finals, or power limiting to prevent the problem described, please drop me a line.

Sampledot Revisited

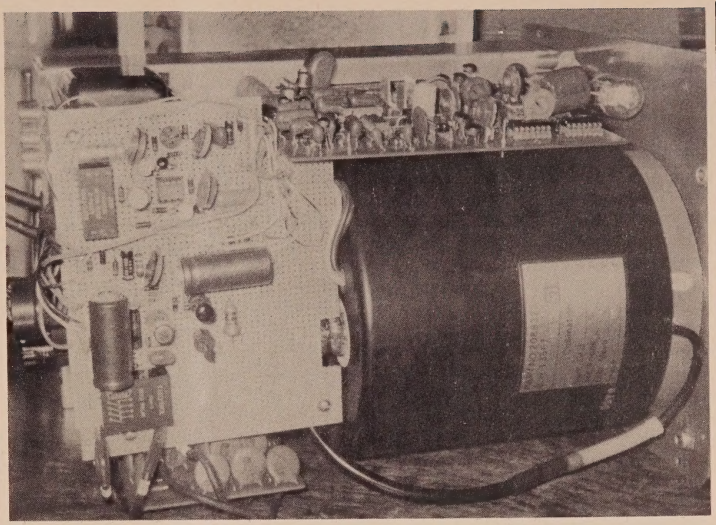
The Sampledot system of narrow band TV described by Bob Stone, W3EFG, at the Dayton Hamvention offers exciting possibilities for ham use. (See *CQ*, Feb. '76) The commercial TV application of Dr. Stone's invention in somewhat greater but still sub-standard bandwidths is the subject of favorable comment in a thought provoking article by Raymond Wilmotte in the February issue of the IEEE *Spectrum Magazine.* Mr. Wilmotte's article, called "TV look ahead", points out the fact that the bandwidth required for television can be drastically reduced while picture quality remains good. He cites W3-EFG's *Sampledot* system as a practical example of a system using less than normal bandwidth that produces good quality and is compatible with NTSC standards.

Mr. Wilmotte's article is a comprehensive one dealing with the needs and probable innovative changes in television. If you are not a *Spectrum* subscriber, I strongly recommend that you beg, borrow, or steal a copy and read it. Thanks to Paul Adler, WA2ITK for bringing this article to my attention.

New On The Scene

Raytheon Semiconductor has recently announced a new IC that sounds like the best thing to come along since sliced bread. Carrying the designation 4151, this new Raytheon device can be used as *either* a voltage-to-frequency or frequency-to-voltage converter. (Simple voltmeter type read-out of SSTV f.m. swing?)

The 4151 should be of special interest to design types because of its applicability to microprocessor interfacing and analog to digital conversion.



Top view of W5DFU monitor.

You can get more details on this interesting chip and its application by writing to Raytheon Semiconductor 350 Ellis St., Mountain View, CA. 94040. *Popular Electronics* has a fine write up on the 4151 under Lou Garner's Solid State column in the April issue. It includes some diagrams, so don't miss it.

Back To Basics

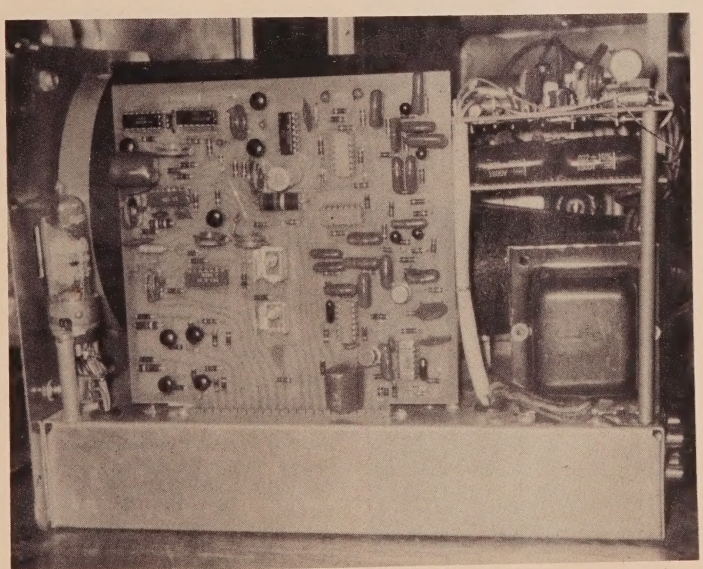
With all the excitement over scan conversion, microprocessors, UARTs, etc., it sometimes seems that some of the fundamentals get overlooked. For instance, you get better picture quality if your camera is adjusted correctly.

Compensatory adjustments between the camera and monitor sometimes make it difficult to determine whether you are really getting the frequency swing that you should out of a camera subject displaying a good brightness range. So, what should you do about it?

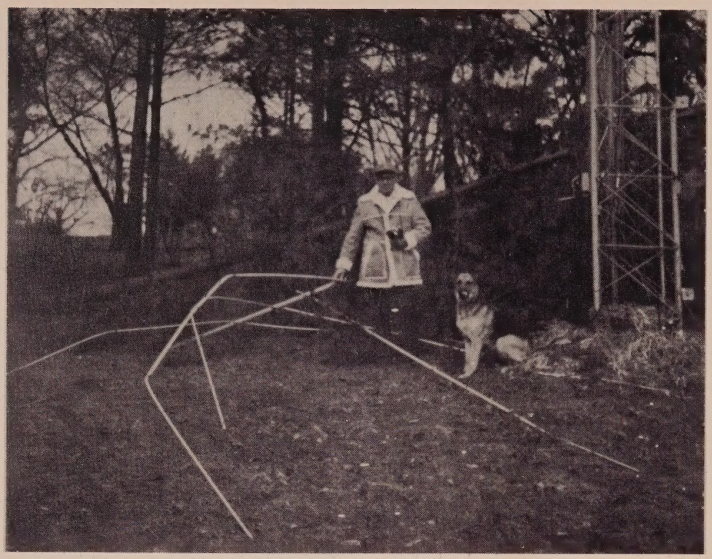
Nick Stavrou, W4TB, one of SSTV's real pioneers down in North Carolina designed a video analyzer to be used in conjunction with your scope that can be of great value in checking either your camera performance or the characteristics of received signals.

Nick's design is a simple one. All you need is a couple of tuned toroids and a resistor.

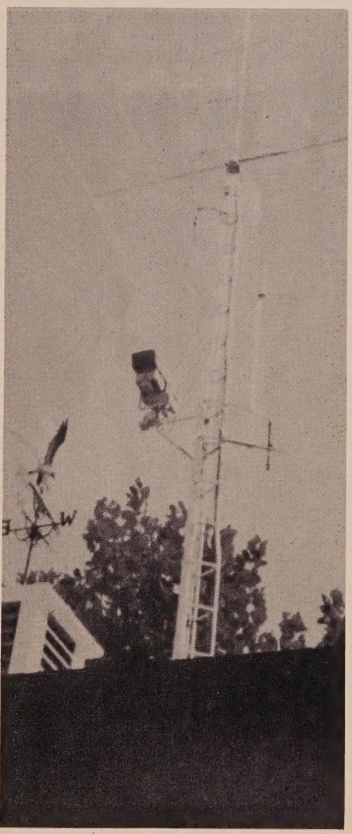
The photo with the "Christmas tree on its side" pattern shows how a Robot Gray Scale Tape can appear on your scope. By establishing frequency calibration marks for the 1200 to 2300 Hz. range you can



Right side view of W5DFU monitor.



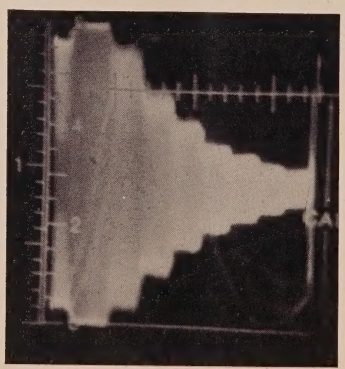
A tired and disconsolate W2DD inspects ice-storm damage with German Shepherd friend.



Remote operated fast scan camera used by W5DFU for weather watch project.



Lightning strike picture "frame-grabbed" from weather watch camera and converted to slow scan video as described in text.



Video analyzer scope pattern generated with gray scale tape. White is at the right.

quickly estimate the swing of any video.

As seen on my scope, the horizontal sync pulse and blacks are at the left of the screen with a height of about two inches, while the whites are about one-quarter inch high at the right.

Don't forget that not every picture has true blacks and whites when making your contrast and brightness adjustments. For example, black and white printed material should yield a swing close to the 1500/2300 Hz. range. However, color photos or black and white portraits may produce a narrower range of frequencies no matter what you do. You do *not* need to swing the full range to produce a good picture, but generally speaking, the greater the range, the better the picture.

Using this video analyzer can become addictive because it is not only helpful in adjusting your camera, but also becomes a great tuning aid on reception. The horizontal sync pulse becomes very evident when you hit the correct tuning point.

If you are interested in building this simple but effective gadget, send me an SASE for the details.

Mother Nature Wins Again!

Early March brought disaster to a large part of the U.S. in the form of severe icestorms.

Although I am sure that many were plagued with greater problems, the sight of my mighty Telrex broken in half and converted to Paul Bunyan style spaghetti did tear me up a bit.

It's not too evident in the accompanying picture, but a 35 foot pine fell very close to my tower, taking out a few guy wires on the way.

Rounding out the two days of general misery, lack of power, hand-pumping water, and complete frustration, yours truly hauled brush, sawed limbs, and groaned over the anticipated bill from the tree surgeons (3 men, two trucks, and a "bucket").

I kept thinking of that old Lucky Strike commercial, "Nature in the raw is seldom mild!" True, very true. Last Summer it was a lightning strike, what next?

Letters, Pictures, Feedback

Just because Summer's coming on, don't forget to write to W2DD at the same old address: 2112 Turk Hill Road, Fairport, N.Y. 14450. What YOU are doing IS of interest to others, so keep those pix and letters coming PLEASE. 73, Bill, W2DD

ceeds to the minimum position that gives maximum transmitter input/output. Also some older (and new) transmitters do not have tune-operate switches or an output load control. The amplifier tuning of transmitters without loading controls consists simply of adjusting them for maximum deflection of the relative power output meter.

Modifications

In addition to 50-90 watt c.w. transmitters, hamfest flea markets abound with 150 to 300 watt c.w.-a.m. Phone transmitters such as Johnson Viking I's and II's, and Valiants; Heath DX-100's; Collins 32V1's, 32V2's, and many others. Their a.m. phone capabilities are of limited usefulness; so their audio frequency components can be bypassed or removed entirely. Their power input can be reduced to the Novice 75-watt limit by advancing their amplifier bias controls to reduce their idling current close to zero and retarding their excitation controls to hold down input. Inserting a 25,000-ohm resistor in the amplifier screen-grid, d.c. lead or removing the d.c. voltage from the screen terminal of one of the tubes when two or more are operated in parallel will also reduce input power without sacrificing appreciable efficiency. Just unplugging one of the tubes may make the remaining amplifier tubes operate unstably.

Some older equipments use tubes that are now unobtainable or prohibitive in price. One solution to the problem is to consult a tube manual or the *Handbook* for a newer tube with similar characteristics and change tube sockets to fit. The 6146 is a general replacement for the 807, 1625, TV sweep tubes and similar tubes used as output amplifiers in so many low and medium-power amateur transmitters. In fact, the 6146B can be substituted for the irreplacable 4D32 tube used in Johnson Viking I and Collins 32V1 transmitters by changing the tube socket and limiting the 6146B plate current to 150 milliamperes.

Vacuum-tube rectifiers may also be replaced with solid-state rectifiers for less voltage drop and cooler operation. But proceed with care or a sudden power surge may destroy the new rectifier in a blink of the eye. The peak reverse (inverse) voltage (PRV or PIV) across the rectifiers in a full-wave, centertapped circuit is 1.57 times the total transformer secondary voltage; and sudden voltages surges may double its value momentarily. Consequently, a power supply delivering 500 to 600 volts at a current up to several hundred milliamperes, d.c., calls for solid-state rectifiers with a 3000-volt PRV or greater rating and an ample current rating. Fortunately, 600 to 1000-volt, 1-ampere diodes are available from several *CQ* advertisers at economical prices. Connect two strings of three or more of them in series, cathode *(bar)* to anode *(arrow)*, and connect the strings between the plate pins and one filament pin of the base of a discarded rectifier tube, with the cathode end of the strings going to the filament pin. The diodes may be mounted on a piece of "perf board" cemented into the tube base. An 0.01-uf., 600-to-1000-volt capacitor and a 470K, 1-watt resistor across each diode will give added surge protection to the rectifiers.



John, WN8RFH, and Tom, WB8RUO, Taylor, Cincinnati, Ohio, with a mixture of their own equipment and of the High School Amateur Radio Club. John operates mostly from the club station, but Tom has worked all states and is approaching 100 countries at home.

News And Views

The Federal Communications Commission's experimental program of allowing Civil Service personnel to conduct Radio Amateur examinations in local Civil Service offices has now been made permanent. When you are ready for your General or higher class exam and it is not convenient to appear at a regular FCC office to take the exam, write to nearest FCC office for information about other locations where you may appear for the examination. The mystery of why the FCC was not issuing "WC" calls when available calls beginning with the WB prefix ran out in densely populated call areas has apparently been explained by the release of the new regulations for the Radio Amateur Civil Emergency Service (RACES). RACES stations licensed to Civil Defense headquarters will have call signs beginning with the WC prefix.

Dave Brittain, WN7BHO, P.O. Box 622, Carson City, Nevada, 89701, has organized the "Over Forty Novice Club" with the announced purpose "to offer camaraderie of those Novices trying for their General in

(Continued on page 75)

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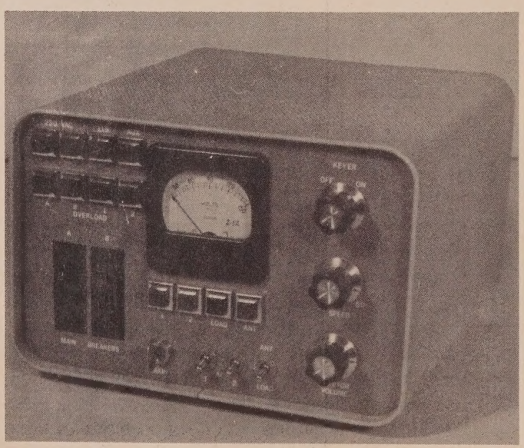
AN A.C. CONTROL CENTER FOR YOUR STATION

BY ROBERT A. SULLIVAN, WØYVA/4

A common problem in the ham shack is the a.c. interconnection and control of all pieces of equipment without the need for operating a number of switches for on-off control. Furthermore, the resulting "rats-nest" of a.c. lines behind the equipment can be dangerous. To eliminate the above problems an a.c. control center was developed. In this development the following features were deemed necessary:

1. The control center should match existing equipment in my case; Heathkit.

2. A single key-locking type switch should control all a.c. power to the station. This will serve two purposes. First, in an emergency all power can be removed quickly and, second, unauthorized persons will not be able to operate the equipment.



The author's a.c. control center. The cabinet and knobs were purchased from Heathkit to match his existing Heathkit equipment. Complete control details are given in the text.

3. Resetable circuit breakers should be provided on the front panel and a visual means for detecting fuse failure or circuit breaker tripping shall be provided. This would allow quick trouble shooting when time is at a premium. (For example, during a contest).

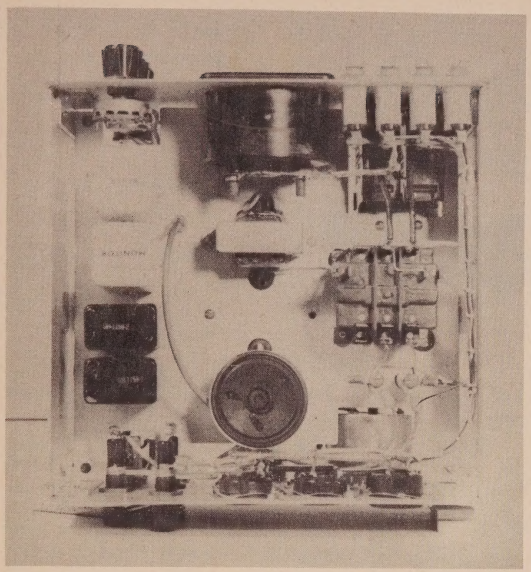
4. For convenience a front panel switch to select either antenna or dummy load.

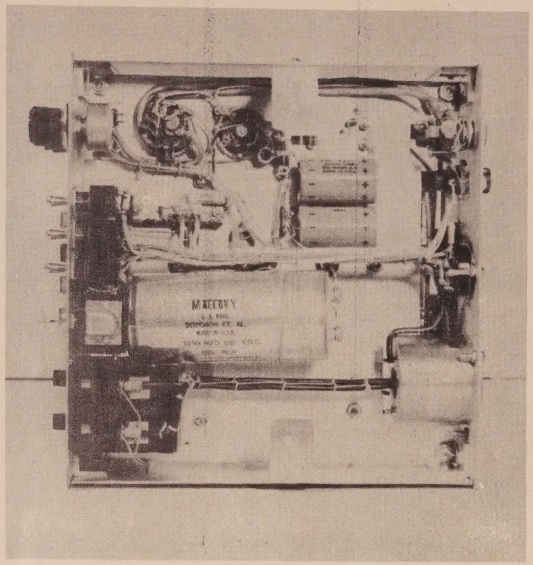
5. It was decided to build an electronic keyer and keying monitor into the unit. This was desirable since the keyer as a small separate enclosure seemed always to be in the way and besides . . . there was some extra room in the enclosure used.

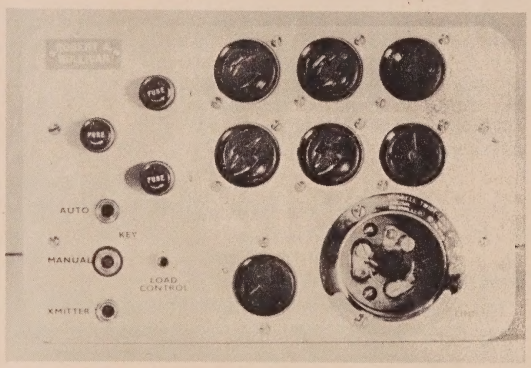
The photo shows the result of the final design. The enclosure and three knobs were purchased from Heathkit, Benton Harbor, Michigan. Other material sources and details on finishing will be described later. The four indicating lamps in the upper left corner indicate the presence of input power, both 230 and 115 v.a.c. Directly below these are four additional lamps to indicate tripped breakers and blown fuses. (In a later modification the lamp labeled "AUX" was changed to a red lens and placed across F^3. This change is reflected in the schematic and parts list.) The two main circuit breakers are in the lower left. The meter reads a.c. line voltage. Along the bottom center, from left to right, is the key type main switch, 115 v.a.c. control switches (circuits 1 and 2), and the *Antenna—Dummy Load* switch. The lamps below the meter are for 115 v.a.c. circuits (1 and 2) and to indicate the position of the *Antenna—Dummy Load* switch. Along the right side are the controls for the electronic keyer and monitor. Top to bottom: Keyer on-off, keyer speed, and monitor volume.

Construction

The unit is built of $\frac{3}{32}$" sheet aluminum and $\frac{3}{4} \times \frac{3}{4}$







The top view (above) shows the keyer and monitor plug-in units in the upper left corner. Directly below are the power supply filter reactors. The circuit breakers can be seen in the upper right directly below the indicator lamps. Below the breakers is K1. The speaker for the monitor is seen at the lower center. In the bottom view (upper right), the large capacitor is the power supply filter for the keyer described in the text. Circuit breakers are to the lower left. Note the extensive use of by-pass capacitors at the octal socket for the keyer. The rear view (lower right) is neatly laid out with components marked and easily accessible.

