

QST

devoted entirely to Amateur Radio

August 1977

\$1.50



Hams aid disaster communications in aftermath of Kentucky nightclub fire!

Page 52

TEMPO

VHF / ONE PLUS



MORE POWER / 25 OR 5* WATTS OUTPUT SELECTABLE

REMOTE TUNING / ON MICROPHONE

NEW LOWER PRICE / NOW ONLY \$399.00

SIDEBAND OPERATION WITH SSB/ONE ADAPTER / MARS OPERATION CAPABILITY / 5 KHz NUMERICAL LED

The Tempo VHF/One Plus is a VHF/FM transceiver for dependable communication on the 2 meter amateur band • Full 2 meter coverage, 144 to 148 MHz for both transmit and receive • Full phase lock synthesized (PLL) • Automatic repeater split—selectable up or down • Two built-in programmable channels • All solid state • 800 selectable receive frequencies with simplex and +600 KHz transmit frequencies for each receive channel.

*Adjustable internally 3 to 15 watts

TEMPO FMH-2, FMH-5 & FMH-42 (UHF)

6 channel capability • selectable 1 or 2 - 1 or 5 Watts output • Solid-state • Battery level meter • Earphone jack • Built-in charging terminals and separate charging jack for Ni-cad batteries • Flex antenna • Carrying case standard • Excellent frequency stability allows use with booster amplifier for high power output over 100 Watts • 8 AA batteries or 10 AA Ni-cads.*

*Not furnished.

FCC Type accepted models available.

TEMPO VHF & UHF AMPLIFIERS

VHF (135 to 175 MHz)			
Drive Power	Output	Model No.	Price
2W	130W	130A02	\$199
10W	130W	130A10	\$179
30W	130W	130A30	\$189
2W	80W	80A02	\$169
10W	80W	80A10	\$149
30W	80W	80A30	\$159

UHF (400 to 512 MHz)			
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
2W	10W	10D02	\$125

FCC Type accepted models available.

TEMPO POCKET RECEIVERS

MS-2, 4 channel scanning receiver for VHF high band, smallest unit on the market. MR-2 same size as MS-2 but has manual selection of 12 channels. VHF high band. MR-3, miniature 2-channel VHF high band monitor or paging receiver. MR-3U, single channel on the 400 to 512 UHF band. All are low priced and dependable.



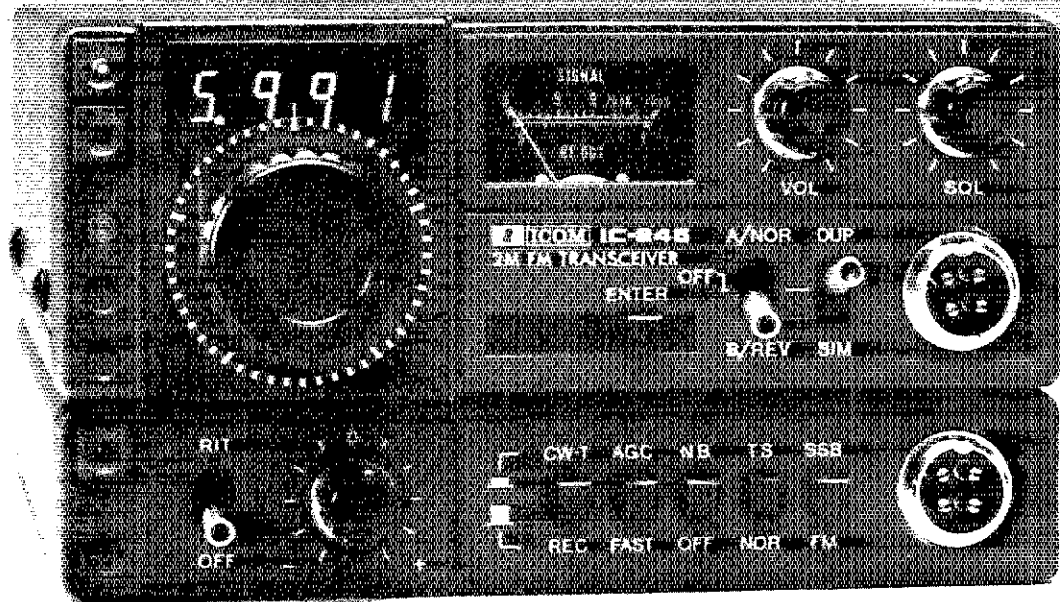
Sold at Tempo dealers throughout the U.S. and abroad. Please call or write for further information.