× 1/8" aluminum angle. The sheet aluminum is available in most any sheet metal shop and the angle is Reynolds do-it-yourself available in most hardware stores. To prevent screw heads showing on the front panel, supporting aluminum angle is epoxied to the rear of the front panel. Most other details of mechanical construction are evident in the photographs. The meter hole and rectangular cutouts for the breakers are easily made with the use of a "Nibbler" tool. The front panel is finished in the following manner: First the panel should be completely drilled and tested for fit with all components. Be sure the panel fits into the cabinet. Carefully remove all scratches by sanding with emery paper followed by medium grade steel wool. Finally wash the panel with a household cleanser such as "Comet" and dry completely. Spray the panel with *one* coat of green hammertone paint. I used Plasti-Kote No. 214 and achieved a green very close to that on the front panels of my Heathkit equipment. For that "professional" appearance, the remainder of the aluminum used in construction is etched: Drill and clean all pieces to be etched as described above. Immerse the pieces in a solution of lye and water. Use about ½ cup of lye per gallon of water in a plastic container. **Be sure to follow the safety precautions on the can of lye.** Etching should be complete in approximately ½ hour. (The exact time must be found by experiment and is a function of the lye solution and the temperature of the water). After removing the aluminum from the solution, you will find the aluminum has turned dark black. This residue can be washed away under the cold water tap and wiping with a cloth soaked in household vinegar. Finally wash the aluminum with a mild soap and dry. The aluminum will have taken on a pleasing satin-like finish. (For additional information on aluminum finishing see the excellent article by W3KOC in *QST* for October 1967). As a final touch the front and rear panels should be decaled. The dry transfer type are the easiest to use. Carefully apply the de-

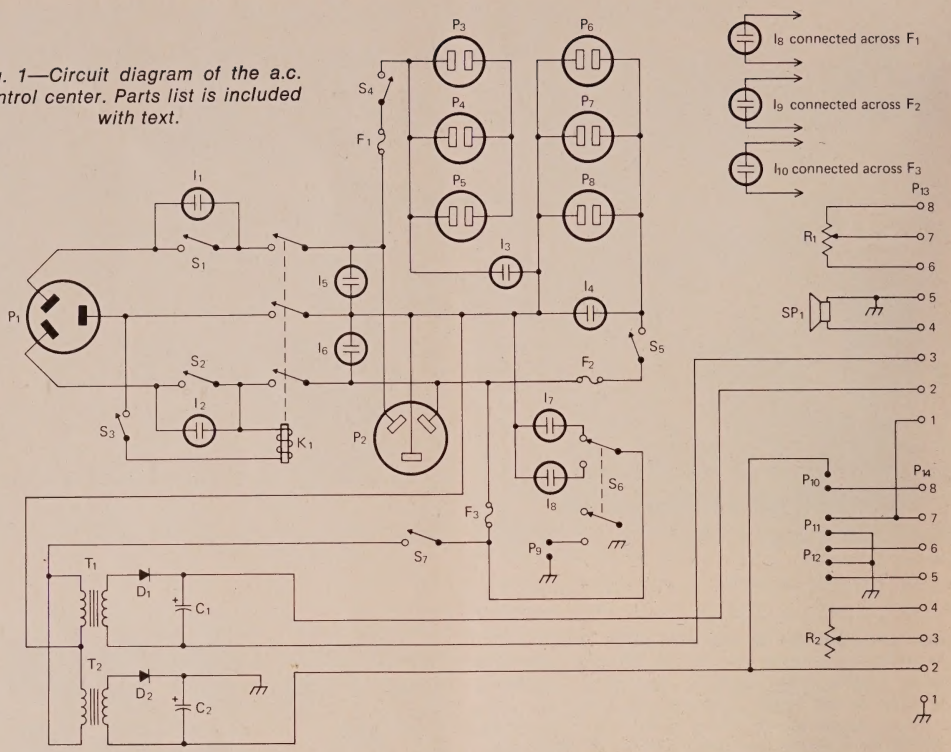


Fig. 1—Circuit diagram of the a.c. control center. Parts list is included with text.

sired markings and spray the panels with clear Krylon to protect the decals.

Circuit Details

Fig. 1 and 2 form a complete schematic. It is straightforward and does not require much in the way of explanation. A single 230 v.a.c. output and two 115 v.a.c. circuits are provided. Each 115 v.a.c. circuit is separately fused. No special wiring precautions need be taken except in the case of the Digi-Keyer. The keyer and monitor are built into separate octal plug-in modules. I found the keyer very susceptable to r.f. pickup and it was necessary to use shielded wiring for all external leads. Each lead was bypassed at each end with .001 uf disc ceramic capacitors (These capacitors are not shown on the schematic or parts list). The two small power supplies are for the keyer and monitor. A single power supply could be used of course but I used on-hand surplus transformers. Be sure to use at least the size capacitor listed in the parts list for C2. Smaller values caused erratic operation of the keyer with the trans-

(Continued on page 69)

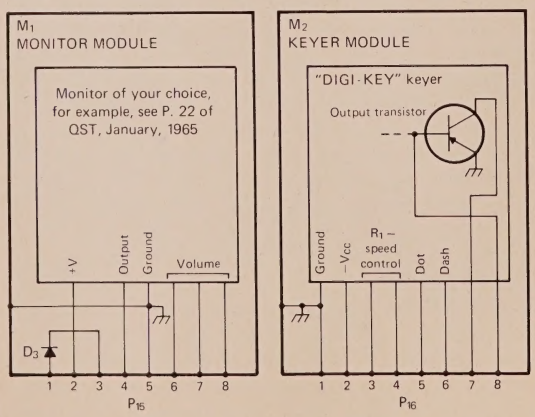


Fig. 2—The keyer and monitor are built into separate plug-in modules.

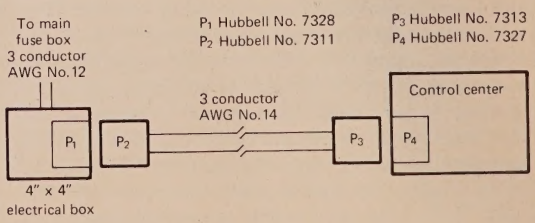
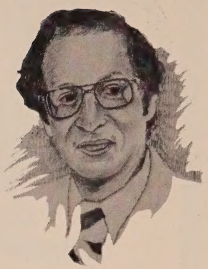


Fig. 3—Basic connections between main fuse box and the a.c. control center.

Math's Notes



BY IRWIN MATH, WA2NDM

Applying And Using Panel Meters

Although every experimenter should have at least one v.o.m. or similar meter at his disposal for measuring the various electrical parameters encountered in general experimenting, special meters are often required. This is especially true in homebrew projects where meters on hand are often used for measuring all sorts of voltages or currents.

In an attempt to help those wishing to put their "junk-box meters" into use, we will attempt to solve some of your panel meter-related problems this month.

Before using a meter however, there are two basic parameters that must be known about it. First of these is the full scale sensitivity in either volts or amperes and the other is the internal resistance.

In order to determine these parameters we must first check to be sure that we are measuring only the basic movement. Meters that were employed as voltmeters will have a multiplier resistor connected within the meter case between one side of the movement and an external terminal, ammeters will have a shunt resistor connected, within the meter case, across the two external terminals. Milliammeters and microammeters will not have any of those and the movement will be connected to the outside terminals. Depending on the type of meter you have on hand, the internal resistors must first be removed and the actual movement be connected directly to the outside terminals. Do this step with extreme caution and care. You can easily damage the meter beyond repair if you slip. Most reasonably careful adept people can do the job with little problems however—so don't be unduly dismayed.

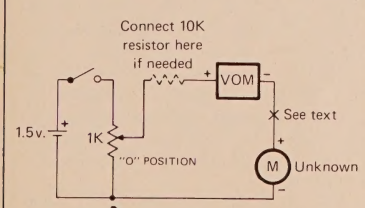


Fig. 1—The test setup for determining the internal resistance of an unknown meter.

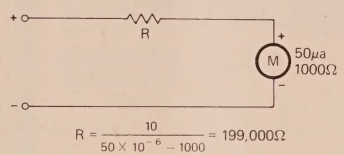


Fig. 2—A 0-10 volt meter made from a 50 ua movement as per the procedure in the text. R may be made up of a fixed resistor and potentiometer for an exact 0-10 volt range.

Basic Parameter Determination

Now, once you have the basic movement connected, proceed to the test hookup of fig. 1. Set your v.o.m. to its most sensitive range, set the 1K pot to zero, and close the switch. *Slowly* turn the 1K pot until the unknown meter just reads full scale. Read the value of the unknown meter's full scale current sensitivity on your v.o.m. If the unknown meter "pegs" over full scale with the slightest movement of the 1K pot, connect a 10K resistor as shown in the schematic and repeat. If the unknown meter will not reach full scale even at maximum output from the 1K pot, increase the battery voltage until you can get at least a half scale detection. Similarly, if the v.o.m. "pegs" switch to a less sensitive range.

Once the current sensitivity is known the internal resistance can be obtained by simply setting the 1K pot for exactly full scale detection of the unknown meter and inserting resistance, in the form of another potentiometer or fixed resistors at the "X" in the schematic until the meter reads exactly half scale. The value of the inserted resistance is equal to the value of the meters internal resistance. This value can be anywhere from a few ohms or so to several hundred ohms. Under no circumstances should you use an ohmmeter to find the internal resistance of a meter, you can easily damage a sensitive movement by this method.

At this point, you should have a good idea of what your "junk-box" meter actually is. If you are using a "store bought" meter, you should be certain you know its sensitivity and internal resistance also for the rest of the calculations will require these parameters.

D.C. Voltmeters

To make a voltmeter, we must take our basic movement and add an external multiplier resistor. The value of this multiplier resistor is calculated by dividing the full scale voltage desired by the current sensitivity of the meter and subtracting the internal resistance of the meter. Or, in algebra, simply:

$$R \text{ multiplier} = \frac{V \text{ full scale desired}}{i \text{ meter}} - R \text{ internal}$$

Fig. 2 shows a typical example of a 50 microampere meter being hooked up as a 0-10 volt voltmeter.

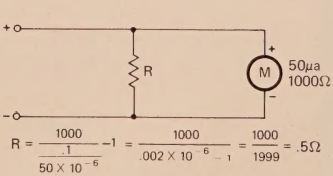


Fig. 3—Milliammeter example given in the text. Use copper wire to make up the .5 ohm resistor.

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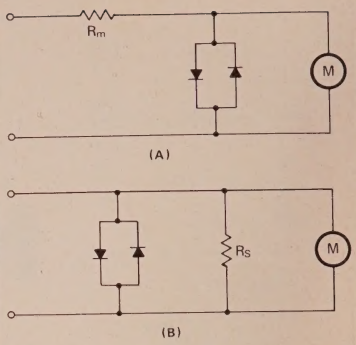


Fig. 4—How to use diodes to protect meter movements from severe overloads.

The power dissipated by the multiplier may also be determined by the following formula:

$$Pm = (i\ meter)^2\ R\ multiplier.$$

When building voltmeters, bear in mind that the more sensitive the basic movement, the higher the value of multiplier resistor required and the less current drawn from the circuit being measured therefore the lower the loading of the circuit. Whenever possible therefore, use movements of 1 milliampere or less for voltmeter fabrication.

D.C. Ammeters And Milliammeters

When it is desired to make an ammeter or milliammeter of a specific value, a shunt resistor must be connected across the movement to "shunt" the additional current away from the movement. Since we know the value of internal resistance of the meter and its current sensitivity, we can easily determine the shunt resistor's value by the following expression:

$$Rs = \frac{R\ internal}{\frac{current\ desired}{i\ meter} - 1}$$

(calculate current desired/ i meter first)

The value of shunts will usually be from a few ohms to fractions of an ohm. Since measuring values this low usually cause problems, a convenient way to make shunts is to consult a wire table giving resistances of copper wire by gauge, and then cutting off a length equal to the resistance required. The accuracy of this method can then be checked by hooking a v.o.m. (appropriately set) in series with the meter and causing known current to pass through the combination.

Fig. 3 is an example of a 50uA

(Continued on page 77)



ADRIAN WEISS, K8EEG, ON

QRP

Getting The Thing To Work: Part IV

The gain and selectivity of an amplifier stage can depend on both the electrical value of the components and their positions on a p.c. board. In dealing with the minor and major current loops, the experimenter should bear in mind that several problems can arise because of the physical layout of components forming these loops.

1.) **Unwanted Resonances.** Unwanted resonances on frequencies other than the operating frequency can be caused by ignoring the point made in an earlier section of this series, namely, that components and their leads can form tuned circuits which will oscillate or amplify on unwanted frequencies. A transistor is unselective as to which frequencies it will amplify or upon which it will oscillate. In fact, a transistor is capable of performing both functions at the same time on any number of frequencies. Selectivity depends entirely upon the circuit into which a transistor is inserted. Also, the transistor itself consists of internal elements which, when voltage and current is applied, function as resistive and capacitive (or inductive) components and effect the operation of the transistor in the circuit. The Hybrid-Pi transistor model (see fig. 1) is an attempt to schematically represent those various "internal" components of the transistor itself. Simplified design formulas for interstage and output matching networks (such as that shown on p. 26 of the January, 1976 issue) ignore these internal components, but the expanded formulas do take them into account (especially the base-emitter and the output capacitance) and they are significant in circuit operation.

In practice, for example, an inductive component, such as a small r.f. choke inserted between base and ground and used to complete the

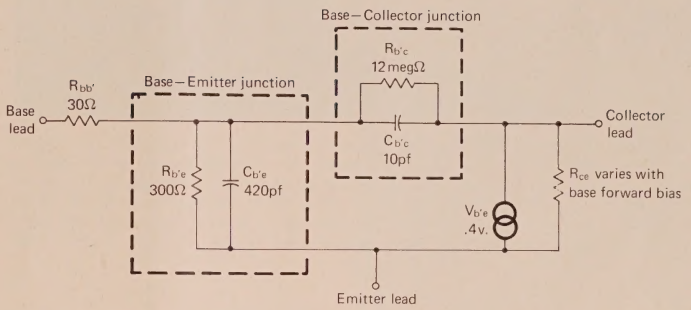


Fig. 1—A simplified Hybrid-Pi transistor model. Values shown for typical 2N2102 triple-difused planar transistor are taken from the RCA Power Transistor Manual.

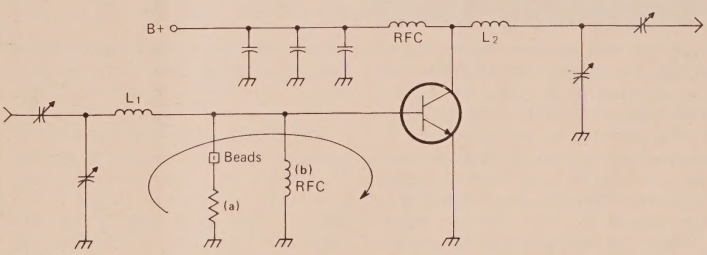


Fig. 2—A d.c. minor current loop completion in an amplifier circuit utilizing an input machine network.

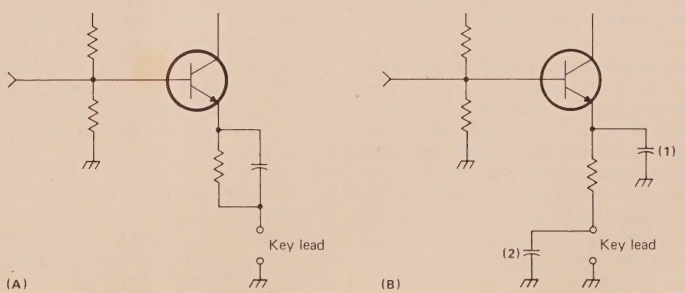


Fig. 3—(A) Typical predriver keying method. (B) Correct method.



The QRPp position at W4AWS. The Argo and linear (left, partially shown), topped by a Z-L network universal antenna transmatch. The receiver section of the HW-7 is helped by Art's homebrew preselector sitting on the HW-7. Art was the southernmost check-in (except for a KP4) on the 80 meter QRPp Net during the winter-spring of 1974-75. He used a 40 meter dipole fed thru the L-network transmatch with good results. He had severe static problems most of the time, but managed to copy many of us.

d.c./minor current loop, may resonate with the base-emitter capacitance to produce oscillations in the h.f. and v.h.f. regions. Some experiments performed by this writer during leisure time showed some interesting results in this respect. Various sizes of inductances were placed across the input of an amplifier that was functioning properly on the desired frequency. With some finagling, it was possible to get the stage to oscillate on its own as well as continue amplifying the desired signal frequency. The self-oscillation power was added to the desired signal power in increased output. Of course, the parasitic signal spread hash out over the h.f. spectrum, as well as on the desired signal frequency. In short, the experimenter should be aware of the above factors with respect to unwanted resonances in both minor and major r.f. current loops.

A preliminary method of checking for unwanted resonances is to couple a grid-dip oscillator into each loop and scan the HF and VHF regions for an indication of unwanted resonances. Once the stage is in operation, a wavemeter and receiver can be used to check for the presence of harmonics and parasitics that may be traceable to unwanted resonances.

2.) **Unwanted Coupling Effects.** Unwanted coupling between the input and output of a single stage, or between successive stages of an amplifier chain, can occur because of the physical layout of components as well as lack of adequate shielding and improper matching network tuning and design.

When the unwanted coupling takes the form of a feedback loop, the condition for self-oscillation exists (analogous to the "tickler" winding in the old regenerative detector in terms of function). In this case, the r.f. energy generated at the output of a stage or series of stages is fed back to the input side either via leads and components or radiation, and excites the stage independent of driving power source. The stage "takes off" on its own and continues putting out r.f. energy even when drive power is removed from the input. This usually is a "snowballing" process in which the transistor is very quickly driven beyond its dissipation rating and burns out. Whenever this phenomenon is encountered (*i.e.,* r.f. output continues after drive power is removed), the B+ must be immediately removed from the stage in order to turn it off. Then checking for and debugging of the feedback loop can proceed.

Feedby occurs when r.f. energy from one stage makes its way to the output of a succeeding stage and appears in the output of that stage by following a path other than through the transistor itself (the drive power applied to the base of a transistor will normally add to the output of the transistor). While this coupling effect is usually not significant when all stages in an amplifier chain operate on the same frequency and are all clean with respect to harmonics and parasitics, it can be a problem in a transmitter which utilizes a frequency multiplication scheme, or which is generating harmonics or parasitics in an earlier stage of the chain. Quite frequently, a combination of feedby, inadequate shielding, and improperly designed/tuned matching networks, results in the presence of a strong fundamental signal and intermediate harmonics in the output of a transmitter utilizing the frequency multiplication scheme. If proper attention to layout, network design and tuning, and shielding, fails to eliminate the unwanted signals, about the only solution is a bandpass filter which can be inserted either at the offending stage, or in the output.

3.) **Minor Current Loop.** The minor current loop consists of the components which complete the base-emitter circuit of a transistor. Both r.f. and d.c. currents may utilize the same component path, as is the case with fig. 1 in last month's column, or separate paths may be necessary if a matching network (as shown in fig. 2) which provides only an r.f. path is used. In this case, the component or components which complete the d.c. current path should not interfere with the operation of the r.f. circuit, *i.e.,* should not present a path to ground for r.f. current.

For example, fig. 2 shows alternate methods of providing d.c. bias and/or a d.c. current path in the form of a resistor and r.f. choke—usually only one is necessary. The base resistor should be isolated from the base r.f. circuit through the use of an r.f. choke of appropriate size, or a few ferrite beads (chosen for high impedance at operating frequency) may suffice. Otherwise, the r.f. drive power will see two loads—the base-emitter impedance of the transistor, and the base resistor — and drive power will be shunted to ground proportionately. In Class A stages, where the base-to-ground resistor (which provides d.c. bias in combination with a base-to-B+ resistor) is usually on the order of kilohms, the above effect can be discounted because of the relative size of the resistor.

With respect to board layout, the

(Continued on page 73)



WILLIAM I. ORR, W6SAI, ON

Antennas

Pendergast pushed the headphones up on his head, leaned back in his pink velvet operating chair and placed his feet on the artificial marble top of his operating table. He looked at me with a grim smile.

"Conditions are really bad these past few weeks", he groaned. "They are *so* bad I can't even hear the crystal calibrator in my receiver".

"Anybody can work DX when conditions are good, and bad conditions separate the men from the boys. Plenty of fellows are working plenty of DX. Don't let bad conditions get you down", I said.

Pendergast sighed. "Well, George Jacobs, W3ASK, in his propagation column in *CQ* is making noises about the bottom of the cycle being reached early this fall. Maybe things will get better after that".

"The sunspot cycle doesn't go up as fast as you might wish", I warned. "Better be prepared for conditions like these for a year or more".

"You really are Little Mary Sunshine", observed Pendergast." A real pessimist. I bet if they cut a woman in half, you'd get the half that eats".

"Cheer up", I replied. "Lots of fellows are having fun and lots of fellows are working away with their antennas". I brandished a handful of envelopes. "Observe what came in the mail today. A lot of dandy antenna ideas for the readers of *CQ*".

Pendergast brightened. "Great! I really enjoy reading the mail. What's coming up this month from your loyal readers?"

"OK", I said. "The first letter is from Frank, K5CM, in Oklahoma. "He has a very simple, inexpensive and easily built antenna for 160 meters that gained him a 44 multiplier in the January *CQ* Worldwide 160 meter contest. Just look at fig. 1.

"The antenna proper is 25 feet of TV mast sections, top loaded with a capacity "hat" and resonated with a base coil. The antenna forms an inductive circuit which is series-resonated with a capacitor made out of printed circuit board".

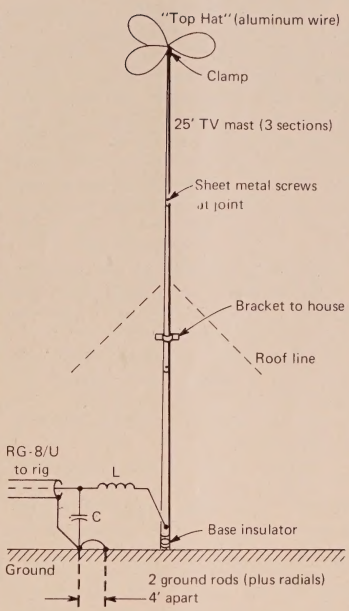


Fig. 1(A)—The compact 160 meter vertical antenna at K5CM. Only 25 feet high, this antenna puts out a potent signal that provided a 44 multiplier in the January CQ WW Contest. The following components are used in the antenna:

18 feet of aluminum fence wire for "top hat"
Guy Wire clamp (Radio Shack 15-827)
Four inch wall mount (Radio Shack 15-833)
Two 10 foot TV mast sections (Radio Shack 15-843)
One 5 foot TV mast section (Radio Shack 15-842)
One base loading coil. About 100 turns, 3 inches diameter, 10 turns perinch (not critical as long as inductance is high enough)
Five double sided printed circuit board pieces, 10"x1½"
Scrap vinyl cut from gallon bottle to wrap mast at wall bracket
One quart soda bottle as bottom insulator.

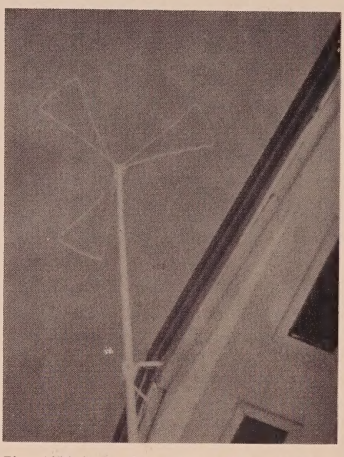


Fig. 1(B) is a view of the "Top Hat" on K5CM's vertical antenna.

"PC board?", interrupted my friend. "Now, that's an unusual idea for a capacitor!"

"Variable capacitors of any size, or any spacing, are hard to come by these days, unless you live near a surplus store", I replied. "Frank needed about 2000 pf to hit resonance with this antenna. So he made up a capacitor of five strips of double sided, phenolic board. Each strip measures 1½" by 10" and has a capacity of 400 pf. The bottom sides of the boards are all connected to the ground system and the top side of each board is connected to the input end of the base coil, and to the center of the coaxial line. Frank found the boards surplus, for ten cents apiece. He has blown 6 kv capacitors in this circuit, but the boards seem to take the gaff with no

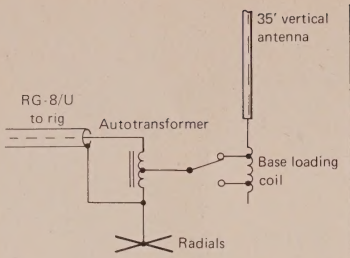


Fig. 2—The 80 meter experimental antenna at W1AM. Vertical antenna is made of aluminum tubing and radials are made of aluminum fence wire (Sears, Roebuck). Base loading coil, switch and toroid autotransformer are mounted in a waterproof house at the base of the antenna. Radiation resistance of antenna is about 14 ohms at 3.5 MHz and toroid coil is tapped near mid-point (determined by experiment for lowest s.w.r.). R.f. voltage at the base of the antenna is very high and the switch must have robust contacts to pass the antenna current. Auto-transformer is made from an Amidon balun kit. Ferrite core is wound full of #14 enamel wire supplied in kit, tapped every two turns. Total of 10 turns. The 50 ohm point is tapped on at the 8th turn, with antenna tap at four turns.

problem. Here's what he says. "I read from the letter: 'The reason for using separate strips is so that I can vary the size of the capacity. I also made up some smaller boards of 100 pf capacitance. I placed the circuit boards on a piece of 2×4 lumber just to hold them up off the grass.

'The TV mast sits on a quart size soda bottle half-buried in the ground, and the mast is bracketed to the house at the 13 foot level. The metal bracket is insulated from the mast by about ten wraps of polyvinyl plastic cut from a plastic bottle.

'The top hat is made of three pieces of aluminum ground wire, each about six feet long. They are shaped into squashed loops and clamped to the top of the TV mast with a guy wire clamp. A muffler clamp will work OK, too.

'The base loading coil is composed of two pieces of surplus air-wound inductor, a total of about 100 turns, 3 inches in diameter. The total value of inductance is unknown—but the whole antenna dips to 1.8 MHz. At resonance, the s.w.r. is about 1.4-to-1. I only use two ground rods at the present time'.

"He should have put in some radials", murmured Pendergast.

"Finally, Frank says that he uses sheet metal screws to make a good electrical connection between the mast sections and scraped off the paint at the top hat, so a good connection is made there. He also says the antenna bandwidth is quite narrow, about 20 kHz between the 2-to-1 s.w.r. points, and shows a good, sharp dip on his grid-dipper".

Pendergast looked at the drawing. "A lot of these parts came from the *Radio Shack,* so you can't say the material is hard to get".

"That's right", I agreed. And I like the idea of making the loading capacitors out of circuit board. That suggestion should be of benefit to a lot of fellows".

"What's next?" asked Pendergast.

"Well, I got a nice note from Art, W1AM, who was having problems with his 5-band DXCC, especially on 80 meters. So he dreamed up an interesting vertical antenna, and in the past DX season has worked 125 countries with it. Not bad, I'd say!

"The antenna is a 35 foot vertical, made up of odd-ball sections of aluminum tubing that Art had lying around the yard. It is mounted on a base insulator, and well guyed.

"Art says that *Sears, Roebuck* sells aluminum wire and he bought a mile of it for about twenty five dollars. He cut it up into 70 foot lengths and laid them down as radials, fanning them out like spokes on a wheel from the base of the tower. He then made some "nails" out of aluminum wire and fastened the radials right down on the grass. The grass quickly grew over the wires, and in a few weeks he could run a lawn mower over the radials! No trenching or digging at all, and the wires were soon totally invisible".

"Very clever. I like that.", said Pendergast, as he studied fig. 2.

"W1AM put an aluminum box, or "dog house" at the base of the antenna with a double-pole, double-throw, 4 position switch in it. The switch placed varying amounts of inductance in series with the antenna and connected the antenna to an autotransformer, wound on an old balun toroid. The radiation and loss resistance totals about 14 ohms, and the basic circuit for 80 and 75 meters is shown in the sketch. The tap on the toroid was slightly over half-way up from the bottom end.

"The voltage and current at the base of the antenna are quite high when full power is run and the leads should be short and the switch should be well insulated. Taps on the loading coil are adjusted to the favorite points in the 75 and 80 meter bands. Fine adjustment could be made changing the length of leads to the switch.

"For 40 meter operation, the antenna becomes highly inductive and the radiation resistance is much higher in value. Here, the circuit becomes as shown in fig. 3. Radiation resistance is close to 80 ohms, and the series capacitance is set for resonance at 7.15 MHz. Switching between 40, 75 and 80 meters is controlled by the switch when everything is adjusted properly. The final two-band, three frequency is as shown in fig. 4.

"Bandwidth is quite good, being less than 2-to-1 over the ranges of 3500-3530 kHz, 3775-3840 kHz and 7.0-7.3 MHz."

"What does he use for a radial system, just all that aluminum wire?", asked my friend.

"Art says he varied the radials as he went along, starting with 10 radial wires, then 30, then 60 and finally, 100. He noticed major changes as the number of radials increased—from 10 to 30, the whole tuning network had to be rebuilt, the taps on the autotransformer changed, and the operational bandwidth narrowed appreciably."

"I knew it!", shouted Pendergast, jumping out of his chair. "This proves beyond a doubt that when the vertical antenna is mounted on the ground a large number of radial wires are required!"

"Relax", I replied. "Remember, when you think, you break out into a rash".

Pendergast subsided, and I continued, "Increasing the number of radials from 30 to 60 made another substantial difference, but Art could accommodate it by changing the taps on the coil. Raising the number of radials from 60 to 100 brought still more changes, the most noticeable

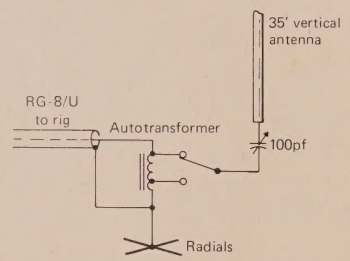


Fig. 3—The W1AM antenna rearranged for 40 meters. Antenna resonance is below 7 MHz, so a series capacitor is used to establish resonance. Radiation resistance of the antenna is about 80 ohms, so an additional 4 turns were added to autotransformer to step-up impedance from 50 ohms. Antenna is resonated at 7.15 MHz and s.w.r. is quite low across entire 7 MHz band. Auto-transformer has 11 turns, with 50 ohm tap at 8 turns. (One more turn has been added to the auto-transformer for 40 meter operation).

difference being the narrowing of the antenna bandwidth".

Pendergast nodded. "Right. He's getting the ground losses out of his system, the efficiency is going up, and the Q is also going up, hence the narrower bandwidth."

"Art says the antenna works very well, or very poorly, depending upon what you want. For close-in work on 80 meters, the vertical is 20 db down on a 130 foot, end-fed wire about 50 feet high. However, at greater distances, say 3000 miles away, the vertical beats the horizontal by 10 db to 15 db.

"For long-haul stuff—Australia and Asia—the antenna is exceptional. Art says he's fully competitive on 80 meters for the first time in his life. Both antennas seem about equal at 1000 to 1500 miles out.

"He goes on to say that the interference ratio is quite remarkable. Often, in working a weak station 2000 miles away, the QRM from Russian teletypes in the 80 meter band is intolerable. Transmitting on the vertical and receiving on the horizontal drops the QRM and makes a 100% QSO possible.

"On the other hand, the vertical is great in working DX in the face of U.S. competition. The interference received from U.S. statons is much reduced on the vertical, while the DX stations are much stronger than on the horizontal. In other words, the DX to QRM ratio is great on the vertical."

Pendergast breathed heavily. "This is really *great* information from a fellow who has first-hand experience with a vertical over a long period of time".

"Right", I agreed. "Listen to what Art has to say about 40 meters. He says that on 40, the situation is different. The horizontal seems to work nearly as well as the vertical. On very long haul paths, the vertical seems to beat out the horizontal, but only by 3 db or thereabouts. And, of course, the big guns with the beams beat him out, too. He attributes the better performance of the horizontal to the fact that it is twice as high on 40 as on 80 meters, from an electrical viewpoint".

"Well, this is really great", repeated Pendergast. "A pleasure to get some practical information on a sure-fire DX antenna for 80 meters, and how it progressed as it grew". He paused, and then asked, "Anything else interesting in the mail on vertical antennas?"

"Yes", I answered. "I received a letter from Harold, WN3WTG, who operates 15 meter novice c.w. from a trailer court. He says he's in a place with no nearby trees, or poles, and no *permanent* antennas are allowed.

"Well, Harold put up a "temporary" antenna which can be set up or torn down in two or three minutes. He takes it down when it is not in use. Since the trailer is rented, nothing could be affixed to it. Harold designed a 15 meter vertical dipole, made up of a half-wave type CB whip antenna and a TV mast tripod stand (fig. 5). The tuning coil of the whip is removed and the form acts as a base insulator for the whip. The bottom 10 feet of the antenna is used as a support, resting in the tripod. A 2 foot section is cut off one of the old radials and is bolted to the top of the whip to provide an 11 foot vertical section. Two radial wires are clipped on and are tied off on the corners of the trailer and the coaxial line comes down and through a partially opened window of the trailer. The antenna is very sturdy, Harold says, and has an s.w.r. of only 1.4-to-1 in the 15 meter Novice band."

'Not bad", admitted Pendergast. "Fifteen meters is in and out and I enjoy going down there and working Novices when the band is open".

"I wish more Generals would work more Novices", I replied. "It's enjoyable talking to the newcomers, but very few Generals do it".

Pendergast switched on his receiver, preparatory to a quick look-see across the band. "Before you go, I have a complaint to make", he said.

"Oh?", I queried. "What is it?"

"In the February *CQ* column you show an 80 meter, quarter-wave sloper wire running down from a tower. And you show a balun at the top. I don't think it is necessary".

"That's right", I replied. "The balun is not required, and can be left out. The antenna works against the tower as a ground, and the inner conductor of the coaxial line attaches directly to the balun. I'm sorry, I goofed on that drawing".

"Forgiven", said my friend, as he slipped the earphones over his head. He listened for a moment, moving the receiver dial back and forth slowly. Then he said, "Man! You should hear 20 meters. It's *red hot!* I'm hearing both Europe and Asia at the same time! This is really *great!*"

"A few minutes ago you were complaining about how terrible DX was and how bad the bands were".

"Nonsense!", replied my friend. DX is where you find it, and here it is!" ■

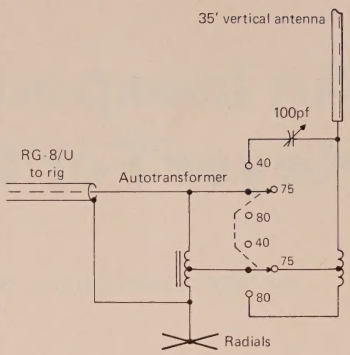


Fig. 4—The complete W1AM antenna for 3.5, 3.8 and 7.15 MHz. The auto-transformer provides impedance terminations of about 14 ohm and about 80 ohms. On 40 meters, the series capacitor establishes resonance and on 80 meters, the number of turns in the base loading coil establishes antenna resonance. Good radial system improves performance on both bands. Final design of auto-transformer has 11 turns, with 50 ohm tap at the 8th turn and 75-80 meter tap at 4 turns from the ground end. W1AM has worked CR9AK and other goodies for a total of 170 countries with this antenna.

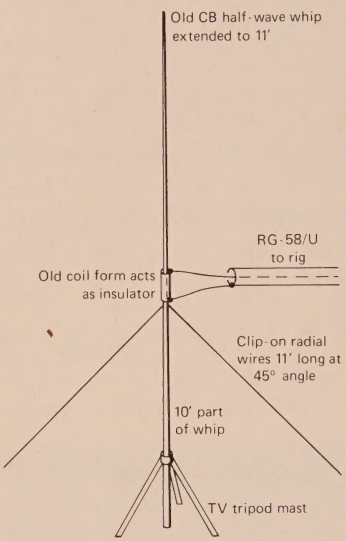


Fig. 15—The 15 meter antenna at WN3-WTG. Made up of a surplus CB whip (either ½ wave or ⅝ wave), the antenna performs as a ground plane at 21 MHz. The CB loading coil is used as a base insulator and the top of the CB whip is extended to 11 feet for resonance at 21.1 MHz. The rest of the whip serves as a base support, along with a short TV tripod mast. Two or more 11 foot radial wires stabilize mast. Radials are clip-on for quick assembly and disassembly.

An Inexpensive Memory Keyer For Contests

BY BERT P. VANDENBERG, WB6KBF

After each Field Day or Contest a flurry of memory keyer circuits appear in the various amateur magazines which promise to make next years contest easier on the c.w. operator. Unfortunately, in many cases, the pocketbook suffers and a considerable investment of spare time is also a prerequisite to their construction.

The memory keyer circuit shown in fig. 1 uses only three IC's and can easily be constructed in two evenings for a total cost[1] of around $10.00. Batteries can be used to power the keyer since it uses less than 1/3 watt[2]. Five minutes is all that is required to program the memory or change an existing program.

A volatile memory is the only drawback this circuit has over some of the more expensive units. However, the comparative ease of programming this unit, and its price should more than make up for the instant amnesia suffered when the power is removed.

Summary Of Circuit Operation

One 2511 is a dual 200 bit static shift register whose digital levels are shifted one position for each clock pulse. Inverters I1 and I2 form a variable frequency, gated square wave clock oscillator which is controlled by the state of flipflop FF2. FF1 performs the functions of buffering the clock oscillator and debouncing the manual clock switch needed for data entry.

Once the data has been entered into the shift register, a momentary closure of the start switch will cause FF2 to clear its Q output, allowing the clock oscillator to start free running.

The shift register keeps shifting the data message in a recirculating mode until a preprogrammed control command is shifted out of the shift register to set FF2 and stop the clock. With proper programming, the message will once again be lined up in such a way inside the shift register so that another momentary push of the start switch will cause the entire procedure to be repeated again.

The message will continue to recirculate each time the start button is pushed until either the message is changed by reprogramming or the power has been shut off.

Two or more shorter messages can be stored and each one will be sent individually in turn each time the start button is depressed.

Programming The Shift Register

A maximum of 200 time slots are available for the programmed message. A *dit* uses one time slot as does a space. A *dah* uses up three time slots. The shift register must first be cleared of previous programming by switching the data and control switches to ground and the recirculate switch to load. Hold the start button down till the register is full of zeros. With the speed control set at fast this should take around 10 seconds.

After waiting for the appropriate amount of time for the registers to clear themselves release the start button and switch the control line to +6v. In another ten seconds or so the clock oscillator will stop.

The control line should once again be switched to ground and the data line switched to the desired position. If a *dah* is to be entered into memory, switch the manual clock through three complete up-center-down-center cycles. Then switch the data line to ground and cycle the manual clock through one cycle to insert the space into memory. Continue this procedure until the entire message has been entered into the shift register. Now switch the recirculate/load control to the recirculate position and depress the start switch. The message will be sent in perfect code at whatever speed the operator desires. After some familiarity is gained with the circuits operation, the programmer can learn to be more sophisticated with the control line programming. Multiple message programming, variable pauses, etc. can be implemented.

[1] The 2511 can be obtained from PolyPaks for $3.99. A variety of switches are also available from PolyPaks at 3 for $1.00. RCA 4000 series logic may be substituted for the 74C series if proper pinpoint is observed.

[2] Typically 275 mw, more if the optional "ready" light is incorporated.

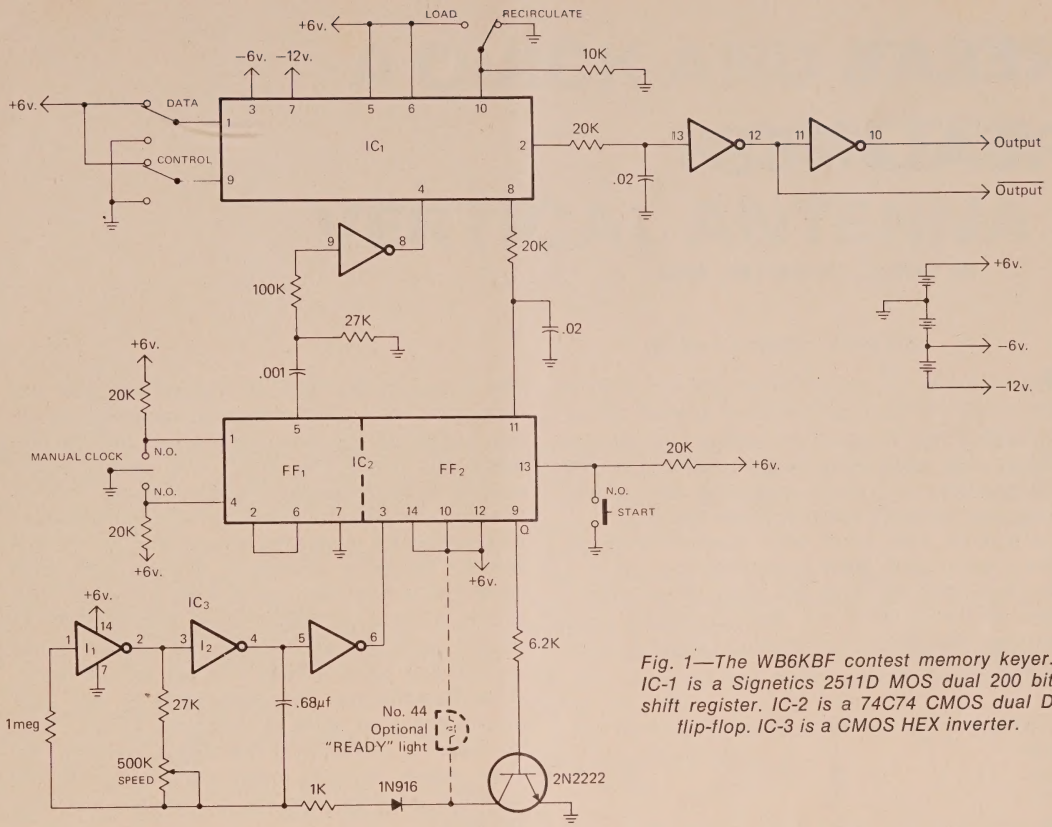


Fig. 1—The WB6KBF contest memory keyer. IC-1 is a Signetics 2511D MOS dual 200 bit shift register. IC-2 is a 74C74 CMOS dual D flip-flop. IC-3 is a CMOS HEX inverter.

The memory keyer was used at the Field Day site of the North Shores Amateur Radio Club of San Diego, K6SAI, with excellent results. Using a lantern battery for the +6 volt supply, provided more than enough power for 24 hours of continuous operation, even with the optional "ready" light included. ■

From Novice To Extra At Age 13

Ted Karas, WB3ZEA attained one of his major goals when he passed his Extra examination in Washington, D.C. on March 19, 1976. Ted was licensed as a Novice on March 11, 1975, A General/Advanced on August 8, 1975. One year from Novice to Extra and he is only 13 years old. He may not be the youngest Extra but he is surely one of a select few. Ted operates 15 and 40 meters c.w. on a HW-16 Transceiver with a dipole antenna out of Gaithersburg, MD. He has 44 states towards his WAS Award and gets in his fair share of DXs. He is a member of the Montgomery Amateur Radio Club of Gathersburg, MD. Ted is an "A" student at Montgomery Village Junior High School, participates in a full sports program and has time left over to read a book or two on amateur radio. Ted resides at 19340 Frenchton Place Gaithersburg, MD.



RELAY REALITIES

BY CARL C. DRUMELLER, W5JJ

Relays appear in many transmitters and even in some receivers. Most stations have at least one or two; many have more. But we seldom stop to consider whether we're applying them correctly or just sticking them in circuits, applying power, and blindly hoping they'll function as we desire.

Let's think a bit about what happens when we close a switch that feeds power into the coil of a relay. For simplicity, we'll talk about direct current relays. Probably these are more commonly used than ones designed for alternating current in their actuating coils.

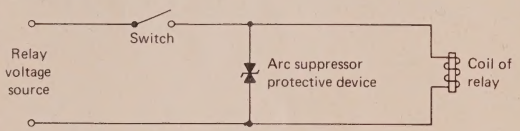


Fig. 1—Using a protective device to prevent high voltage, high current surges.

As that current attempts to flow into the coil, a counter electromotive force is generated. This is of opposite polarity and therefore tends to oppose the initial current flow. In practice, this means that the relay does not actuate the precise moment that you close the switch. With proper design, the delay can be made a small matter of milliseconds, usually small enough to ignore.