Prices subject to change without notice

11240 W. Olympic Blvd., Los Angeles, Calif. 90064
931 N. Euclid, Anaheim, Calif. 92801
Butler, Missouri 64730

213/477-6701
714/772-9200
816/678-3127

Henry Radio



That's all, Folks!

All you need for All Mode Mobile, that is.

All Mode Mobile is now yours in a superior ICOM radio that is a generation ahead of all others. The new, fully synthesized **IC-245/SSB** puts you into FM, SSB and CW operation with a very compact dash-mounted transceiver like none you've ever seen.

- **Variable offset:** Any offset from 10 KHz through 4 MHz in multiples of 10 KHz can be programmed with the LSI Synthesizer.
- **Remote programing:** The **IC-245/SSB** LSI chip provides for the input of programing digits from a remote key pad which can be combined with Touch Tone* circuitry to provide simultaneous remote program and tone. Computer control from a PIA interface is also possible.

* a registered trademark of AT&T.

- **FM stability on SSB and CW:** The **IC-245/SSB** synthesis of 100 Hz steps make mobile SSB as stable as FM. This extended range of operation is attracting many FM'ers who have been operating on the direct channels and have discovered SSB.

The **IC-245/SSB** is the very best and most versatile mobile radio made: that's all. For more information and your own hands-on demonstration see your ICOM dealer. When you mount your **IC-245/SSB** you'll have all you need for All Mode Mobile.

SPECIFICATIONS

RECEIVER SENSITIVITY
12dB SINAD
1000Hz BW
15dB S/N
1000Hz BW
15dB S/N
1000Hz BW
15dB S/N
1000Hz BW
15dB S/N

TRANSMITTER
100W
100W
100W
100W
100W
100W
100W
100W
100W
100W

POWER SUPPLY
12VDC
12VDC
12VDC
12VDC
12VDC
12VDC
12VDC
12VDC
12VDC
12VDC

WEIGHT
1.5kg
1.5kg
1.5kg
1.5kg
1.5kg
1.5kg
1.5kg
1.5kg
1.5kg
1.5kg

OPERATING TEMPERATURE
-20°C to +55°C
-20°C to +55°C
-20°C to +55°C
-20°C to +55°C
-20°C to +55°C
-20°C to +55°C
-20°C to +55°C
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-20°C to +55°C
-20°C to +55°C

REGULATORY APPROVALS
FCC Part 97
ICES R-1
ETSI EN 300 220
ETSI EN 300 221
ETSI EN 300 222
ETSI EN 300 223
ETSI EN 300 224
ETSI EN 300 225
ETSI EN 300 226
ETSI EN 300 227

VHF/UHF AMATEUR AND MARINE COMMUNICATION EQUIPMENT

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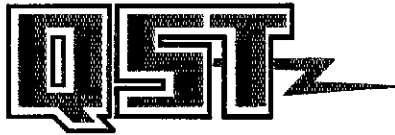


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THE COVER

Amateurs were on the scene within minutes of the Beverly Hills Disaster. See page 52.