When the switch is opened, however, a complication is introduced. While current was flowing, a magnetic field was built up around the coil. Energy was stored in this field. As the current flow was interrupted, this field collapsed, returning its energy to the coil. But, now that it's back into the coil, where can it go? The circuit (coil, switch, power source) no longer exists; it's been opened. That returning power is not limited by the original voltage that pushed the generating current through the coil initially: Power = Voltage × Current, and when current is almost zero (as it must be in an open circuit), voltage *can* rise to nearly infinity. *Can,* but doesn't, as there always are certain losses in actual circuits that place a finite limit on voltage excursions. Nevertheless, the voltage does go very high, which causes all sorts of undesired effects. Like, for instance, sparking at the switch contacts. Or, much worse, blowing every semiconductor that might be powered from the d.c. source that runs the relay!

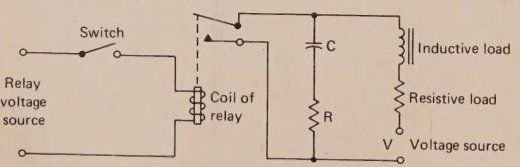


Fig. 2—Circuit to minimize inductive reactance in relay use. See text for computing component values.

What can you do about this thoroughly undesirable situation? Well, you can put a husky diode across the relay coil, not just any diode but one designed especially for the control of short-duration high-voltage, high-current surges. These diodes operate somewhat the same: Up to a specified voltage, they offer a high resistance; beyond that voltage, the resistance decreases rapidly, serving as an effective shunt, even a sink, for the power represented by the excess voltage. See fig. 1.

As you might expect, there are disadvantages. The only one important enough to consider is that a short delay is introduced in the drop-out of the relay armature. This usually is not any great problem but could be if rapid actuation is desired. Why the delay? Well, that energy stored in the inductive field returns to the wire in such a manner that it tends to oppose the decrease in current flow (remember, the power source has been interrupted by an open switch) and thereby prolongs the flow, which, in turn, causes the relay's magnetic core to retain its attraction to the armature for a bit longer.

Thus far, we've talked only of the relay's coil and

(Continued on page 70)

A QUICK AND EASY 160 METER VERTICAL ANTENNA

BY BILL TURNEY, WBØCGR

How about putting an antenna up for 160 meters? It doesn't take much real estate to put up a very effective antenna for the top band if you construct a top loaded vertical.

Here is a list of materials you will need:

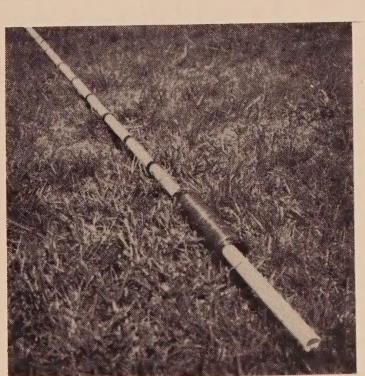
1. One 40 foot zoom-up mast.
2. One spool of nylon cord for guys.
3. One half pound spool of #16 enamel wire.
4. One foot piece of 2" plastic water pipe for coil form.
5. One pop bottle for base insulator.
6. One empty plastic bottle, gallon size, for a weather protector for the coil.
7. 10' piece of 1" plastic water pipe to go through and support the coil form and support the wire top whip. It fits into the top of the 40' mast.
8. Grounding rod and wire for the radials.

The coil is 8" long, close wound, and mounts 1 foot above the metal mast. That leaves about 8' extending above the coil to support the wire whip. Start with the wire full length and trim it to the frequency you desire. The Q is very high so don't expect to cover more than about 10 kHz each side of resonance if you respect 2-1 s.w.r. limits. Put a loop in the top of the wire whip to avoid corrona discharge.

By connecting to the mast below the coil, (¼ wave on 40 meters) the antenna will serve well on both 40 and 160 meters.

I think by reviewing the parts list and comments you will figure out how simply everything goes together.

I will be looking for your FB signal on the top band this season OM. ■



The upper section of the 160 meter antenna. The coil is positioned 1 foot above the metal mast. The vertical wire is taped to the 10' piece of pvc water pipe. A one gallon plastic bottle (with a hole in the bottom) slips over the coil to protect it from the weather.

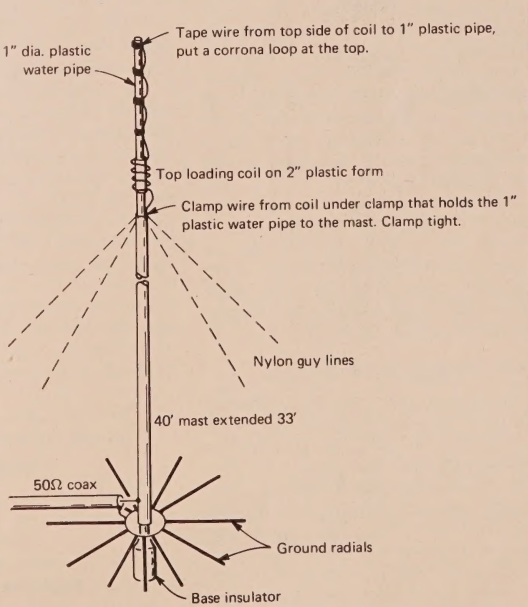


Fig. 1—A simple top loaded vertical antenna for 160 meters.



JOHN A. ATTAWAY, K4IIF, ON

DX

De Extra extends congratulations to Dick Spenceley, AJ3AA, and Dick Roderick, WA5VDH, for great #1 performances in *CQ's* USA/WPX 76 Award chase. Congratulations also to staff member Bernie Welch, AC8IMZ, who is doing a #1 job of managing the award.

From the TV and newspapers one could get the impression that the Citizen Banders (CB) have replaced amateur radio in emergency service. Some articles even refer to CB'ers as amateurs. Then, along comes a major crisis like the Guatemalan earthquake disaster and things are put back into perspective. During the hours following the quake, the few telephone lines left standing were totally inadequate and for several days amateur radio was the backbone of communications between TG9-land and neighboring countries. Congratulations to the many stations throughout the hemisphere who participated in this effort. Some of the strongest signals heard were strong because they were equipped for DX and Contest operation.

After months with little operating time, DX Editor AD4IIF has put a mobile unit in the car and can be found near 14290 and 14220 mornings from 1230-1330 GMT and again 1745 - 1815 GMT, always delighted to chat and receive DX tidbits.

Rules for the CQ DX Awards

For several years the *CQ* DX Award program has been under continual examination by the *CQ* DX Awards Advisory Committee, whose objective was the modernization of the older awards and the introduction of new awards. The Committee's goal was the development of a DX award program which would yield a challenge to every DXer, whether oldtimer or newcomer, sidebander or brass-pounder, mobile or even slow scan TV operator.

Examples of new awards introduced during this interval are the DX Hall of Fame, the WPNX Award for Novies, the WPX Honor Roll, VPX and the very challenging Single Band WAZ awards. An example of modernization is the *CQ* C.W. and S.S.B. award programs for countries worked and confirmed.

As a consequence of the state of flux resulting from the Committee efforts, we have never published all the rules in the same issue for easy reprinting. However, things have now stabilized and we are able to remedy this situation. The complete rules for all programs follow:

The WAZ Program

Single Band WAZ

20 Meter Phone

23...WB4ECE 24...W4HNW

S.S.B. WAZ

1305...OZ9VO

C.W.-Phone WAZ

3928...W9LI
3929...DK7JH
3930...OE9JKI
3931...DK7NF
3932...JA1PSZ
3933...OK1ATE
3934...OK1VM
3935...OK1DAT
3936...W1MLG
3937...PY7AZQ
3938...VE3BZ
3939...F5CH
3940...OZ7BW
3941...PAØJR
3942...DL3RQ

Phone WAZ

515...K4DXO

Complete rules for both the Single Band and regular WAZ Programs appear elsewhere in this issue. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to the DX Editor, P.O. Box 205, Winter Haven, FL 33880.

The CQ DX Award Program

SSB

428...PY2BDU
429...G3YBH
430...OK1IQ
431...DL1IP
432...DL7CO
433...DJ8TP

C.W.

197...DL7IP

Endorsements

175...I1DWH
275...K3EH

Complete rules and application forms for the *CQ* DX Awards program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped to: "CQ DX/WPX Awards", Box 3368, San Rafael, Calif. 94902.

DX Hall of Fame

DX Hall of Fame membership is only accorded those DXers who have made major contributions to the hobby. Such contributions involve considerable personal sacrifice and can usually be described by the phrase "above and beyond the call of duty." Nominations for the DX Hall of Fame are made through the *CQ* DX Awards Advisory Committee, and require the positive vote of 75% of the Committee for acceptance. DX clubs or individuals may suggest names to the DX Editor, the Assistant DX Editor or to any member of the Committee for consideration.

The Zone Award Programs

Regular WAZ

The WAZ Award will be issued to any licensed amateur station presenting proof of contact with the forty zones of the world. This proof shall consist of proper QSL cards to be checked by the DX Editor or verified at one of the authorized checkpoints for *CQ* DX Awards. Most of the major DX clubs of the USA and national amateur radio societies abroad can be authorized checkpoints if they clear in advance with K4IIF. If in doubt consult the DX Editor. Any legal type of emission may be used providing communication was established after Nov. 15, 1945.

1. The official *CQ* WAZ Zone Map will be used in determining zone boundaries.

2. Confirmations must be accompanied by a list of claimed zones showing the call letters of the station QSOed and the mode. The list should also show the applicant's name, call letters, and complete mailing address clearly.

3. All contacts must be made with licensed *land based,* amateur stations working in authorized amateur bands.

4. All contacts submitted by the applicant must be made within a 250

mile radius of the original location.

5. Any altered or forged confirmations will result in permanent disqualification of the applicant.

6. Continued use of poor operating ethics will result in disqualification of the applicant.

7. In addition to the conventional certificate for which any and all bands and modes may be used, specially endorsed and numbered certificates are available for phone and single sideband operation. The phone certificate requires that all contacts be two-way phone and the s.s.b. certificate requires that all contacts be two-way s.s.b.

8. If, at the time of the *original* application, a note is made pertaining to the possibility of a subsequent application for an endorsement or special certificate, only the missing confirmations required for that endorsement need be submitted with the later application.

9. Include with the application $1.00 or 8 International Reply Coupons to defray the cost of the certificate.

10. Decisions of the *CQ* DX Awards Advisory Committee on any matter pertaining to the administration of this award shall be final.

11. All applications should be sent to the DX Editor, P.O. Box 205, Winter Haven, Florida 33880.

12. Zone Maps and/or WAZ applications are available from the DX Editor or from *CQ* for a self-addressed stamped envelope or self-addressed enevlope and 1 IRC.

The following list of zones is presented as a guide. Any questions will be decided by the zone map.

Zone 1. Northwestern Zone of North America: KL7, VE8-Yukon, the VE8-Northwest Territories Districts of Makensie and, Franklin, and the islands west of 102° including Victoria, Banks, Melville, and Prince Patrick.

Zone 2. Northeastern Zone of North America: VO2-Labrador, that portion of VE2-Quebec north of the 50th parallel, and a portion of the Northwest Territories-VE8 east of longitude 102°. The latter includes part of the District of Franklin and the islands of King William, Prince of Wales, Somerset, Gathurst, Devon, Ellesmere, Baffin, and the Melville and Bootlia Peninsulas.

Zone 3. Western Zone of North America: VE7, W6 and the W7 states of Arizona, Idaho, Nevada, Oregon, Utah, and Washington.

Zone 4. Central Zone of North America: VE3, VE4, VE5, VE6, the W7 states of Montana and Wyoming. WØ, W9, W8 (except W. Va.), W5, and the W4 states of Alabama, Tennessee, and Kentucky.

Zone 5. Eastern Zone of North America: FP8, VE1, VO1, that portion of VE2-Quebec south of the 50th parallel, VP9, W1, W2, W3, the W4 states of Florida, Georgia, South Carolina, North Carolina, and Virginia, and the W8 state of West Virginia.

Zone 6. Southern Zone of North America: XE and XF.

Zone 7. Central American Zone: FO8-Clipperton, HP, HR, KS4, KZ5, TI, TI9, VP1, TG, YN, and YS.

Zone 8. West Indies Zone: CM/CO, FG7, EM7, HH, HI, KG4, ITP4, VP2, VP5, VP7, 6A, KC4- Navassa, PJ7/FS7, PJ6, PJ8, and YVØ-Aves.

Zone 9. Northern Zone of South America: FY7, HK, PJ2, PJ3, PJ4, PZ, VP3/8R, VP4/9Y4, and YV.

Zone 10. Western Zone of South America: CP, HC, HC8, and OA.

Zone 11. Central Zone of South America: PY and ZP.

Zone 12. Southwest Zone of South America: CE.

Zone 13. Southeast Zone of South America: CX, LU, VP8, and *all Antarctic prefixes.*

Zone 14. Western Zone of Europe: CT1, CT2, DJ/DL/DM, EA, EA6, EI, F, G/GB, GD, GI, GM, GW, HB, HL, LA, LX, ON, OY, OZ, PA/PI, PX, 3SM/SL, ZB2, and 3A2.

Zone 15. Central European Zone: FC, HA, HV, I, IT, IS, OE, OH, OK, SP, UA2, UP, UQ, UR, YU, ZA, ZB1/9HI, 9A1.

Zone 16. Eastern Zone of Europe: UA1, UA3, UA4, UA6, UA9-Bashkir & Chkalov, UB5, UC2, UN1, and UO5.

Zone 17. Western Zone of Siberia: UA9-Sverdlovsk, Chelyabinsk, Komi, Jurgan, Molotav, Omsk, Tyumen, plus UH8, UI8, UL7, and UM8.

Zone 18. Central Siberian Zone: UA9-Novosibirsk, Tonsk, Kåmerovo, and Altai; UAØ-Keasnoyarsk, Irkutsk, Chita, Bruyate Mongolia, and Dickson Island.

Zone 19. Eastern Siberian Zone: UA0-Khabarovsk, Amur, Yakutsk, Primorsky, Sakhalin Island, Wrangel

CQ DX 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. Honor Roll submissions must clearly state that the submission is for the Honor Roll.

CW

W6PT 320	W8LY 310	W6ISQ 305	VK3AHQ ... 301	W6NJU 294
W6ID 317	W4IC 309	W9DWQ ... 305	W4BQY 299	WA6MWG .. 293
W8KPL 316	ON4QX 308	W0AUB 304	DL3RK 298	WA6EPQ ... 288
W4WX 312	WA6GLD ... 306	K6LEB 302	WA8DXA ... 296	DJ7CX 281

SSB

TI2HP 320	VE3MR 314	WA6MWG .. 309	K8DYZ 300	DJ7CX 287
W2TP 320	W6EL 314	W9KRU 308	K6AQV 299	K1KNQ 287
W2RGV 319	W6KTE 314	VE3GMT ... 307	WA6GLD ... 299	SP5BXV ... 287
WA2RAU ... 319	W9DWQ ... 314	K3GKU 307	HP1JC 298	DL1MD 286
DL9OH 318	W9JT 314	K6EC 307	WØYDB 298	OE3WWB .. 286
G3FKM 318	F9RM 313	F9MS 306	K4HJE 297	W6TCQ 286
IØAMU 318	WA2EOQ .. 313	WA3IKK ... 306	W6FW 297	K8GQG 286
W3NKM 318	W2QK 313	W9QLD 306	DK2BI 296	W3CRE 284
W9ILW 318	W6RKP 313	XE1AE 306	G3RWQ 295	DK1FW 282
K2FL 317	K6WR 313	YV1KZ 306	W9OHH 295	OK1MP 282
W4NJF 317	W6YMV 313	OE2EGL ... 305	YS1O 295	VE7WJ 282
W4EEE 316	K4MQG 312	OZ3SK 305	W8ZOK 292	WB6PNB ... 282
W4SSU 316	F2MO 311	K8WEH 305	WAØCPX ... 293	K8PYD 282
SM5SB 315	IØZV 311	ZL1AGO ... 305	DL6KG 292	WA2VEG ... 280
W3AZD 315	I8YRK 310	VE2WY 304	WØSFU 291	W6HUR 279
W4IC 315	W6NJU 310	W2CNQ ... 304	G3KYF 290	W9YRA 277
W6EUF 315	ZL9NS 310	G3DO 303	OE1FF 290	I1WT 275
W6REH 315	ZS6LW 310	WA6AHF ... 303	WB2RLK ... 290	VE7HP 275
I8AA 314	SM6CWK .. 309	W6KZS 303	W6FET 290	K6GUY 274
O8KDB 314	K4RTA 309	VE3MJ 302	XE2YP 289	W4WSF 274
IT9JT 314	KH6BB 309	WA2HSX ... 301	YV1LA 289	K9LUI 271
SM6CKS ... 314	W3DJZ 309	WB6DXU ... 300	WAØKDI ... 288	G3WW 271

The WPX Program

Mixed

514...VE3EJK
515...YU4JHI
516...W9MYG
517...IT9WGI
518...I5AFC
519...OH2BMG

2XSSB

889...K2SHZ
890...DK9KD
891...WA6EVX/KG6
892...I5AFC
893...JH1VRQ

C.W.

1454...VE3EJK
1455...YU5XSX
1456...DL9ID
1457...DK6NC
1458...W6ETR
1459...ZL2AUP

VPX

PA-2028 .....Huub Sanders
OK2-17441...Oldrich Macura

Endorsements

Mixed: W6TCQ 1300; WB4KZG 1100; I2PHN 850; I2PHN, K3EH, VE7WJ, WA6TAX 800; I2PHN 750; JA8MS, W2FLD, W6KYA 700; JA8MS, K4RK 650; JA8MS, WB8AAX 600; WB8AAX, WAØTKJ 550; OH2BMG 500; OH2BMG 450; VE3EJK, W9MYG 400; VE3EJK 350.

CW: W8LY 1300; W8KPL 1150; G2GM 950; K8MFO 900; WA2EAH 700; SM6BZE, WB4KZG 600; SM6BZE 550; WB8AAX 500; K2IP, WA5TPO 450; VE3EJK 350.

SSB: UB5WE, W6RKP 900; UB5WE, W6RKP 850; IT9JT, W6RKP, WB4KZG, UB5WE 800; I2PHN, W6RKP, UB5WE 750; I2PHN, W6RKP, UB5WE 700; DL9XN, I2PHN, W6RKP 650; DL9XN, I2PHN, W6RKP 600; DL9XN, W6RKP 550; K2SHZ, W6RKP 500; K2SHZ, W6RKP 450, JH1VRQ, K2SHZ, W6RKP 400; I6ICD, JH1VRQ, K2SHZ 350.

Eighty Meters: W4HHN, PA-2028.
Twenty Meters: JA2IU, JH1VRQ, OK1DKR, VE3EJK.
Ten Meters: W4HHN.
Africa: UB5WE, PA-1722.
Asia: DL9XN, JH1VRQ, PA-1722
Europe: DL9ID, I5AFC, VE3EJK, W6KYA, YU5XSX, PA-1722, PA-2028.
North America: VE3EJK, PA-1722.
South America: PA-1722.
Oceania: JH1VRQ.

Complete rules for WPX may be found on page 67 of the February issue of *CQ*. Application forms may be obtained by sending a business size envelope, self-addressed and stamped, to "CQ DX/WPX Awards", Box 3388, San Rafael, Calif. 94902.



Left to right are television star Mike Douglas, Florida citrus spokeswoman Anita Bryant and Florida Citrus Commission Research Director John Attaway (who may be better known to CQ readers as K411F, CQ's DX Editor). The scene is Walt Disney World near Orlando, Florida during the filming of the Mike Douglas Disneyworld series telecast this past February. (Photo courtesy of Walt Disney Productions)

Island, and the Soviet Kuriles.
Zone 20. Balkan Zone: JY, LZ, OD5, SV, TA, YK, YO, ZC4/5B4, and 4X4.
Zone 21. Southwestern Zone of Asia: EP, HZ, MP4, 9K, VS9 (except Maldives and Socotra), YA, YI, 4WI, UD6, UF6, UG6, and AP-West Pakistan.
Zone 22. Southern Zone of Asia; AC3, AC5, CR8, 4S7, VU (except Andaman and Nicobar Islands), 9N1, and S2 Bangladesh.
Zone 23. Central Zone of Asia: AC4, the BY provinces of Tibet, Sinkiang, Kansu, and Hinghai, JT1, and UA0-Tanna Tuva.
Zone 24. Eastern Zone of Asia: BY (except the provinces in Zone 23), BV, CR9, and VS6.
Zone 25. Japanese Zone: HL/HM, JA/KA, and KR6.
Zone 26. Southeastern Zone of Asia: HS, XV, XU, XW, XZ, 3W8, and VU2-Andaman and Nicobar Islands.
Zone 27. Philippine Zone: DU, KC6, and KG6.
Zone 28. Indonesian Zone: CRØ, VR4, VK9 (except Nauru, Norfolk Is., and Christmas Is.), VS1, VS4, VS5, ZC5, 8F, and 9M.
Zone 29. Western Zone of Australia: VK6, VK8, and VK9-Christmas Is.).
Zone 30. Eastern Zone of Australia: VK1, VK2, V3, VK4, VK5, VK7, and VKØ-Macquarrie Is.
Zone 31. Central Pacific Zone: KB6, KH6, KJ6, KM6, KP6, KW6, KX6, C2-Nauru, VR1, VR3, and ZM7.
Zone 32. New Zealand Zone: FK8, FO8, (except Clipperton), FU8/YJ, KS6, VK9-Norfolk Is., VR2/3D2, VR5, VR5/A3, VR6, ZK1, ZK2, ZL, and 5W1.
Zone 33. Northwestern Zone of Africa: CN2, CN8, CT3, EA8, EA9, 3V8, and 7X.
Zone 34. Northeastern Zone of Africa: ST, SU, and 5A.
Zone 35. Central Zone of Africa: CR4, CR5-Guinea, EL, TU, TY, TZ, XT, ZD3, 5N2, 5U, 5V, 6W8, 9G1, and 9L1.
Zone 36. Equatorial Zone of Africa: CR5-Sao Thome, CR6, EAØ, TJ, TL, TT, TN, TR, 9Q5, 9U5, 9J, ZD7, and ZD8.
Zone 37. Eastern Zone of Africa: CR7, ET2, ET3, FL8, 6O1, 6O2, 5H3, 5X5, 5Z4, and 7Q7.
Zone 38. South African Zone: ZD9, ZE, and ZS.
Zone 39. Madagascar Zone: FB8, 5R8, FR7, VQ8, VQ9, and VKØ-Heard Is.
Zone 40. North Atlantic Zone: LA-Jan Mayen, LA-Svalbard, OX, TF, and UA1-Franz Joseph Land.