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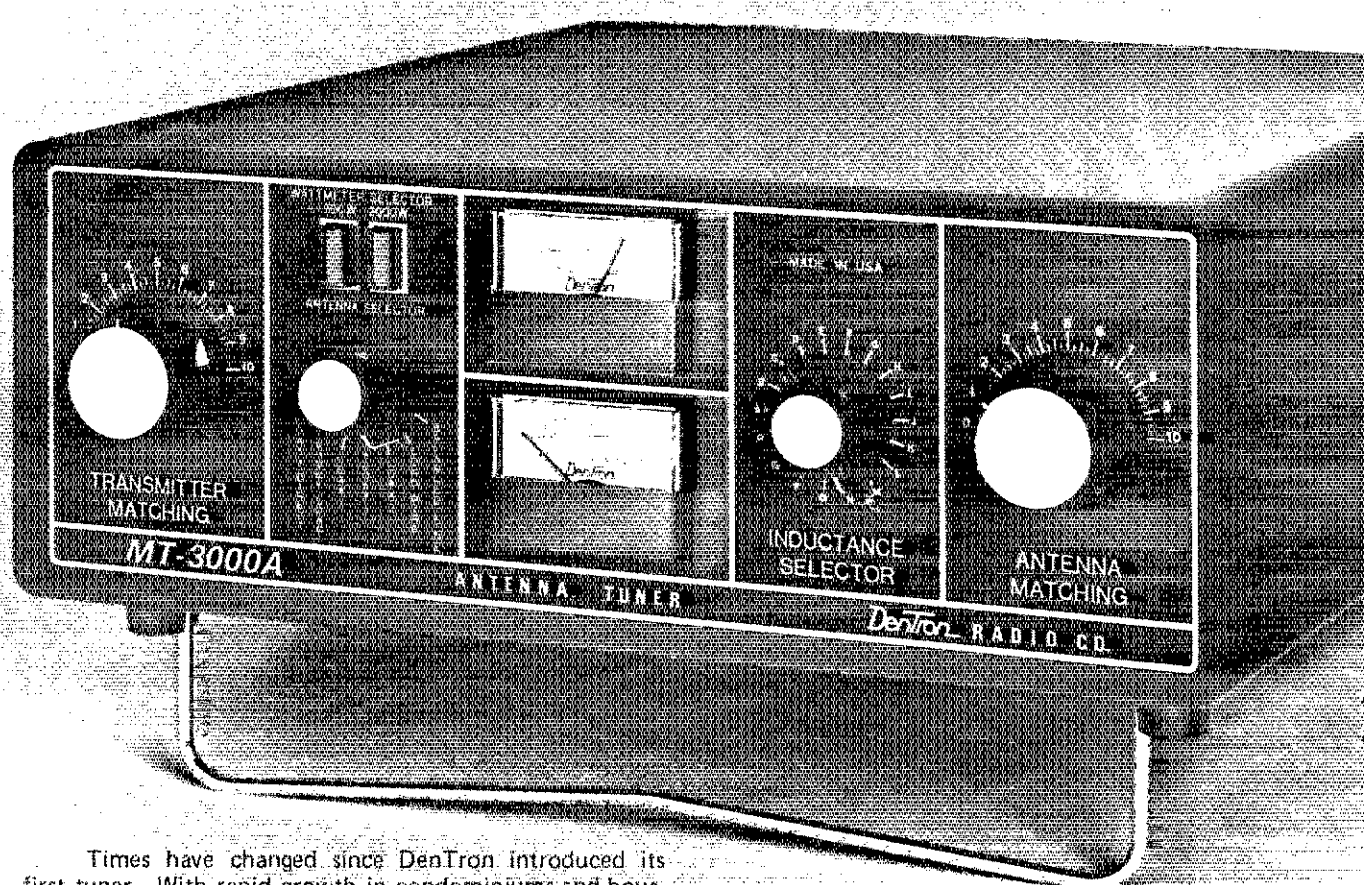
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Look closely at the new MT-3000A. You've never seen anything like it.



Times have changed since DenTron introduced its first tuner. With rapid growth in condominiums and housing developments, we have new problems that require new solutions.

DenTron decided to rethink the tuner and what its total capabilities should be.

The MT-3000A is a capsulized solution to many problems. It incorporates 4 unique features to give you the most versatile antenna tuner ever built.

First, as a rugged antenna tuner the MT-3000A easily handles a full 3KW pep. It is continuous tuning 1.8-30mc. It matches everything between 160 and 10 meters.

Second, the MT-3000A has built-in dual watt meters.

Third, it has a built-in 50 ohm dummy load for proper exciter adjustment.