The UA9 and UAØ Zones are sometimes rather hard to determine. However, the DX column in the August, 1968 issue, pg. 82 has a handy table to use in locating stations in these zones.

Single Band WAZ

Effective Jan. 1, 1973, special WAZ awards have been issued to licensed amateur stations presenting proof of contact with the 40 zones of the world on one of the 5 high frequency bands, 80-10 meters. Contacts for a single band WAZ award must be made after 0000 hours GMT, Jan. 1, 1973. Proof of contact shall consist of proper QSL cards checked by the DX Editor or a member of the CQ DX Award's Advisory Committee. Single band certificates will be awarded for both two-way phone, including s.s.b. and a.m., and two-way c.w.

The first two-way c.w. winner and first two-way phone winner on *each* of the 5 bands will receive a handsome plaque showing that he is number one for that band and mode. Subsequent winners will receive numbered certificates.

Amateurs competing for the plaques must have their cards checked by the DX Editor, P.O. Box 205, Winter Haven, FL 33880. It is suggested that the cards be sent by registered mail as the winner will be determined by the earliest postmark. The Single Band WAZ program is governed by the same rules and uses the same Zone boundaries as the regular WAZ program.

As of March 1, 1976, plaques have been awarded for 20 meter c.w., 20 meter phone, 15 meter c.w., 15 meter phone and 80 meter phone. Plaques not yet awarded include 80 meter c.w., 40 meter c.w., 40 meter phone, 10 meter c.w., and 10 meter phone.

The Prefix Award Programs

WPX

The CQ WPX Award recognizes the accomplishments of confirmed QSO with the many prefixes used by amateurs throughout the world. Separate distinctively marked certificates are available for 2×SSB, CW and Mixed Modes as well as the VPX Award for shortwave listeners and the WPNX Award for U.S.A. novice amateurs.

1. Applications:

A. All applications for WPX certificates (and endorsements) must be submitted on the official application form CQ 1051A. This form can be obtained by sending a self-addressed stamped envelope to the Assistant DX Editor. It is highly desirable to use business size envelopes, 8½ × 11 inches, for this purpose.

B. All QSO's must be made from the same call area.

C. All call letters must be in strict alphabetical order and the entire call letters must be shown.

D. All entries must be clearly legible.

E. Certificates are issued for the following modes and numbers of prefixes. Cross mode QSO's are not valid for the CW or 2×SSB certificates.

Mixed (Any Mode)	—400 Prefixes Confirmed
CW	—300 Prefixes Confirmed
2×SSB	—300 Prefixes Confirmed

Separate applications are required for each mode.

F. Cards need not be sent but must be in the possession of the applicant. Any and all cards may be requested by the Assistant DX Editor or the CQ DX Committee.

G. The application fee for each certificate is $1.00 or eight (8) International Reply Coupons (IRC's).

H. All applications and endorsements should be sent to the Assistant DX Editor.

2. Endorsements:

A. Prefix endorsements are issued for each 50 additional prefixes submitted.

B. Band endorsements are available for working the following numbers of prefixes on the various bands: 1.8 MHz-35; 3.5 MHz-150; 7 MHz-250; 14 MHz-300; 21 MHz-300; 28 MHz-250.

C. Continental endorsements are given for working the following numbers of prefixes in the respective continents: North America-126; South America-88; Europe-146; Africa-80; Asia-68; Oceania-51.

D. Endorsement applications must be submitted on CQ Form 1051A. Use separate applications for each mode and be sure to specify the mode of your endorsement application.

E. For Prefix endorsements list only additional call letters confirmed since the last endorsement application.

F. A self-addressed stamped envelope or self-addressed envelope with 1 IRC is required for endorsement stickers.

3. Prefixes:

A. The 2 or 3 letter/numeral combinations which forms the first part of any amateur call will be considered the prefix.

B. Any difference in the numbering, lettering or order of same shall constitute a separate prefix. The following would be considered different: W2, WA2, WB2, WN2, WV2, K2 and KN2.

C. Any prefix will be considered legitimate if its use was licensed or permitted by the governing authority in that country since Nov. 15, 1945.

D. A suffix would designate portable operation in another country or call area and would count only if it is the normal prefix used in that area. For example, K4IIF/KP4 would count as KP4. However, KP4XX/7 would NOT count as KP7 since this is not a normal prefix. Suffixes such as /M, /MM, /AM, /A and /P are not counted as prefixes. (See also rule 3E). An exception to this rule is granted for portable operation within the issued call area. Thus contacts with a special prefix such as WS2-JRA/2 counts for WS2, however, WS2JRA/3 would count for W3.

E. All calls without numbers will be assigned an arbitrary 0 plus the first two letters to constitute a prefix. For example, RAEM counts as RA0, AIR as AI0, UPOL is UP0. All portable suffixes that contain no numerals will be assigned an arbitrary 0. For example, W4BPD/LX counts as LX0 and WA6QGW/PX counts as PX0.

VPX

The VPX or Verified Prefixes Award can be earned by Short Wave Listeners (s.w.l.s) who possess QSL cards confirming reception of at least 300 different amateur prefixes. No Mode endorsements are available. Applications are submitted to the Assistant DX Editor in accordance with WPX rules.

WPNX

The WPNX Award can be earned by U.S.A. Novices who work 100 different prefixes prior to receiving a higher class license. The application may be submitted after receiving the higher license providing the actual contacts were made as a Novice. Prefixes worked for the WPNX Award may later be used for credit toward the WPX Award.

The rules for the WPNX Award are the same as for WPX except that only 100 prefixes must be confirmed, and applications are sent to the Assistant DX Editor.

WPX HONOR ROLL

6. WPX Honor Roll

The WPX HONOR ROLL recognizes those operators and stations that maintain a high standing in confirmed, current prefixes. The rules, therefore, reflect the belief that Honor Roll membership should be accessible to all active radio amateurs and not to be unduly advantageous to the "old timers." With the exceptions listed below, all general rules for WPX apply toward Honor Roll credit.

A. Only current prefixes may be counted toward WPX HR standings; those prefixes to be listed and updated annually in CQ or available from the Assistant DX Editor.

B. Special Issue prefixes, i.e., 3C, 4A, OF, etc. will be considered current during their existence and for five years after the date of last issuance after which time they will be deducted as credit for Honor Roll standings.

C. Honor Roll applicants must submit their list of current prefixes (entire call required) separate from their regular WPX applications. Forms are available for this purpose and their use is highly recommended. WPX HR applications may be obtained by sending a self-addressed stamped envelope (or 1 IRC) to the Assistant DX Editor. A separate application must be made for each mode.

D. A filing charge of $1.00 is required for each original WPX Honor Roll application.

E. Endorsements for the Honor Roll may be made for 10 prefixes or more. An SASE or IRC should be included.

The CQ DX Award Programs

Applications:

1. The *CQ* CW DX Award and CQ SSB DX Award are issued to any amateur station submitting proof of contact with 100 or more countries (See Rule 3) on c.w. or s.s.b. Applications should be submitted on the official CQ DX Award Application. (CQ Form 1067B)
2. All QSO's must be 2 Way S.S.B. or 2 Way C.W.—cross mode or 1 Way QSO's are not valid for the *CQ* DX Awards. QSL's must be listed in alphabetical order by prefix and all QSO's must be dated after November 15, 1945. Except for the Mobile endorsement, all QSO's must be made from the same call area.
3. QSL cards must be verified by one of the authorized checkpoints for CQ DX awards, or must be included with the application. If cards are sent directly to the Award Manager, postage for their return by first class mail must be included. If Certified or Registered mail return is desired, sufficient postage should be included.
4. Country endorsements for 150, 200, 250, 275, 300, 310, and 320 countries will be issued. (See Rule 3.)
5. To promote multi-band usage and special operating skills, special endorsements are available as shown:
   A. A 28MHz Band endorsement for 100 or more countries confirmed on the 28MHz band.
   B. A 3.5/7MHz Band endorsement for 100 or more countries confirmed using any combination of the 3.5 and 7MHz bands.
   C. A 1.8MHz Band endorsement for 50 or more countries confirmed on the 1.8MHz band.

(Continued on page 72)



Contest Calendar

BY FRANK ANZALONE, W1WY

The results of the 1955 World Wide DX Contest, the first one that I was involved with, appeared in the May 1956 issue of *CQ*. That adds up to over 20 years that I have been part of the *CQ* contests program. From a modest total of about 1000 entries in the '55 contest we exceeded over 3500 in last year's affair.

We are especially proud of the large selection of Trophies we award, 30 in the October and November classic, and 9 in the WPX SSB in March.

We are cognizant of the fact however that it's only through the generosity of the many dedicated donors that this program is possible. Bill Leonard, W2SKE and Larry LeKashman, W2AB started the sponsorship almost 20 years ago, soon followed by Buzz Revees, K2GL, Don Wallace, W6AM, Don Miller, W9WNV and many, many others. Much too large a list to cover here.

Contact me if you as an individual or as a club want to sponsor an award or a memorial. There are a few spots available, especially in the WPX Contest.

Would also like to hear from some of you fellows that do a lot of traveling and could possibly help us get some of these awards to overseas winners we find it difficult to reach.

Through a misunderstanding I listed the YZ-30 Contest in last month's Calendar as a 1976 affair. Actually it was run last year and the announcement was in reference to certificates that are available to those working the contest in 1975. My apologies.

73 for now, Frank, W1WY

Mass. Bi-Centennial QSO Party

Starts: 0000 GMT Saturday, May 1
Ends: 2400 GMT Sunday, May 2

Sponsored by the South Shore Repeater Assoc. and endorsed by the Mass. Bi-Centennial Commission this year's party will put emphasis on the Bi-Centennial celebration.

The same station may be worked once per band. Phone and c.w. are considered separate bands. No cross-band or repeater contact are permitted. Mass. stations may work each other for QSO points but not a section multiplier.

Exchange: RS(T) and QTH. County for Mass., and ARRL section or DX country for others.

Scoring: Two points for each completed QSO. Mass. stations multiply total by (Mass. counties + ARRL sections + DX countries) worked. Out-of-state stations multiply total QSO points by different Mass. counties worked. (max. 14)

Frequencies: C.W. — 1810, 3560, 7060, 14060, 21060, 28060. Phone—1820, 3960, 7260, 14290, 21390, 28590, 50.110, 146.52. Novice—3720, 7120, 21120, 28120.

Awards: Distinctive awards and certificates for working all Mass. counties. Separate awards for v.h.f. entries.

Mailing deadline July 15th to: South Shore Repeater Assoc., c/o R. J. Doherty, W1GDB, RFD #1, 14 Pine St., Sandwich, Mass. 02563. Include a s.a.s.e. for results and awards.

Calendar of Events

May	1-2	Massachusetts QSO Party
**May	1-2	Swiss "H-22" Contest
*May	1-3	Connecticut QSO Party
*May	8-9	Bermuda C.W. Contest
*May	8-9	Vermont QSO Party
*May	8-10	Georgia QSO Party
*May	14-16	YL ISSBers QSO Party
*May	15-17	Michigan QSO Party
*May	22-23	USSR "M-CQ" Contest
*May	22-23	Wisconsin QSO Party
*May	22-23	New York State QSO Party
May	23-24	Nostalgia Radio Exchange
June	4-7	CHC/FHC/HTH Party
June	5	6 Meter "SMIRK" QSO Party
June	5-6	SOWP C.W. QSO Party
June	5-6	Minnesota QSO Party
June	12-13	RSGB National Field Day
June	12-13	ARRL VHF QSO Party
June	12-14	West Virginia QSO Party
†June	19-20	All Asian Phone Contest
June	26-27	ARRL Field Day
July	3-4	Venezuelan Phone Contest
July	3-25	Space Net VHF Contest
July	17-19	County Hunters C.W.
July	24-25	Venezuelan C.W. Contest
July	24-25	ARRL Bi-Centennial
Aug.	7-8	10-10 Net QSO Party
Aug.	14-15	European C.W. Contest
Aug.	21-22	All Asian C.W. Contest
Aug.	21-23	New Jersey QSO Party
Sept.	11-12	European Phone Contest

*Covered in April Calendar
**Covered in March Calendar
†Not official

Nostalgia Radio Exchange

Starts: 1800 GMT Sunday, May 23
Ends: 0100 GMT Monday, May 24

The Southeast A.R.C. of Cleveland, Ohio is again sponsoring this unusual activity.

The object is to work stations using old rigs with your nostalgia rig. A Nostalgia Rig will be defined as any gear built since 1945, but must be at least 10 years old. You can also participate with your present equipment.

(Ed: Make sure your signal meets the present day standards however.)

The same station may be worked on each band and mode, but no a.m. phone below 21 MHz.

Exchange: Name, RS(T), state, province or DX country and transmitter type. (ie: home brew using 807 tube and etc.) Also any other interesting information.

Scoring: Non-contestant QSOs 1 point, "NX" QSOs 3 points. Multiply total QSO points by (different xmtrs. + states + provinces + DX countries) worked on each band. Multiply that total by your Nostalgia multiplier. (Total years old of your transmitter and receiver. If transceiver multiply age by two.)

Different transmitters and receivers may be used by one station. Figure score separately for each and combine for total score.

Frequencies: C.W.—70 kHz from low edge of each band. Phone — 3910, 7280, 14280, 21380, 28580. Novice—3720, 7120, 21120, 28120.

Awards: Certificates will not be awarded for the highest score but unusual and ingenius experiences,

circumstances, achievements will be taken into consideration.

Send logs, comments, anecdotes to: Southeast A.R.C., Att: Stu Stephens, W8KAJ, 2836 Queenston Road, Cleveland Heights, Ohio 44118.

IARS/CHC/FHC/HTH QSO Party

Starts: 2300 GMT Friday, June 4
Ends: 0600 GMT Monday, June 7

A s.a.s.e. to K6BX will get you more detailed information.

Exchange: QSO no., RS(T), name, CHC/FHC no., state, county or similar division, Non-members send HTH instead of no.

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

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

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

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

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

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

6 Meter "SMIRK" QSO Party

From 1100 to 0500 GMT Saturday, June 5

The party is open to all but only scores of SMIRK members are eligible for awards.

Exchange: Call, state or country and SMIRK number if you are a member.

Scoring: Number of contacts × states + countries worked for your final score.

Only necessary to submit a copy of your scoring showing number of contacts and states / countries worked, and your final score. You may be requested to submit your log later so have a copy available.

Certificates to each state winner and to the overall high scorer.

Include a s.a.s.e. for a copy of the SMIRK Newsletter with the party results.

Mailing deadline July 1st to: Ray Clark, K5ZMS, 7158 Stone Fence Drive, San Antonio, Texas 78227.



These are the type of Plaques that Tony Slapkowski, K4AWS (ex-WB2MTU) handed out in previous VHF Space Net contests. Something worthwhile to shoot for in the coming Space Net VHF activity in July.

Minnesota QSO Party

Starts: 0001 GMT Saturday, June 5
Ends: 0500 GMT Sunday, June 6

The Heartland A.R.C. is the sponsor of this year's party. Phone and c.w. are separate contests, there are no restrictions as to mode or operating time but only one transmitter may be used at one time. Crossband or repeater contacts are also not allowed.

Exchange: RS(T) and QTH. County for MN stations, ARRL section or DX country for others.

Scoring: One point per QSO, 3 points if its with a Novice. MN stations multiply total QSO points by ARRL sections and DX countries worked. Others multiply QSO points by MN counties. (max. 87)

Multiply final score by 1.5 if using 250 watts or less input power.

Frequencies: C.W. — 1810, 3535, 7035, 14035, 21035, 28035, 50050, 144050. Phone—1850, 3950, 7235, 14330, 21365, 28525, 51000, 2 meter simlex. Novice — 3725, 7125, 21125, 28125. Avoid nets or traffic frequencies.

Awards: None mentioned but appropriate awards will be given.

Stations making 50 or more QSOs must include a check sheet for each band and mode used.

Look for a possible special events call station, call unknown at this time. Contacts will be worth 5 points on each band and mode.

Logs must be received by July 9th and go to: HARC c/o Steven J. Gardner, WBØMAO, P.O. Box 261, Staples, Minn. 56479. Include s.a.s.e. and equipment description.

SOWP Bi-Centennial C.W. QSO Party

Starts: 1200 GMT Saturday, June 5
Ends: 2400 GMT Sunday, June 6

The Society of Wireless Pioneers (SOWP) an organization of professional wireless operators both active and retired are sponsoring this one.

Exchange: RST, city and state, and SOWP membership number.

Frequencies: 55 kHz up from low end of each band. Novice, mid-frequency of novice band.

A special certificate will be awarded to all member stations who submit a log showing 10 or more contacts with fellow members.

(Evidently this activity is for SOWP members only. It would seem fitting that all wireless pioneers should have been invited to participate. Ed.)

Mailing deadline is June 15th to: Bill Willmot, K4JPF, 1630 Venus Street, Merritt Island, Fla. 32952.

RSGB National Field Day

Starts: 1700 GMT Saturday, June 12
Ends: 1700 GMT Sunday, June 13

While stations outside Great Britian are not eligible to enter this activity on a competitive basis you can contact the British portables and submit your check log.

A certificate will be awarded to the overseas station in each continent whose log shows that he contributed the most contacts to the competing stations.

Send your logs to: RSGB HF Contests Committee, c/o A. Davis, 41 Gainsborough Road, Crawley, Sussex RH10-5LD, England.

West Virginia QSO Party

Starts: 0100 GMT Saturday, June 12
Ends: 0059 GMT Monday, June 14

This one is sponsored by the West Virginia State Radio Council. The same station may be worked on each band for contact points, and W. Va. stations may also work each other.

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

Scoring: W. Va. stations multiply total QSOs by (W. Va. counties + states + countries) worked. Multiply total by power multiplier.

Out-of-state multiply total W. Va. QSOs by W. Va. counties worked. (max. of 55) And multiply total by power multiplier.

A power multiplier of 1.5 for stations using 200 watts or less input.

Frequencies: C.W.—35 kHz inside each c.w. band. Phone—10 kHz inside "General" portion of each phone band.

Awards: To the 1st, 2nd and 3rd highest scoring W. Va. stations, and top scores in each state and country. (Single operator only)

Logs must be received no later than July 17th and go to West Virginia QSO Party, P.O. Box 299, Dunbar, West Virginia 25064.

All Asian DX Contest

Phone: June 19-20—C.W.: Aug. 21-22
Starts: 1000 GMT Saturday
Ends: 1600 GMT Sunday

Classifications: Single operator, single transmitter all band only. (No multi xmtr.)

Exchange: For OM's, RS(T) plus age of operator. For YL's, RS(T) plus 00.

Scoring: One point per QSO. Asians use non-Asian countries for their multiplier. (ARRL DXCC list) Non-Asians use prefixes of Asian countries worked for their multiplier. (*CQ* WPX list) Note: Ogasawara JD1 (Bonin & Volcano) are in Asia. Minamitori Shima JD1 (Marcus) is in Oceania.

Final Score: Total QSOs from each band times the sum of the multiplier on each band.

Awards: To the highest scorers, both phone and c.w. as follows: Single operator, all band in each country and USA call areas, up to the 5th rank where returns justify. Single band and multi-operator each country only. Continental leaders will receive a medal in addition to the certificate.

Logs: Keep all times in GMT, fill in country or prefix column only first time it is worked, and use a separate sheet for each band. A summary sheet showing the scoring and other information, and a signed declaration is also requested.

Things to remember: Disqualification regulations are strictly enforced so check your log carefully. On 3.8 MHz the JA's use 3793—3802. Non-Asians use prefixes for their multiplier, not countries. Club stations are classed as multi-operator. Each operator of a multi station will give his age in the exchange. KA contacts do not count.

Logs must be received no later than Sept. 30th for phone entries and Nov. 30th for the c.w. section. Logs go to: J.A.R.L. Contest Committee, P.O. Box 377, Tokyo Central, Japan. Include an IRC and s.a.e. for copy of results.

Asia Country List: A4X, A51, A6X, A7X, A9X, AC3, AP, BV, BY, CR9, EP, HL/HM, HS, HZ/7Z, JA/JE/JF/JG/JH/JR, JD1 JT, JY, OD5, S21, TA, UA/UK/UV/UW9-0, UD6/UK6C-D-K, UF6/UK6F-O-Q-V, UG6/UK6G, UH8/-UK8H, UI8/UK8A-G-I-L-O-T-Z, UJ8/-UK8J-R, UL7/UK7, UM8/UK8M-N, VS6, VS9M/8Q6, VU, VU (Andaman) VU (Laccadive) XU, XV/3W8, XW8, XZ, YA, YI, YK, ZC4/5B4, IS9 (Spratly) 4W, 4X/4Z, 7O (S. Yemen) 7O/-VS9K (Kamaran) 8Z4, 9K2, 9M2, 9N1, 9V1.

Venezuelan Contest

Phone: July 3-4—C.W.: July 31-Aug. 1
Starts: 0000 GMT Saturday
Ends: 2400 GMT Sunday

This is a world wide type contest, all bands 10 thru 80. There are four categories, single operator, single and all bands, and multi-operator, single and multi transmitter, all band only.