Fourth, the antenna selector switch; (a) enables you to by-pass the tuner direct; (b) select the dummy load or 5 other antenna systems, including random wire or balanced feed.

The compact size alone of the MT-3000A (5½" x 14" x 14") makes it revolutionary. Combine that with its four built-in accessories and we're sure you'll agree that the MT-3000A is one of the most innovative and exciting instruments offered for amateur use.

At **\$349.50** the MT-3000A is not inexpensive. But it is less than you'd expect to pay for each of these accessories separately.

As unique as this tuner is, there are many things it shares with all DenTron products. It is built with the same meticulous attention to detail and American craftsmanship that is synonymous with DenTron.

After seeing the outstanding MT-3000A, wouldn't you rather have your problems solved by DenTron?

DenTron 2100 Enterprise Parkway
Twinsburg, Ohio 44087
Radio Co., Inc. (216)425-3173

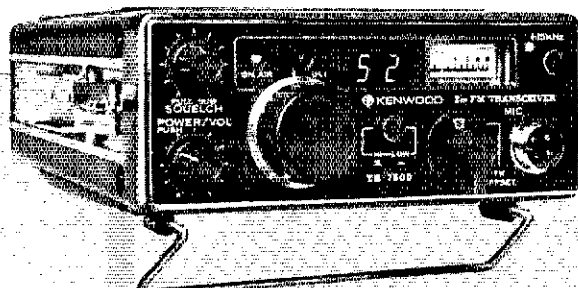
TR-7500



There are a number of good 2 meter FM transceivers on the market. You may already own one. But, even if you do, we suggest that you put your radio to this test. And, if you're thinking of buying one, this test should be a helpful guide.

	NO	YES
Is it PLL synthesized?	<input type="checkbox"/>	<input type="checkbox"/>
Does it have 100 channels (88 pre-programmed)?	<input type="checkbox"/>	<input type="checkbox"/>
Does it have 12 extra diode programmable channels?	<input type="checkbox"/>	<input type="checkbox"/>
Does it have single knob channel selection?	<input type="checkbox"/>	<input type="checkbox"/>
Does it have a LED digital frequency display?	<input type="checkbox"/>	<input type="checkbox"/>
Does it have a powered tone pad connection?	<input type="checkbox"/>	<input type="checkbox"/>
Does the receiver have helical resonators?	<input type="checkbox"/>	<input type="checkbox"/>

If your answer is NO to any of these, the TR-7500 is the radio that you should own. And, in addition to these important features, you get proven Kenwood quality, value and service.



TR-7500 Specifications

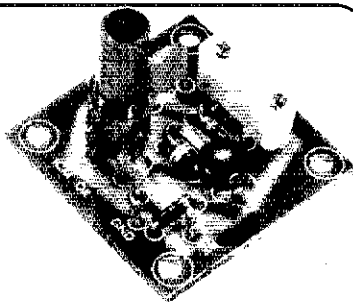
Semiconductors: Transistors	41
FETs	8
ICs	7
Diodes	35
Frequency Range: 146.01 to 147.99 MHz	
Mode: FM	
No. of Channels: 100	
Operating Temperature: -20 to +50 degrees C	
Power Voltage: 11.5 to 15.0V DC (13.8V DC nominal)	

Grounding Polarity: Negative ground
 Antenna Impedance: 50 Ohms
 Current drain: Less than 0.5A in receive with no input signal
 Less than 3A in transmit (HI) Less than 1.5A in transmit (LOW) (at 13.8V DC)
 Dimensions: 172 mm (6-3/4") wide
 250 mm (9-7/8") deep
 75 mm (2-15/16") high
 Weight: Approximately 2.2 kg (4.8 lbs.) (approximately)
TRANSMIT SECTION
 RF Output Power: High: 10 Watts
 Low: 1 Watt (approximately)
 Modulation: Variable reactance frequency shift
 Frequency Deviation: ±5 KHz
 Spurious Radiation: Better than -60dB

Tone Pad Input
 Impedance: 600 Ohms
 Microphone: Dynamic microphone with PTT switch, 500 Ohms
RECEIVE SECTION
 Receive System: Double conversion superheterodyne
 Intermediate Frequency: 1st IF: 10.7 MHz
 2nd IF: 455 kHz
 Sensitivity: Better than 0.4 uV for 20dB quieting Better than 1 uV for 30dB S/N
 Squelch Sensitivity: Better than 0.25 uV
 Selectivity: 12kHz at -1dB down
 40 kHz at -70dB down
 Image Rejection: Better than -70dB
 Spurious Interference: Better than -60dB
 Audio Output: More than 1.5 watts across 8 Ohms load 10% distortion
 Intermodulation: Better than 66dB

for the experimenter!

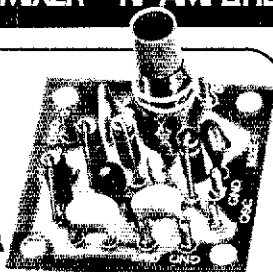
INTERNATIONAL CRYSTALS & KITS
 OSCILLATORS • RF MIXER • RF AMPLIFIER • POWER AMPLIFIER



OX OSCILLATOR

Crystal controlled transistor type. 3 to 20 MHz. OX-Lo, Cat. No. 035100. 20 to 60 MHz, OX-Hi, Cat. No. 035101
Specify when ordering.

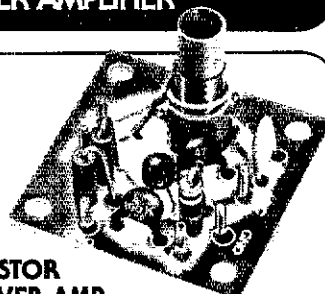
\$3.95 ea.



MXX-1 TRANSISTOR RF MIXER

A single tuned circuit intended for signal conversion in the 30 to 170 MHz range. Harmonics of the OX or OF-1 oscillator are used for injection in the 60 to 179 MHz range. 3 to 20 MHz, Lo Kit, Cat. No. 035105. 20 to 170 MHz, Hi Kit, Cat. No. 035106
Specify when ordering.

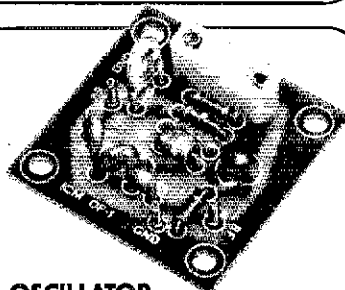
\$4.50 ea.



PAX-1 TRANSISTOR RF POWER AMP

A single tuned output amplifier designed to follow the OX or OF-1 oscillator. Outputs up to 200 mw, depending on frequency and voltage. Amplifier can be amplitude modulated. 3 to 30 MHz, Cat. No. 035104
Specify when ordering.

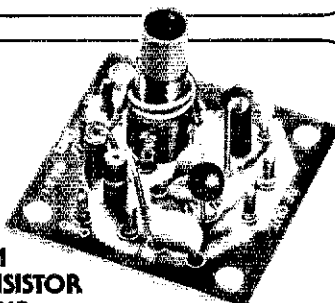
\$4.75 ea.



OF-1 OSCILLATOR

Resistor/capacitor circuit provides osc over a range of freq with the desired crystal. 2 to 22 MHz, OF-1 LO, Cat. No. 035108. 18 to 60 MHz, OF-1 HI, Cat. No. 035109
Specify when ordering.

\$3.25 ea.



SAX-1 TRANSISTOR RF AMP

A small signal amplifier to drive the MXX-1 Mixer. Single tuned input and link output. 3 to 20 MHz, Lo Kit, Cat. No. 035102. 20 to 170 MHz, Hi Kit, Cat. No. 035103.
Specify when ordering.

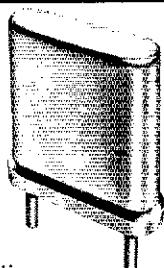
\$4.50 ea.



BAX-1 BROADBAND AMP

General purpose amplifier which may be used as a tuned or untuned unit in RF and audio applications. 20 Hz to 150 MHz with 6 to 30 db gain. Cat No. 035107
Specify when ordering

\$4.75 ea.