Exchange: RS(T) report plus a 3 figure QSO number starting with 001.

Points: Contacts between stations in different countries 2 points. Between stations in the same country zero points, but permitted for multiplier credit.

Multiplier: One for each country and each YV call area contacted on each band.

Final Score: Total QSO points multiplied by sum of different countries and YV call areas worked on each band.

Awards: Trophies to the top scorers in each category. Medals to the winners in the following areas: Caribbean, Central America, No. America, So. America, Europe, Asia, Oceania and to the top s.w.l. scorer. Certificates to all stations making following totals: Caribbean, Central, North and South America, 20 YV's and 10 other countries for s.s.b., 15 YV's for c.w. Europe and Africa, 10 YV's and 10 other countries. Asia and Oceania, 5 YV's and 10 other countries. S.W.L., 50 complete QSO exchanges at least 10 of which must be YV's.

Times must be logged in GMT, indicate multiplier only first time it is worked on each band, and use a separate sheet for each band. Include a summary sheet showing the scoring and other information, and the usual signed declaration. The usual disqualification rules will be in effect.

A remittance of $2.00 or its equivalent in IRC's is requested with each certificate application. Deadline for mailing is Sept. 15th for phone and Oct. 15th for c.w. to: Radio Club Venezolano, P.O. Box 2285, Caracas 101, Venezuela.

VHF Space Net Round-up

July 3/4, 10/11, 17/18, 24/25
6 P.M. Saturday to 9 P.M. Sunday
Local Time each Weekend.

The Space Net VHF program is being reactivated by Tony Slapkow-

(Continued on page 72)



GEORGE JACOBS, W3ASK, ON

Propagation

The declining sunspot cycle is still making news. The Swiss Federal Observatory at Zurich reports a monthly mean sunspot number of 4.6 for February, 1976. This is the lowest level of activity observed during the present cycle, and it is still expected to go lower. During February, there were 17 days when the sun's surface was completely devoid of spots, including the entire period between February 1 and 12.

February's mean number results in a smoothed sunspot number of 14 centered on August, 1975. A smoothed number of 6 is forecast for this month, as the present cycle gets nearer and nearer to its minimum value.

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

10 Meters: Very few DX opportunities expected on this band during the present period of very low solar activity. An occasional opening may be possible towards South America during the afternoon hours, when conditions are High Normal, or better. Frequent short-skip openings between distances of approximately 750 and 1400 miles, however, should be possible on many days.

15 Meters: A decrease in DX openings on this band is normal for May and the summer months. Some fairly good openings should still be possible towards South America when conditions are at least Low Normal, and towards southern Africa and the South Pacific occasionally when conditions are High Normal, or better. Best time to check the band for DX is during the afternoon hours. Numerous short-skip openings, between approximately 600 and 2300 miles, should be possible on most days.

20 Meters: This is expected to be the best band for DX propagation during May. Opening shortly after sunrise, good DX conditions are expected to one area of the world or another, throughout most of the day and well into the evening hours. Conditions should peak for an hour or two after sunrise and again during the late afternoon hours, with openings possible to most areas of the world. When propagation conditions are at least High Normal, the band may remain open to many areas of the world through the early evening and well into the hours of darkness. Very frequent short-skip openings are also expected throughout the day, ranging between approximately 350 and 2300 miles. Quite often, especially during the afternoon hours, optimum conditions may exist for both short and long skip, with stations a few hundred miles away QRMing DX stations.

40 Meters: Shorter hours of darkness and seasonally higher static will mean somewhat fewer DX openings on this band during May. Some fairly good ones, however, should still be possible. Check from about an hour before sundown, through the hours of darkness, and until shortly after sunrise for openings to many areas of the world. Good daytime short-skip openings can be expected over distances between 150 and 750 miles, with nighttime openings extending up to the one-hop limit of 2300 miles.

80 Meters: Fewer DX openings are also expected on this band during the month. It's worth checking, however, during the hours of darkness and the sunrise period for what could often be some fairly good openings to several areas of the world. Excellent short-skip openings are expected throughout the daylight hours over distances ranging between approximately 50 and 250 miles. During the hours of darkness, the short-skip range will increase out to about 1800 miles, and considerably further when static levels are low.

160 Meters: Propagation conditions on this band have passed their seasonal peak, and will be on the decline until early fall. Openings up to distances of at least 1000 miles should still be possible during the hours of darkness, and over considerably greater distances at times when static levels are low.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For May 1976

	Expected Signal Quality			
Propagation Index	(4)	(3)	(2)	(1)
Date				
Above Normal: 16	A	A	B	C
High Normal: 9, 13, 15, 17	B	B	C	D
Low Normal: 6-8, 10-12, 14, 18, 24-26, 28-31	B	C	D	E
Below Normal: 2-5, 19-20, 22-23, 27	C	D	E	E
Disturbed: 1, 21	D-E	E	E	E

Where *expected signal quality is:*

A—Excellent opening, exceptionally strong, steady signals greater than S9+30 dB.

B—Good opening, moderately strong signals varying between S9 and S9+30 dB, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and 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 band opening for any day of the month. For example, a path shown in the Charts with a propagation index of (3) will probably *not open* on May 1 (E), will be *poor* May 2-5 (D), and *fair* May 6-8 (C), etc.

For updated information dial Area Code 516-883-6223 for DIAL-A-PROP, subscribe to bi-weekly MAIL-A-PROP, P.O. Box 86, Northport, NY 11768, or check WWV at 14 minutes past each hour.

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 (15 through 80 Meters) for a particular geographical region of the continental USA, as shown in the left hand column of the Charts. A ** indicates the best time to listen for 10 meter openings; * best times for 160 meter openings.

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

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

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

3. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. On the Short-Skip Chart appropriate *standard* time is used at the *path midpoint*. For example, on a circuit between Maine and Florida, the time shown would be EST; on a circuit between N.Y. and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones, *add* 2 hours in the PST zone; 3 hours in MST zone, 4 hours in CST zone; and 5 hours in EST zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 P.M. in Los Angeles; 17 or 5 P.M. in Washington D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* in other areas of the USA, *subtract* 8 hours in the PST zone, 7 hours in MST zone, 6 hours in CST zone and 5 hours in EST zone. For example, at 20 GMT it is 15 or 3 P.M. in N.Y.C.

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.

V.h.f. Ionospheric Openings

Sporadic-E ionization usually increases considerably during May, and some fairly frequent *6 meter* short-skip openings should be possible. Openings are most likely to occur over distances between approximately 1000 and 1400 miles. Best times to check are between 10 a.m. and 2 p.m. and between 6 and 10 p.m., local daylight time, although sporadic-E ionization can occur at other times as well. When ionization is very widespread and intense, two-hop openings considerably beyond 1400 miles may be possible for brief periods on *6 meters*, and short-skip openings between approximately 1200 and 1400 miles may also be possible on *2 meters*.

By checking short-skip conditions on *10 meters*, you can often get a good idea about possible openings on *6 meters*. When the shortest skip you hear on *10 meters* is down to 500 miles, or less, be sure to check *6 meters* for openings in the same general direction. The same rule applies to *6* and *2 meter* openings. When sporadic-E openings are down to about 500 miles on *6 meters*, check *2 meters* fast for possible skip openings as well.

The *Eta Aquarids* meteor shower should intersect the earth's atmosphere between May 3 and 5. This is usually a major shower, and it should reach maximum intensity during the evening of May 4, with a predicted hourly meteor count in excess of 20. Chances are good for meteor-burst short-skip openings during the period of the shower.

Not much auroral activity is expected during May, although some may occur during periods of radio storminess. 73 ,George, W3ASK

CQ Short-Skip Propagation Chart

May & June, 1976

Local Daylight Savings Time At

Path Mid-Point (24-Hour Time)

Band (Meters)	*Distance Between Stations (Miles)*			
	50-250	*250-750*	*750-1300*	*1300-2300*
10	*Nil*	08-09 (0-1) 09-13 (0-2) 13-17 (0-1) 17-21 (0-2) 21-23 (0-1)	08-09 (1) 09-13 (2) 13-17 (1-2) 17-21 (2) 21-23 (1) 23-07 (0-1)	08-09 (1-0) 09-21 (2-0) 21-23 (1-0) 23-07 (1-0)
15	*Nil*	07-09 (0-1) 09-13 (0-2) 13-17 (0-1) 17-21 (0-2) 21-00 (0-1)	07-09 (1-2) 09-13 (2-3) 13-17 (1-2) 17-19 (2-3) 19-21 (2) 21-00 (1) 00-07 (0-1)	07-09 (2-0) 09-13 (3-1) 13-17 (2-1) 17-19 (3-1) 19-21 (2-0) 21-07 (1-0)
20	*Nil*	07-09 (0-2) 09-12 (0-3) 12-17 (0-4) 17-19 (0-3) 19-23 (0-2) 23-07 (0-1)	07-08 (2) 08-09 (2-3) 09-12 (3-4) 12-17 (4) 17-19 (3-4) 19-20 (2-4) 20-21 (2-3) 21-23 (2) 23-07 (1)	07-08 (2) 08-09 (3-2) 09-15 (4-2) 15-17 (4-3) 17-20 (4) 20-21 (3) 21-23 (2) 23-07 (1)
40	08-10 (0-2) 10-16 (1-4) 16-18 (2-4) 18-20 (1-3) 20-22 (0-2) 22-08 (0-1)	08-10 (2-4) 10-15 (4-2) 15-16 (4-3) 16-19 (4) 19-20 (3-4) 20-22 (2-3) 22-08 (1-2)	08-09 (4-3) 09-10 (4-2) 10-15 (2-1) 15-16 (3-1) 16-19 (4-2) 19-20 (4) 20-22 (3-4) 22-01 (2-4) 01-03 (2-3) 03-08 (2)	08-09 (3-1) 09-10 (2-1) 10-16 (1-0) 16-19 (2-1) 19-20 (4-3) 20-01 (4) 01-03 (3) 03-06 (2) 06-08 (2-1)
80	08-10 (4) 10-18 (4-3) 18-20 (4) 20-22 (3-4) 22-00 (2-4) 00-06 (2-3) 06-08 (3-4)	08-10 (4-1) 10-16 (3-0) 16-18 (3-1) 18-20 (4-2) 20-00 (4) 00-06 (3-4) 06-08 (4-3)	08-09 (1) 09-10 (1-0) 10-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-3) 22-02 (4) 02-06 (4-3) 06-08 (3-2)	08-09 (1-0) 09-18 (0) 18-20 (1-0) 20-22 (3-2) 22-02 (4-3) 02-06 (3-2) 06-08 (2-1)
160	06-09 (4-1) 09-10 (2-0) 10-19 (1-0) 19-21 (3-1) 21-23 (4-2) 23-06 (4-3)	06-09 (1) 09-19 (0) 19-21 (1-0) 21-23 (2-1) 23-01 (3-2) 01-04 (3) 04-06 (3-2)	08-09 (1-0) 09-21 (0) 21-23 (1) 23-01 (2-1) 01-04 (3-2) 04-07 (2) 07-08 (1)	08-21 (0) 21-01 (1) 01-04 (2) 04-06 (2-1) 06-07 (1) 07-08 (1-0)

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

ALASKA

Openings Given In GMT #

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

HAWAII

Openings Given In HST #

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

* Indicates best time for 160 Meter openings.
** Indicates best time for 10 Meter openings.
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.

Changing QTH?

Moving is often exciting, hectic and confusing. It's packing, shipping, saying goodbye to friends and leaving them behind. Don't say goodbye to CQ and leave us behind for the new folks to read. Give us about 6 weeks notice and CQ will be there about the same time you get the last carton unpacked. You won't miss a single great issue.

Attach Current Mailing Label

New Address

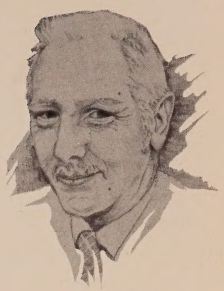
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Address _____
City _____
State _____ Zip Code _____

cut out, paste on post card and mail to:

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

A. EDWARD HOPPER, W2GT, ON

Awards



The "Story of The Month" for May, as told by Paul is:

Paul Bugen, WA3TUC

Born in Easton, Pennsylvania and graduating from Lafayette College, Paul went to Washington, D.C. where he got a Civil Service job with the Treasury so that he could go to Georgetown Law School at night. Passed the bar of the District of Columbia but has never practiced law, having transferred to the Internal Revenue Service in 1937. Joining the Intelligence Division of IRS in January 1941 in Detroit where he stayed until going into the Army in April 1943. Immediately joined the Counter-Intelligence Corps, ultimately winding up with the detachment assigned to the 104th Infantry Division and earned a Bronze Star in the European Theatre of operations.

Decided, while overseas, that he wanted to be closer to the folks in Easton, so on returning from service, he transferred to the Philadelphia office in 1946. Stayed there, married the best stenographer in the office in 1947 and wound up with 3 daughters, Sharon (married with one daughter), Stephanie, a recent graduate of Penn State, and Marsha (married) a technician in the X-Ray department of Abington Hospital.

Transferred to the Camden District office in 1954, Paul supervised a group of 15 Special Agents and stayed until 1963 when he was detailed to New York City to supervise a group of 15 Special Agents who were brought in from all over the country to work with the Inspection Division in trying to house-clean the Manhattan District office. In 1964 he joined the staff of the Assistant Regional Commissioner-Intelligence, Philadelphia as a Reviewer-Conferee where he stayed until retirement in June 1972.

In 1966 it was discovered that he had angina and in September 1968 he had a mild infarction. Angina became worse and in early 1972 he had a cardiac catherization, followed by a double coronary artery bypass. While recuperating in the hospital, he received a package from K1WPS (brother), containing 3 of the ARRL books, but Paul was hurting and could not get interested. He visited Paul about the time he retired and left his "old Drake R-4A" and they strung a wire around the house. After several months of listening, a visit to neighbor, W3EY, brought a promise of help in getting a license, although he said that Paul was the "Oldest f--t" he ever helped. On the air about Thanksgiving time, 1972 with lots of fun on c.w., then much hard work on code and technical stuff during the summer of 1973, took General exam the last week of August 1973 and luckily passed as he went back to the hospital on Labor Day. Thus missed his youngest daughter's wedding day on September 16, and when they finished testing him, they discovered one of the by-passes had closed down. So in mid-October they opened him up again and by-passed the bad by-pass. When he got home he found that his brother had come down from Marblehead, and with the assistance of some other ham friends, had moved the shack to the 2nd floor and had also left his "old Yaesu FT-101" so Paul could work phone, when he felt better.

One of Paul's friends/neighbors, John Bizik, W8DYK/P3 had become interested in County Hunting through Bob Brown, WA3VLB, and they got Paul working on it. Worked his first County on the 20 meter net on 11-14-73 and on the 75 meter net 11-20-73. Now has his own Yaesu FT-101B with SB-220 linear and a Classic 33 beam on one section of a Rohn tower on the peak of the roof and a Hy-Gain trap-dipole on 40 and 75. County Hunting has been a God-send to a retired "old man" of 62, and Paul has truly enjoyed the great bunch of guys and gals who are found on the nets.

Paul has taken a few trips with his Yaesu in the car to help repay the many who have helped him. On one trip to Michigan he gave out about 25 counties in Michigan, Indiana and Ohio. Has terrific ignition noise on 20 but he and his ham "God-father, W3EY hope to get rid of that.

Paul has close to 3000 counties confirmed and will continue to work for that magic number *(All)* as time permits. Again thanks to a most wonderful group, he has enjoyed every single minute spent County Hunting.

Special Honor Roll (All Counties)

#141— David E. Manescu, W6CCM 2-12-76.

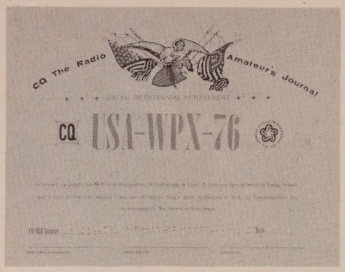
Awards Issued

Dave Manescu, W6CCM made them *All,* endorsed All 14MHz; All S.S.B. and All Mobiles. Naturally he also made USA-CA-3000. Dave cautions you to *not* wait until you have them *All* to do your paper work, it took him 12 hours to do his.

Jim Lucht, WA7VGA applied for USA-CA-2000.



Paul Bugen, WA3TUC.



The new USA-WPX-76 Award.

Justino Ramiro Santos, CT1UA added USA-CA-1500 endorsed All S.S.B.; #1 to CT1, to his collection.

Tom Hoot, WB5HIG was sent USA-CA-1000 endorsed All S.S.B.; All Mobiles and USA-CA-1500, Mixed.

Anthony Baltuz, K3QJJ acquired USA-CA-500, 1000 and 1500 endorsed All S.S.B.

Curt George, W4SSU qualified for USA-CA-500 and 1000 endorsed All S.S.B.; All Mobiles.

Lawrence Moore, K6SLP claimed USA-CA-500, All A-3.

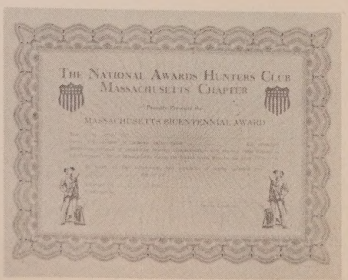
Presley Foster, WB5HBO had me send him USA-CA-500, endorsed All S.S.B.; All 20; All Mobiles.

Andrew Isar, WA3PMI won USA-CA-500.

R. L. Robertson, WA5TPO was issued USA-CA-500.

Awards

USA-WPX-76 Award: This Special Bicentennial Achievement Award sponsored by *CQ* is available to any licensed amateur in the world, also an s.w.l. version is available. Full rules page 27, October '75 *CQ* or send s.a.s.e. to Bernie Welch, W8IMZ, 7735 Redbank Lane, Dayton, Ohio 45424. Basic rules require a station to contact a total of 200 stations using their special Bicentennial prefix calls. 35 of the 200 must be different prefixes——no QSL cards required and the Award is FREE. Send list of the 35 different prefix



Massachusetts Bicentennial Award.

stations in one column, the remaining 165 in four other columns certified by two amateurs or one club officer. Note paragraph 4 of the rules regarding mobile stations, should interest County Hunters.

Virginia Independence Bicentennial Award: Sponsored by the Richmond Amateur Radio Club and issued for confirmed contacts, one each with the original 13 colonies (Connecticut, Delaware, Georgia, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina and Virginia) and 5 with Richmond, Virginia stations. The five are in addition to the other Va. contact thus 18 are necessary and they must be made between January 1 and December 31, 1976. Send 75¢ and alphabetical list of calls, giving



Justino Ramiro Santos, CT1UA checking his USA-CA Record Book.

date, GMT time, and mode. List shall be certified by 2 other licensed amateurs or an officer of the local radio club, certifying that the applicant has the QSLs in his possession. Send to The Richmond Amateur Radio Club, P.O. Box 73, Richmond, VA. 23201.

San Jose Bicentennial Award: The City of San Jose celebrates its Bicentennial in 1977 and contacts between July 1, 1976 and December 31, 1977 will count. The Award is sponsored by the radio amateurs of Santa Clara County (of which, San Jose is the County Seat) who are members of the Santa Clara County Amateur Radio Association (SCCARA) 200 points are required and awarded on the basis of the QTH of the station requesting the award, as follows: The total of stations worked must include a specified minimum of SCCARA members. Stations outside the 6th call area must work at least two SCCARA members, and each contact will count 25 points. Stations within the Sixth District but outside of Santa Clara County must work at least 5 SCCARA members, with each counting for 10 points. Stations located within Santa Clara County must work at least 10 SCCARA members, for a point count of 5 points each.

Contacts with the club stations, W6UW or W6UU, will count as follows: for stations outside the Sixth District, 50 points; for stations within the Sixth District but outside Santa Clara County, 20 points; and for stations in Santa Clara County, 10 points. Only *1* such contact will be allowed—W6UW *or* W6UU—not both.

Santa Clara County Stations other than SCCARA members will be worth 2 points each to stations outside the county and 1 point each to other stations within the county. Contacts with stations anywhere in the Pacific Division will be worth 1 point to stations outside the Division. Contacts may be made by any mode on any band, but each station can be credited only once, regardless of how many bands or modes are used. No credit for contacts via repeaters, except that contacts via Oscar will be credited per previous rules. An endorsement for all phone or all c.w. contacts will be available. Send log data (station worked, date, time, mode and name of the operator) with one U.S. Dollar ($1.00) or 5 IRCs (latest type only!!) to: The Club Secretary, SCCARA, P.O. Box 6, San Jose, CA. 95103.

Massachusetts Bicentennial Award: Issued for contacts with Massachusetts amateurs during January 1, 1975 and December 31, 1976. Contacts through repeaters are acceptable. Mass. amateurs need 200 points, the rest of the U.S. need 100 points. DX (including KH6 and KL7) and v.h.f. outside the first call area need 50 points.

Each contact with a MA. station is 2 points. Contacts with MA. stations in Cities & Towns having historical significance or bearing the name of an American Revolution era important person, are 4 points. Such Cities and towns are: Adams, Boston, Cambridge, Clinton, Concord, Franklin, Hamilton, Hancock, Huntington, Lee, Lexington, Lincoln, Marion, Middleton, Montgomery, Mount Washington, North Adams, Otis, Quincy, Revere, Washington and Warren (Lee is Charles Lee, signer of the Declaration of Independence, not Robert E. Lee, and Lincoln is Major Gen'l. Benjamin Lincoln, Quartermaster of the Continental Army).