.02% Calibration Tolerance
EXPERIMENTER CRYSTALS
 (HC 6/U Holder)

Cat. No.	Specifications	
031080	3 to 20 MHz — for use in OX OSC Lo <i>Specify when ordering</i>	\$4.95 ea.
031081	20 to 60 MHz — For use in OX OSC Hi <i>Specify when ordering</i>	\$4.95 ea.
031300	3 to 20 MHz — For use in OF-1L OSC <i>Specify when ordering</i>	\$4.25 ea.
031310	20 to 60 MHz — For use in OF-1H OSC <i>Specify when ordering.</i>	\$4.25 ea.

Shipping and postage (inside U.S., Canada and Mexico only) will be prepaid by International. Prices quoted for U.S., Canada and Mexico orders only. Orders for shipment to other countries will be quoted on request. Address orders to:
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 Oklahoma City, Oklahoma 73132.



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 Oklahoma City, Oklahoma 73102

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John Titterington, W1EOF, 45 Mountain Ave., Riverside 02915

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Leonard R. Hollar, WA5FSN, RFD 1, 710 South Tenth St., Kingfisher 73750

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The American Radio Relay League, Inc., is a noncommercial association of radio amateurs, bonded for the promotion of interest in amateur radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

“Of, by and for the amateur,” it numbers within its ranks practically every worth-while amateur in the nation and has a history of glorious achievement as the standard-bearer in amateur affairs.

Inquiries regarding membership are solicited. A bona fide interest in amateur radio is the only essential qualification; ownership of a transmitting station and knowledge of the code are not prerequisite, although full voting membership is granted only to licensed amateurs.

All general correspondence should be addressed to the administrative headquarters at Newington, Connecticut 06111.

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*Executive Committee Member

Goodbye, Summer Slump

August is usually a slow month for local radio clubs. With Field Day behind us and many club officers and members away on vacation, things are understandably at a low ebb. But this year, there's something very important that clubs should be doing: They should be getting ready to hold fall Novice and Technician/General licensing classes.

Last fall, the League launched a major effort to assist local clubs and individual instructors in teaching Novice classes. New study material and new promotional tools were developed, and all-new instructor's aids were distributed free of charge to anyone who expressed an interest in teaching a class. The results speak for themselves: Because of the thousands of *you* who accepted the challenge and taught classes, the number of Novice licensees has more than doubled, to 52,000, in less than two years. Some 9,000 of that increase has come in the last two months alone! Even more gratifying have been the reports we've received from instructors using League-supplied material. More than 90 percent of those taking the FCC Novice exam pass it, and the old "drop-out" problem has become a "drop-in" problem instead, with many classes ending up with far more students than they started out with! The total number of amateurs in the U.S. is now about 313,000, which is up by almost 60,000 in the same two-year period.

Now that we've introduced tens of thousands of new people to the pleasures of amateur radio through the Novice program, are we going to rest on our laurels? You bet we aren't! For use this fall, the League will have a complete training program for the Technician and General licenses. The new program will be ready for distribution later this month. It's designed around the new *License Manual* and picks up where the Novice program leaves off, with many of the same popular and effective features. To be successful in our efforts to bring new blood into amateur radio, we have to improve the rate at which Novices upgrade to permanent licenses. This is the goal of the new program.

Of course, the momentum of our Novice efforts will continue; we expect even more Novice classes to be taught this year than last. We're working constantly to improve the training material we provide, including the core of the Novice package, *Tune in the World with*

Ham Radio. The experiences of last fall taught us a lot; as a result, production and distribution of the material should proceed much more smoothly this year. Many thanks are due last year's instructors for bearing with us while we tried to meet an extremely difficult schedule in providing them with material; their patience, understanding, and constructive suggestions were important ingredients in the eventual success of the program.