Double points may be claimed for contacts on any of the four MA. historical holidays of March 17th (Evac-

USA-CA Honor Roll

3000	1500	500
W6CCM .163	CT1UA ..290	K6SLP .1087
2000	WB5HIG 291	WB5HBO 1088
WA7VGA 243	K3QJJJ .292	WA3PMI 1089
	1000	W4SSU 1090
	WB5HIG 385	K3QJJ .1091
	W4SSU .386	WA5TPO 1092
	K3QJJ ..387	

uation Day), April 19th (Patriot's Day), June 17th (Bunker Hill Day), and July 4th (Independence Day). MA. stations may be worked only once except that a station may be worked a second time if mobile, and stations may be worked again on any or all of the bonus holidays listed.

QSL cards are *not* required. Send log data only, showing station worked, time, date, and band and mode plus City or Town. Indicate points claimed for each contact. Certificates will be endorsed for band and mode. There is NO charge for the certificate but applicant must enclose a self-addressed stamped envelope with sufficient postage for the return of your certificate. (DX may include 1 IRC). Submit application to: William Holliday, WA1EZA, 22 Trudy Terrace, Canton, MA. 02021.

DIG Awards Program: This Diploma Interests Group/Diplom Interessen Grouppe of Germany is the largest Awards Hunters Organization in Europe, with close to 1500 members in 49 countries. They have a large awards program and for information/rules may I suggest you send s.a.s.e. to DIG-Secretary, Eberhard Warnecke, DJ8OT, 562 Velbert, Postbox 1244, Germany.

Notes

Do NOT forget the 1976 CW County Hunters Contest, 0000 GMT 17 July to 0600 GMT 19 July 1976. See "Contest Calendar" by Frank Anzalone, W1WY for full details. Frequencies are 3575, 7055, 14070, 21070 and 28070 MHz.

The *Road Runner* is a weekly listing of mobile trips that are scheduled for the next ten days, and is an attempt to provide timely, accurate data to all County Hunters. The Road Runner will be distributed *free* to all who desire it. Send s.a.s.e. for further info and full details to Howard Siegel, WA2GLU/WB5QLU, 6 Yale Circle, Richardson, TX. 75080.

Again lack of space will postpone my story about meeting, after over 50 years, my friend who gave me my very first QSO. How was your month?

73, Ed., W2GT

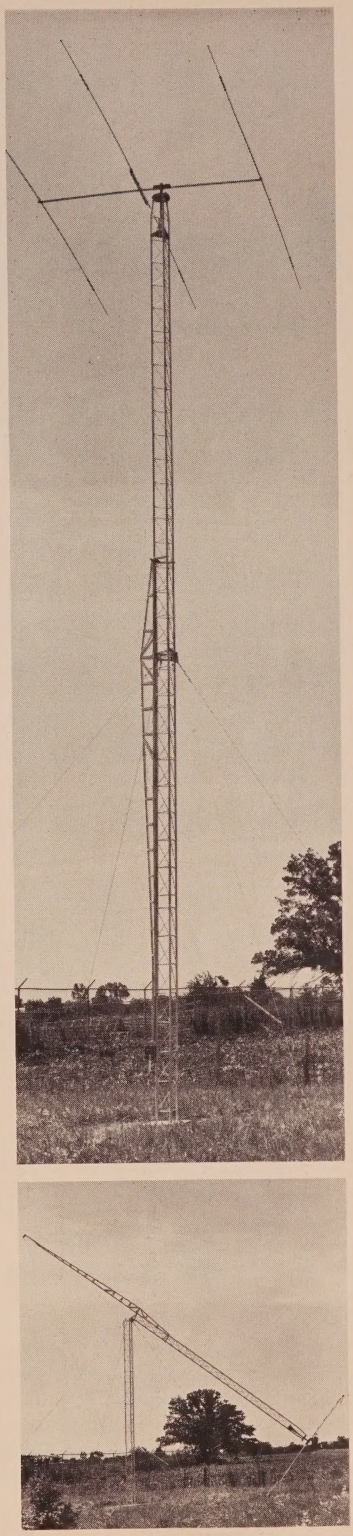
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Surplus Sidelights

BY GORDON ELIOT WHITE

As I suggested in this column last month, a meeting is planned for April, 1977, In Dayton, of people interested in the World War II "Command Sets," SCR-274N, AN/ARC-5, etc.

Anyone who worked on the designs, in production, in procuring the equipment for the Air Corps or the Navy, who used it in combat, or who simply appreciates its design as a surplus item, is invited to participate. The date will be keyed to the Dayton Hamvention, and the meeting will be held at the Air Force Museum.

At the same time, Command Set aficionados plan to present a number of items to the Air Force Museum for display and preservation.

This should appeal to all of those amateurs and others who have used the Command Sets, man and boy, for 30 years, since they flooded onto the surplus market in 1946. It is probably time now to retire this equipment, and what finer resting place than on display at the cradle of American military aviation at Wright Field.

The Museum has suggested that it can use SCR-274N equipment, in original condition, particularly sets with black crinkle finish. In addition to a display of the equipment by itself, the Museum will need certain additional items to restore the World War II and Korean War aircraft that it has in its collection. Other radio equipment of that period would be desireable.

The Museum does not want to be flooded with surplus equipment. I cannot emphasise too strongly, that no one should box up the contents of his junk box and send it to Dayton.

However, the Committee is soliciting gifts of equipment capable of being restored to museum quality, for donation to the Air Force Museum.

Anyone who believes he has items which would be useful to the Museum should write to:

Airborne Radio Commemoration Committee, Box 3067
Alexandria, Virginia, 22302

Do not send equipment. A description of each item, and if possible a photograph, would be sufficient. Each item will be discussed with the Museum, and if accepted, notification will be sent. The Committee will furnish appropriate acknowledgement

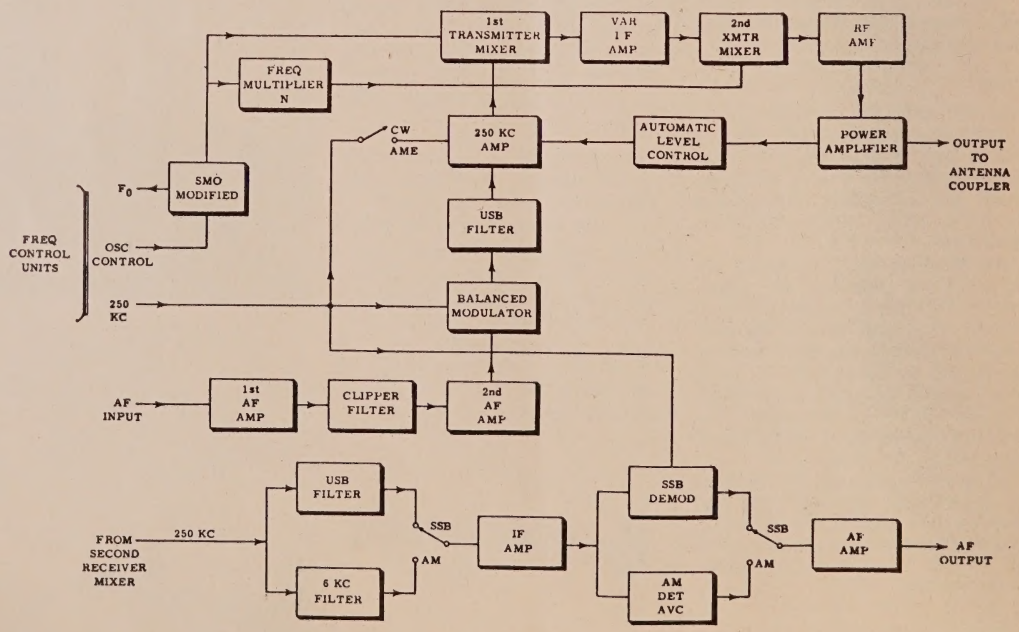


Fig. 1—The modified ARC-38 transmitter block diagram.

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developed for determining the components needed and the values of such components that'll minimize undesired effects. As shown in fig. 2, a resistor and a capacitor are connected in series and placed across the contacts to be protected. Naturally, the capacitor must have a voltage rating high enough to withstand the normal voltage that might appear across the contacts; so the formula deals only with the value of its capacitance. In microfarads, that capacitance is equal to the square of the load current (in amperes) divided by ten; the load current is that flowing through the contacts just before the circuit is opened.

$$C = \frac{I^2}{10}$$

For computing the resistance, the formula is not quite as simple but still not formidable.

$$R = \frac{E}{10\,I\ \ (1+\frac{50}{E})}$$

Where E is the source (voltage of the circuit just before it is interrupted by the contacts opening.

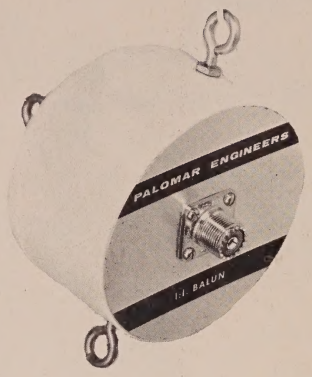
There are a few general rules to keep in mind, like not letting the resistor drop below 0.5-ohms (regardless of the formula) if the voltage is over 50; you can even use up to three times the computed values for voltages up to 70.

In receivers especially you may find relays in "dry" circuits: That is, in circuits that carry very, very little current. In such instances, an ordinary relay most likely will be far from satisfactory; the contacts will not make dependable connections. One remedy is to use a relay with "wiping" contacts, contacts that don't make direct head-to-head connection but touch with a sliding motion. This tends to keep the contacts clean and positive. Still better is the mercury-wetted relay. These can be used only in an upright position, for in the bottom of a sealed container, below the actual contacts but at the base of the armature (or whatever is used to support the contacts) is a small pool of mercury from which a minute amount creeps up the armature to very slightly wet the contacts. It takes a lot of words to tell about it, but the results are worth all the words, for those wetted contacts make perfect connection even in currentless circuits. Also, they greatly reduce the "bounce" that's present in all mechanical relays.

One could write reams about relays . . . . . styles of contacts, varieties of coils, slick tricks for making slow-make or slow-release actions, differential coils, neutral armatures, D'Arsonval-style movements, latching actions, and on and on and on for a seemingly-endless multiplicity of forms. But I won't. Not this time! ■

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Contest Calendar *(from page 60)*

ski, K4AWS. (ex-WB2MTU) This one will be in commemoration of the USA—Apollo 11 and Apollo/Soyuz.

Activity will be on the 50, 144 and 220 MHz bands, but repeater contacts are not permitted.

Exchange: Signal report and Zip code or P.O. location.

Points: Each contact is worth 2 points. The same station may be worked on different bands and again on following weekends for QSO points.

Multiplier: Each different Zip code worked is a multiplier of one (1). of Zip code. (Each used only once)

Score: Total QSO points multiplied by number of different Zip codes and P.O. locations worked.

Awards: In four classes. 1. Over 100 watts input power. 2. 25 to 100 watts, 3. 5 to 25 watts, 4. 5 watts or less. Also 1st and 2nd place club aggregate scores. Awards will be in the form of a plaque with three silver medallions to commemorate each space event.

Mailing deadline is August 21st to: A. W. Slapkowski, K4AWS, P.O. Box 15, Sumterville, Fla. 33585.

DX *(from page 57)*

D. A QRPP Endorsement for 50 or more countries confirmed using any combination of the 3.5 and 7MHz bands.

E. A Mobile Endorsement for 50 or more countries confirmed while operating mobile. The Call area requirement is waived for this endorsement. (See Rule 2.)

F. A SSTV endorsement (*CQ* SSB DX Award only) for 50 or more countries confirmed using 2 Way Slow Scan TV.

G. An OSCAR endorsement for 50 countries confirmed via Amateur Satellite.

(After the basic award is issued, only a listing of confirmed QSO's is required for special endorsements, however specific QSL's may be requested by the Award Manager.)

6. Any altered or forged confirmations will result in permanent disqualification of the applicant.
7. Fair play and good sportsmanship in operating are required for all amateurs working toward CQ DX awards. Continued use of poor ethics will result in disqualification of the applicant.
8. A fee of $1.00 or 8 IRC's to defray the cost of the certificate and handling is required for each award. An SASE or 1 IRC is required for each endorsement.

Country Status:

1. The ARRL DXCC country list constitutes the basis for *CQ DX* Award country status. Deleted countries will *not* be valid for the *CQ* DX Award. Once a country has lost its status as a current country it will automatically be deleted from our records.
2. All contacts must be with licensed land based amateur stations working in authorized amateur bands. Contacts with ships and aircraft cannot be counted.
3. Decisions of the *CQ* DX Advisory Committee on *any* matter pertaining to the administration of these awards shall be final.

CQ DX Honor Roll:

1. The Honor Rolls will list all stations with a total of 275 countries or more.
2. Separate Honor Rolls will be maintained for S.S.B. and C.W.
3. To remain on the Honor Roll, a station's country total must be updated annually.

Applications for the *CQ* CW and SSB DX Awards and Honor Rolls should be submitted to: Mr. Hugh Cassidy, WA6AUD, P.O. Box 3388, San Rafael, CA 94901.

Here and There in the World of DX

Re U.S.A. Bicentennial Prefixes, VERON'S *DX'Press* advises its readers: "Please don't send us a report exclaiming that you have worked ten stations in Sikkim, Bhutan and Tibet this week!" Hugh Cassidy recalls a February visit from an excited young DXer who had worked AC8BT/AJ4, and as he broke through a big pileup of JA's to make the contact it had to be a really rare one, maybe Tibet or China. Hugh offered to research it for the young DXer, and after he left another old hand finally spoke up and asked "Why didn't you just tell him that AC8BT/AJ4 was Al Hix from Charleston, W. Va. trying to warm up down in Puerto Rico?" We guess poor Hugh just didn't have the heart to bust the bubble.

SEANET Convention—A trip to Jakarta, Indonesia is a suggestion for the guy who has everything, and a SEANET Convention Tour is being put together. It will take you to Tokyo, Kyoto, Hong Kong, Bangkok and Singapore before the Jakarta convention in November, and afterwards to Bali and then home via Hong Kong again. If interested drop a line to Russell Chinn, Golden Sun Tours and Travel, 736 Washington St., San Francisco, CA 94108. By the address we conclude that Russell is related to Northern California DX Club stalwart Vince Chinn, K6KQN.

Zone 34 may become a bit easier to work in the near future. A U.S. firm has been awarded the contract to build the electronic surveillance network in the Sinai. A permanent installation should be complete by July 1, with possibly as many as 200 U.S. personnel staffing the monitoring facilities. If you begin to hear W and K stations portable SU best jump in and work them if you need this difficult zone.

160 Meter conditions were excellent during the winter season. W8LRL made WAC in two hours and KV4FZ worked 71 European stations Jan. 24-25. Herb now has his 160 meter country total up to 106.

North Jersey DX Association officers for the bicentennial year are Lou Amoroso, W2ZZ, President; Leo Cunniff, W2OEH, Vice President; Brother Pat Dowd, W2GK, Secretary; and Charles Moraller, WB2UKP, Treasurer.

Bicentennial Year Officers for the Virginia Century Club are Red Bashford, W4IN, President; Vic Samardza, W4EXI, Vice President; and Vic Culver, K4JNM, Secretary-Treasurer.

Correction to Postage Rates

In the March issue we indicated that the rate for airmail to the Caribbean plus Central and South America was now 25¢ per ½ ounce. This was partially in error, as the only South American countries now covered under the rate for the Caribbean and Central America are Columbia and Venezuela. The airmail rate for all South American countries other than Columbia and Venezuela is now 31¢ per ½ ounce.

The important DX country FP8, St. Pierre and Miquelon, is also covered under the 25¢ per ½ ounce airmail rate.

New DX Committeeman

The DX Department is pleased to announce that effective immediately, Art Westneat, W1AM, is a member of the *CQ* DX Awards Advisory Committee, representing the Southern New England DX Association.

Art has been a licensed amateur for 40 years, amateur extra class for 22 years. His special interest is DX, and he has 297 countries and over 1000 prefixes confirmed. He is a regular contributor to the West Coast DX Bulletin, an Associate Editor of the *Long Island DX Association Bulletin* and a Life Member of A.R.R.L. He is an avid c.w. operator with a code speed of 55 words per minute.

QSL Information

Several QSL Bureaus have recently changed their addresses. They are as follows:

Australia (VK8)—Via VK8HA, Box 1418, Darwin, N.T. 5794, Australia. (This address is for VK8 calls only.)

Canada—Central QSL Bureau, P.O. Box 396, Downsview, Ontario, M3M 3A8, Canada.

Chagos (U. S. personnel only)—To Communications Officer, U.S. Naval Command Station, FPO, San Francisco, CA 96685.

Japan (KA only)—Via FEARL (M), c/o Sam Fleminf, GARH-ID-GS-T, APO, San Francisco, CA 96343

Korea (HL9 only)—Amateur Radio Bureau Headquarters, Eighth Army, Office of the AC of S, J6, APO, San Francisco, CA 96301.

Morocco—To ARRAM, c/o M'Rabety Driss, CN8BH, 3 bis Rue Al-Farabi, Rabat, Morocco.

Qkinawa (KA6 only)—Radio Society of Okinawa, P.O. Box 653, Fort Buckner, APO, San Francisco, CA 96331.

Papua/New Guinea—Via P.O. Box 204, Port Moresby.

A2CNN—Via SM3CXS
A6XP—To DK3NK
C5AQ—c/o P.O. Box 254, Banjul, The Gambia
DL0FOC/HB0—Via DJ6SI
EL8O—To OE6WMG
FL8AC—co B.P. 215, Djibouti, French Somaliland
FP8BR—Via B.P. 3, Calmay, St. Pierre
FP8JP—To Box 227, St. Pierre
FY7AE—c/o WA4WTG
FY7YE—Via G3NOF
HK9BKX—To WA6AHF
HZ1TA—U.S. stations via W4UL, G stations via G3RSI, all others via OD5FH
JH1KSB/JD1—To JE3AFS
JY8ZB—c/o DJ9ZB
KC4AAC—Via K7ODK
KC6AQ—To Box 37, Koror, Western Carolines 96940
OE6DK/YK—c/o OE5REB
PJ3CO—Via W1YE
PJ8USA—To K2FJ
ST2SA—Via DJ9ZB
TA1HY—c/o W5QPX
TA1ZB—Via W5QPX
VE1BFV—To W3HNK
VP2EE—c/o K2BPP
VP2KJ—Via WB2TSL
VP2KN—To W7OK
VP2LBR—c/o K2IGW
VP2LDU and VP2LGH—Via VE3FFA
VP2MEV—To WB9IWN
VP8NK—c/o Box 55, Port Stanley, Falkland Islands
VS9MPH—Via G4DVP
WB4SJG/6Y5—To P.O. Box 9096, Columbia, S.C. 29290
XT2AE—c/o DJ9KR
ZD7WT—Via ZD8TM or W3KT
ZE6JL—To P.O. Box 605, Gwelo, Rhodesia
3B6BD—c/o Box 1158, Mbabana, Swaziland
4W1ZB—Via DJ9ZB
5N2NAS—To Box 548, Apapa, Nigeria
5V7WT—c/o F9GL
7P8AZ—Via VE2JH
9Q5DM—To Songa Hospital, Kamina, Republic of Zaire

73, John, K4IIF

QRP *(from page 46)*

ground point for minor current loop components should be at the emitter ground site, or as close to it as possible, and again, leads should be kept as short as possible. When toroids are used as inductances in the interstage tanks or matching networks, their self-shielding properties usually eliminate any unwanted coupling which could occur because of physical proximity. However, it should be borne in mind that while most of the r.f. field of a toroid inductance is concentrated within the core, leads to and from the inductance can radiate r.f. energy which leads to unwanted coupling.

In view of this, toroid inductances in the high-level collector circuits should be mounted at the transistor itself with appropriate bypassing. Likewise, collector inductances of successive stages should be kept as far apart as layout permits (within reason—the power level of the stage will determine the separation distance that is necessary). One common problem, which results in unwanted coupling and produces instabilities in simple transmitters, occurs when the collector inductances of successive stages are tuned by means of variable capacitors mounted on a front panel through relatively long leads. Both the leads and the capacitors themselves invite unwanted coupling. This was a frequent experience of homebrew users of the TenTec TX-1 transmitter module. As long as the oscillator and amplifier collector circuits were tuned with the on-board trimmer capacitors, the TX-1 was pretty stable; but once off-board variable capacitors were substituted for the trimmers, self-oscillation due to unwanted coupling was a frequent experience. Incident-

When you step up to big power we've got the block-buster linear amplifier that will give you a full 2000 watts P.E.P.—all the law allows—with the features you need for a clean signal with great linearity.

It's the Swan Mark II, an amateur radio standard for top power single sideband rigs. One-hundred watts of drive is all you need to go all the way on all bands from 10 to 80 meters. And with the Mark II, the price includes the separate, matching power supply. Both RF deck and power supply are forced-air cooled with high-volume, low-RPM, low-noise blowers.

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ally, TenTec employed proper bypassing strategy on the TX-1 board which aided in stability.

Isolation of the base and collector circuit is important, and is usually adequate if layout is similar to the schematic position of these two circuits in a stage. Off-board leads, however, can defeat good board layout in this respect. For example, the typical c.w. transmitter is keyed by breaking the emitter-ground connection in a low-level predriver or buffer stage (See fig. 3). The key should break only the d.c. emitter loop which is completed by the emitter resistance. The function of the bypass capacitor is to complete the r.f. loop and go directly to ground. If it is "tied" across the emitter resistor (fig. 3a), then the r.f. loop must be completed through the key lead, which are usually several feet long and consist of unshielded cable. In addition to carrying r.f. generated in the stage, these key leads can pick up r.f. generated in later stages and from the output of the final amplifier. Feedback problems result. These problems are enhanced if the transmitter is inadequately shielded etc. A simple test of whether this is happening is to check for r.f. on the key itself—either by touching it with a finger while listening to the note in a receiver, or by using a wavemeter. Usually, r.f. on the key lead will produce a mushy or chirpy keying note —if nothing worse.

The proper completion of the r.f. loop can be accomplished by connecting the emitter-resistor bypass capacitor directly to ground on the p.c. board, or by bypassing the key lead with a 0.1 or .01 capacitor where the lead leaves the board (fig. 3b).

(Continued in the next column.)

News

We are still working on the mail for *The Milliwatt*. Again, patience please!

Send in your cards with the QRPp DXCC and WAS standings so that we can get them into print. Seems like everything is running behind schedule for me this year. But I suppose that we all have the same problem. Andrew Marvell got the experience across pretty well when he said "I feel Time's winged chariot hurrying at my back . . ."

Again, if you have something to contribute to the current series on homebrew techniques and debugging, please do so. One man's experience hardly explains the world! Till next month,

73, Ade, K8EEG

Novice *(from page 39)*

the age group of 40 and over. Further, to encourage the more experienced amateurs to contact Novices and help them to improve by benefitting from their extensive experience. Last but not least, to maybe give a little incentive to those of our age group who are considering joining the rewarding hobby of Amateur Radio." The club offers an attractive membership card and certificate for $2.00, plus 25 cents "handling charge." The club also offers an honorary membership to any higher class amateur who works 10 Novices. We would think you would do better by spending the money to exchange QSL cards with the Novices worked.

Lauree, WN1VUM, became interested in amateur radio when her father, K1DRN, went on a DX-pedition to St. Pierre Island in 1973. In the summer of 75, the whole family accompanied him on the second DX-pedition, and she was utterly fascinated by the "pile-ups" generated by stations calling FP8XX. After returning home, she studied and passed her Novice test in a few weeks and received her license on September 30, 1975. As one of the youngest female amateurs ever licensed in the United States, most of the operators who work her comment that she is either the youngest amateur or first YL they have ever worked. She is also a skilled operator with a good "fist." Her father, Vern, reports that Lauree worked very hard to get her license; that fact is obvious by the very fact that she got her ticket at such an early age . . . **Jim Zalinka, WN2ZFF,** and other members of the Maple Hill High School Amateur Radio Club, Castleton, N.Y. demonstrated Amateur Radio to the members of the local Kiwanis Club by setting up two portable stations at the club, and telling the members about their hobby and working several stations, including one in Texas. Jim is probably haunting the mail box for his General class license as you read this. **Joe Battaglis,** W2QEH, licensed in 1918, also had a visit from the Maple Hill HSARC. Joe was particularly proud to show the club members how he restores old radio equipment.

We are down to the bottom of the page again. You are invited to send news of your radio exploits and pictures for our Monthly Photo Contest. You do not have to be a Novice to write. Send all mail to Herbert S. Brier, W9EGQ, Novice Editor, *CQ*, 409 S. 14 St., Chesterton, Ind. 46304.

73, Herb, W9EGQ



HAM SHOP?

YES, once again we are able to offer CQ subscribers free use of the Ham Shop on a non-commercial basis. Here's your chance to buy, sell, or swap your way into that ultimate station or just pick up some extra spending money. Join the crowd rushing to get in on the action. Run a different ad every month, and get your ads in early. Remember that we have a two month lead time in preparing CQ. Also keep in mind that with CQ's larger format there is far more room for your ads, so act now.

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Closing Date: The 10th day in the third month preceding date of publication. Because the advertisers and equipment contained in Ham Shop have not been investigated, the Publisher 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.**

LOOKING FOR USED GEAR? Buyers and Sellers radio brokerage has the equipment you want at the prices you want to pay. Call our Ham Gear Hotline: 617-536-8777, weekdays 9-5 EST.

SOLAR CELLS DISCOUNT PRICES: 35% off list. Free information: Solenco, 818-Q 18th St., Washington, D.C. 20006.

FREE CATALOG. LEDS, Strobe Lights, Uarts, Memories, Microphones, IC's, Relays, Ultrasonic Devices, Precision Trimmer Capacitors, Digital Thermometers, Unique Components. Chaney's, Box 15431, Lakewood, Co. 80215.

TECH MANUALS for Govt. surplus gear. $6.50 each: R-220/URR, SP-600JX, URM-25D, SG-3/U, TS-173/UR, TS-174/U, LM-21, OS-8B/U. Thousands more available. Send 50 cents (coin) for 22 page list. W3IHD, 7218 Roanne Drive, Washington, DC 20021

FOR SALE: URM-25D Signal Generator $125.00. URM-26B $130.00, TS-510 $250.00 Also Receivers, Transmitters, Components and Test Equipment. Catalog 15 cents. E. French, P.O. Box 249, Aurora, IL 60507.

STARVED ROCK HAMFEST, June 6, for info, write SRRC W9MKS, RFD 1, Box 171, Oglesby, Illinois, 61348.

LEARN CODE in a few days with audio reflex method of teaching letters, numbers, punctuation. One hour cassette only $7.00. Television diagnostic repair course by master technicians. Lessons $6.00 each. Optional matching cassette tape $6.00. Send for first lesson and master index. Guardian Electronics 20 East Main, Ramsey, N.J. 07446.

RADIO MUSEUM now open. Free admission. 15,000 pieces of equipment from 1850 telegraph instruments to amateur and commercial transmitters of the 1920's. Amateur station W2AN. Write for information. Antique Wireless Assn. Main St., Holcomb, N.Y. 14469.

CUSTON EMBROIDERED CLUB EMBLEMS Your design, low minimum, informational booklet, Write Emblems, Dept. 10E, Littleton NH 03561.

REPAIRS. K6BE. 415-548-1889.

UNSCRAMBLE POLICE CODE with decoders. Works on all scanners and receivers. For prices and brochure, write: Don Nobles, Route 7, Box 265B, Hot Springs, Ak. 71901. 501/623-6027.

QSL CARDS - Something completely different. Nothing even close to it on the market! Samples: 25 cents, W5UTT, Box 1171E, Garland, Tx. 75040.

WANTED: Old magazines, Books, Catalogs, Call books and early Radio receivers, parts Etc. Erv Rasmussen W6YPM 164 Lowell, Redwood City Ca. 94062.

FOR SALE: Hallicrafter S38E Gen. Coverage Receiver $25.00, R-46 Speaker $10.00, EICO VTVM Model 232 $18.00. Link 50 mc Transceiver $15.00, ARC-5's 3-6 mc Rec and 5.3-7 mc Xmt. $7.50 each. Surplus 2M. AM Transceiver $15.00. Tom Coddington, WB6AWC, 7825 Scotts Valley Rd. Lakeport, Ca. 95453.

AM LOOKING FOR OLD CQ's, QST's, 73's, and Ham Radio's, as well as all A.R.R.L. publications, all years and issues. Loran Joly, WB0KTH, 432 Central Ave. Mora, MN 55051.

R390 Receiver .5-30 MHz Good Shape, Product Det. and Manual $350.00. Ron Rasmussen 129 Club Drive, San Carlos Ca. 94070

SELL OR TRADE: 9" AC/DC portable TV and HP-13 DC Supply for SB-610 and Regency or Heathkit 2-Meter FM Amplifier. F.H. Kauppi, Route 1 Box 171, Gilbert, MN 55741

SALE: Xtmrs. 6 and 12 V., up to 750V Pl. $2.50 each. 6M Xmtr. and Reg. PS $35.00, Large Lot QST and CQ - $20.00 all. etc. and Fill ur Junk bx chp. WB20BO, 1533 Lowell Ave. New Hyde Park, L.I., N.Y. 11040.

HRO Early 6D6 Coils Pwr. Manual $50; Pr. size 5 selsyns 110V 60 cycle $10; FT 560/ETC 160M kit $25.00 Clean pole pig HV Xfrm $35.00; Mims rotator $50; FOB Art Ford, 56 Gildare Dr. East Northport, LI, NY 11731.

WANTED: Drake SPR4 Recvr. State price and condition also want one Amateur Call Book 1970 or later thru 1975. phone 315-475-5585.

HAVE LOTS OF ELECTRONIC PARTS and Meters. Want to trade for or buy a 1928 to 1931 Wards or Sears Mail Order Catalog. Erv Sly, WB6KKI, 217 Santa Mariana, La Puente, Ca. 91746.

WANTED: Clean KWS1 and Navigator. Sever, 147 South Wise, North Canton, Oh. 44720.

WANT TO TRADE: General Radio 1611-A Capacitance test bridge. Very mint. For 2 meter transciever. No Junk please. WB6KKI, 217 Santa Mariana, La Puente Ca. 91746. (213) 336-6915.

DRAKE GEAR WANTED: T4X - or - C-R4C-L4 Cash for clean reson able Drake Gear. F.E. Coble, 251 Collier Ave. Nashville, Tn. 37211.

WANTED: Millen 90932 Monitor Scope in repairable condition. K6KZT, 2255 Alexander Ave. Los Osos, CA 93402.

QSL - QSL - QSL - QSL - Send QSL Cards to: Philip Steven Kurland, 3000 Valentine Ave. Apt. 1A, Bronx, N.Y. 10458.

WANTED: PRE 1946 QST Magazines. FOR SALE: Motorola 80D - Offer WA7VSD. E. Joseph Sabo, 2417 - 1st Ave. W. Seattle, Wa. 98119.

HEATH HP-13 Mobile Power Supply with Cables - $40. C. Moore, 3329 March Lane, Garland, Tx. 75042. (214) 272-9996.

COLLINS 312B-5 wanted. Also want SC-101; speaker, noise blanker, and filters for 75A-4. Paul Kluwe, 201 Maynard House, Ann Arbor, Mi. 48104.

VARIABLE CAPACITORS: Cardwell MT 100S. 100 pF, .070 spacing, new boxed, $6. Hammerlund MC100 silverplated, dual bearings, rear shaft extension, $1.25 or 10 for $9. Add shipping. J.M. Hoffer, W1DL, 24 Cherry Rd. Framingham, Ma. 01701. (617)872-5084.

OLD HAM, WIRELESS BOOKS AND MAGAZINES. Stamp for List. Radio-Electronic Collector yearbook, $3. Radiographics Books, P.O. Box 18492, Cleveland Heights, Oh. 44118.

WANTED: Ham-m or Ham - II Rotor and Control. Give price and condition. K0TVY, 6503 Lafayette Rd. Raymond Ia. 50667.

HAVE HO-10 MONITOR SCOPE and HO-13 Scanner. Looking for Tower winch or cliff dweller Ant. Saul Slonim, 320 Rose St., Massapequa N.Y. 11762.

TOWER FOR SALE: New, City won't permit installation. 50 Ft., Crank-up, Tilt-over, E-Z way RBS 50, Rotor Head, Concrete ground post. $560 firm. Pick up only. Dean B. Haworth, 14 Phyllis Dr., Succasunna, NJ 07876.

SELL: Several new cartrivision cartridges, and 1/2 " Ampex video tape cheap. List shack cleanup, SASE. W4 API, Box 4095, Arlington, Va. 22204.

CUSTOM EMBROIDERED PATCHES, no minimum, no shape or color limits. Double-knit nylon jackets, custom imprinted tee-shirts LePhCo, 2860 G Pinkerton, Zanesville, Oh. 43701. (614) 453-6966.

MEDICAL: Any licensed amateur radio opertor in the medical or paramedical field should join MARCO (Medical Radio Council). Contact: Stan Carp. M.D., K1EEG, 44 Main St., Saugus, Ma. 01906. (617) 233-1234.

MODERN 60 MIN. CODE CASSETTES. No-vice 0-5 wpm, Progressive 5-13 wpm, General 13-15 wpm, Extra 20-22 wpm. $3 Ea. 4/$10. Royal Box 2174, Sandusky Oh. 44870.

ROCHESTER HAMFEST 1976 is Saturday, May 22. Your name added to mailing list or information, write: Rochester Hamfest, Box 1388, Rochester NY 14603.

SAROC Second Hawaiian Convention, Kuilima Hotel, North Shore, Oahu, Hawaii, August 28, 1976, technical sessions, exhibits, banquet and registration $15.00. Del Webb World Travel OTC charter via United Airlines from Los Angeles depart August 24 return 31 only $300.00 per person, double occupancy in hotel room: includes roundtrip from Los Angeles only, ground transportation and baggage handling airport/hotel in Hawaii, seven nights accommodations Kuilima hotel, SAROC registration with banquet, tax and gratuity. SAROC Las Vegas Convention, January 6-9, 1977. Details on both from SAROC, P.O.B. 945, Boulder CIty, Nevada 89005. Telephone 702-293-2091.

SAROC Second Hawaiian Convention, Kuilima Hotel, August 28, 1976, Technical sessions, exhibits and banquet. SAROC Las Vegas Convention, January 6-9, 1977. Details from SAROC, POB 945, Boulder City, Nevada 89005. Phone 702-293-2091.

NEW YORK CITY Third Annual Hall of Science Radio Club Auction Flea Market Saturday June 5 at Worlds Fair Grounds, Flushing L.I. Admission $1.00 Sellers $2.00. No sellers commission but 10% fee on auctioned items. Zoo, boating, childrens farm, art and science museums adjacent. Field Day goodies galore. Box 1032, Flushing, NY 11352.

SURPLUS TELEPHONES? Standard Commercial Modern dial dest phones. Excellent condition. Cost $30.00, fine for ham shack, bedroom, etc. Special to hams $6.95 prepaid U.S.A. only. Surplus Center, W0BOH, Box 82209, Lincoln, Nebr. 68501.

CRYSTALS- 50 cents each. send stamped envelope and 25 cents for list, (refunded with order). Artrip, Box 163C, Ivy, Virginia 22945.

RECENT YEARS CQ/QST at 9 cents each (plus shipping). SASE for list. W2JBL, 123 Davis Ave. Hackensack, N.J. 07601.

HAVE MEMO-SCOPE Wide Band Preamp and Differential plug ins Extra. Need Dual Trace plug in. K C Connell, Box 256, Christoval, Tx. 76935.

WANT: National SW3 in good condition with coils. W1LMS, Box 48, Ballardvale, Ma. 01810.

FOR SALE: Swan 500 cx-117xc p/s Mint Condition $450. Local buyer preferred for close inspection of equipment before purchase. Absolute guarantee. Julius Shikowitz, 932 East 85th St. Brooklyn, N.Y. 11236. (212) 763-8231.

FOR SALE: Two Hallicrafter S-27 receivers need some repair, $25 ea. if you pick up. Send stamp for list ham items, tubes, test equipment, etc. W9FOC, 1616 Campbell St., Joliet, IL 60435. (815) 725-6700.

WANTED: SB620 monitor, SB220 linear and B&W 850A coil assembly. John M. Webb, Rt. 1 Box 244, Henderson, Tn. 38340.

I NEED N. DAK and or E and KL7 please. for WAS work on 15 meters lot. Charles W. McDonald, 312 Penna. Ave., Downinstown, Pa. 19335.

WANTED: License Plates (Amateur and Regular) for personal collection. Will reimburse postage. Tom Webb, P.O. Box 6, Morganton, N.C. 28655.

WANTED: Weather Station Heath-Kit ID-1290- or ID-1590 and frequency counter. Send price and condition on post-card. J. C. Lachance, 5450 Pl Montmartre, Charlesbourg Canada, G1H4E4.

FOR SALE: Collins Mech. Filter F455-C31 $20, Variac 20 Amps. 115V-$25, 4-250A Tubes new $20. ea. 813's $6. ea., SK400 sockets (2) $7. ea. 4-65A- New $15. Kenneth Trendell, 1090 Shave Rd. Schenectady, N.Y. 12303.

R-390 Receiver Owners — Now available. Government Surplus MX-2840/URR. Audio Frequency Detector. Used to convert the I.F. output to an audio output. Connects to I.F. output, J-116, of R-390. Brand new original carton contains: MX-2840/URR, connecting cables, power cable, technical manuals, spare parts kit, 110-125 VAC power supply. $29.95 prepaid. Colonel Wayne D. Russell, 9410 Walhampton, Louisville, KY 40222.

SELL COMDEL SPEECH PROCESSOR $80 incl. ship. Bank money order. Mr. H. Di Iulio 147, 14 45 Ave. Flushing, N.Y. 11355.

WANTED: 3AP5 or any other 3" Crt with a P5 phosphor. Wayne Letourneau, 2338 E. South No. St. Paul Mn. 55109.

BUY - SELL - SWAP old Radio Shows on Reel or cassette tape. Write: Tape trade, 1705 Kaywin Ave., Bethlehem, Pa. 18018.

WANTED: Polycomm PC-2B manual will copy and return or pay for copy. KA2TE Bx. 57 FPO Seattle 98762.

BUY - SELL - TRADE. Write for free 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.

WANTED: Horizontal output transformer for 23 in. GE TV MOD. M718BWD. W2ISL, 41 Winnebage Rd. Yonkers, N.Y. 10710.

FOR SALE: 4 Jennings JB-12 JO-Bloks, 12 KV P.I.V. at up to 1.0 amp. $16.00, Stencor PC-8401 plate-filament transformer, $5.00, Filament transformer 110v to 6.3 v.c.t. at 10 amps, $5.00, Raytrack 30 amp. filament choke $4.00, Bud type H-9116 chrome handles $3.50, Raytrack 6 meter plate choke on 3/4" steatite form $2.50, 3 pairs Raytheon circuit board mounting brackets, 1 1/2", 2", 2 1/2", $2.00, 3 Raytheon knots (2-MS91528-3F2B, 1- MS91528-1F2B) $1.75. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave. Port Washington, N.Y. 11050.

FOR SALE: CQ magazines solid, 1947 through 1958. each year in heavy binder. $95.00. Ed Hopper, P.O. Box 73, Rochelle Park, N.J. 07662.

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.

SELL: 4-1000 A used, $30. 1,000 pf loading cap. $7 Raytrack kw plate tank coil for 80 & 40 plus kw bandswitch $16. UTC S-50 6KV c.t. 300 ma, new, pick-up only, $75. 7200 v.c.t. 1a. 115/230 v. pri. $35. Pick up only. OZ-PAKS: Large several kw $30; small (2 kw) $20. R. Ross, 95 Norwood Ave., Northport, NY 11768.

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Math's Notes *(from page 44)*

1000 ohm meter hooked up as a 0-100 ma. milliampmeter.

When making up meters such as these it is also a good idea to shunt the meter movement (not multiplier and movement in a voltmeter) with two silicon or germanium diodes across each other as shown in fig. 4. These diodes will serve to offer some protection to the meter if it is inadvertently overloaded. A 50 microampere 1000 ohm meter such as the example we have been using will deflect with $50 \times 10^{-6} \times 1000$ or 50 millivolts. Since silicon diodes will conduct at 700 millivolts and germanium diodes at 500 millivolts these devices will protect the meter from severe overloads but will not affect the normal operation.

While a 10-15 times overload is not recommended, at least the movement will not be destroyed.

Next month we will talk about a.c. measurements, expanded scale units and other considerations relating to panel meter usage.

73, Irwin, WA2NDM

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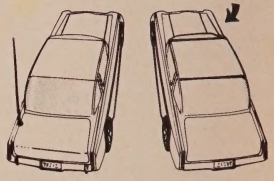
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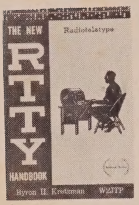
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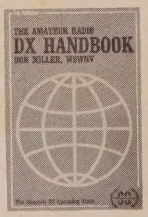
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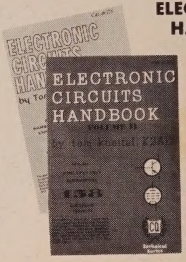


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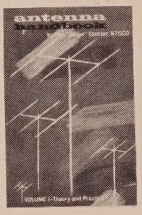
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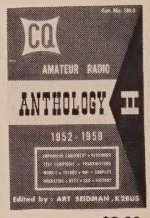
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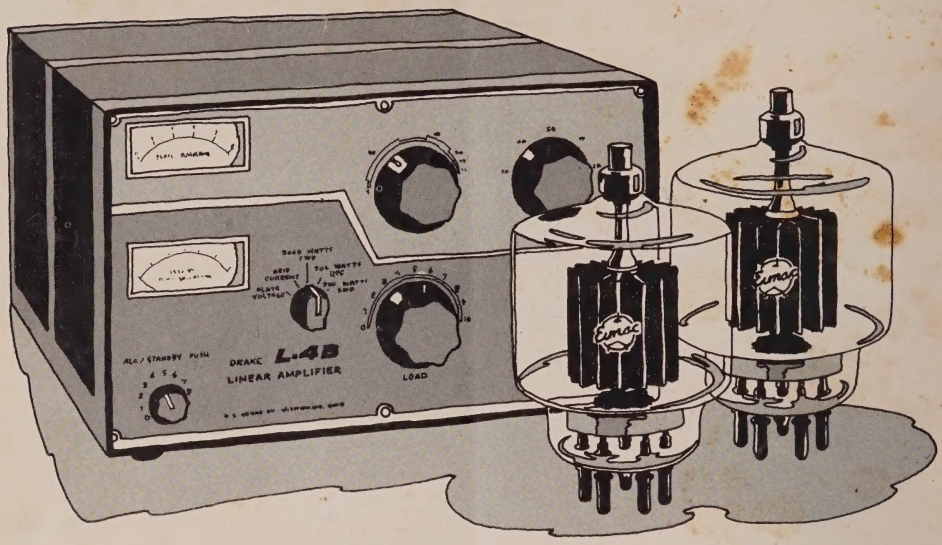
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