If your club is already running classes, there's another important way you can help. Most brand-new Novices need some advice and encouragement to get on the air. This is especially true today, because of the shortage of inexpensive equipment suitable for Novice use. Unfortunately, few manufacturers have taken advantage of the tremendous demand for moderately priced cw rigs for 80-10 meters. If you have an old rig in the attic, don't leave it there; dust it off and make it available to a new ham. Perhaps you could organize an auction or "swap shop" for your club, with the emphasis on equipment for Novice use. If some of your members are willing, a club "equipment bank" could be started. Another difficult problem for many newcomers is antennas, since it takes a certain amount of experience to know what will work and what won't. Offer to provide an antenna "consulting service," or run a seminar at the next club meeting on how to build simple, effective antennas. Don't leave to chance the question of whether your Novice graduates ever get on the air or not; make it a part of your club's organized efforts.

One word of warning: If you offer to make a schedule with a new Novice to be his or her first contact, and you haven't listened in the Novice bands lately, be prepared for an operating experience . . . the QRM. Those Novices, plus many of the 63,000 Technicians who now have Novice privileges, are *active*. Back in 1972, the FCC reduced the size of the 15-meter Novice band by 50 kHz because the upper part of the band was "lightly occupied," according to the Commission. We hope they're listening now! This and the other Novice bands — including 10 meters — are often jam-packed with signals, even in the middle of the week. If anyone still harbors doubts about the health and vitality of amateur radio, they should listen sometime! — K1ZZ

League Lines...

DULL AND UNINTERESTING? Not anymore! The just-published Annual Report for ARRL dynamically illustrates what's happening in amateur radio. How does headquarters spend your money (last year 3 1/2 million dollars)? What do your representatives think and say in directing the policy development of ham radio? What happened in the way of new FCC regulations? This and much, much more displayed in an 84-page professionally prepared report, available now for \$3 (to cover printing and mailing costs). Timely, informative and Verrrry Interesting!

Following the June VHF QSO Party, the CAC recommended a modification in the 2-meter vhf fm rule. For Sept., please note that you may use 146.52 simplex for a maximum of four total hours (listening as well as transmitting) -- increments not more than one hour. Please indicate periods in log. Note too that contacts made by retransmitting either or both stations do not count.

SCOUTS!! If you intend to operate K2BSA/3 (Jamboree), remember to bring the original of your license with you. Traffic (complete Jamboree address a must) should be routed through normal channels to W. PA nets.

High speed code cassettes are now available from HQ for \$5. (30 minutes at 15 wpm & 30 minutes at 20 wpm)

Phone patch? Legal or illegal? See "International News" for full details.

Border Jumping? Can-AM Championship August 20-21 (rules July) and VE/W Contest September 17-18 (rules next month).

Canada & Colombia ok 3rd party traffic and reciprocal operating privileges.

ARRL Newslines use keeps growing! Please remember to call 203-667-0138 if you have a news-worthy story. Also, please remember to call the local newspapers and radio and tv stations -- they would much rather talk to you than to us.

OSCAR VI continues to suffer severe voltage problems and will not be available for use until further notice. Do not attempt to access it as you may cause irreparable damage. Check W1AW for latest information.

Tech Department is mailing two reader interest surveys for the purpose of improving technical coverage in QST and League books. If you receive a survey, please assist by giving us your honest opinion.

Do we have your correct callsign on your QST mailing label? If not and you have not notified us in the past five weeks, please jot down the correct call on the label and return it to us so we may correct our records. CD appointees should list their appointment next to the corrected call. Thanks.

If you are a ham that works in the media and have not registered as such with HQ, please let us hear from you. This list is for internal use only and will be kept confidential.

K1VV/1 tested equipment during FD for upcoming (January 1978) Marconi Celebration. FCC has already granted them Special Events Callsign KM1CC, which could make this the last such station for the U.S. British Consul Granville Ramage CMG visited site and indicated that it was quite likely that The Queen would send a message to President Carter via ham radio during the celebration. Hopefully, the President will follow suit.

HELP! Hq needs qualified lab technicians.

Summertime sporadic E is making things lively on 6 and 2 meters. Report unusual contacts to the attention of W1XZ.

Demand for the Wide World of Amateur Radio is running high with a number of clubs using the 15 minute shows to kick off a full hour talk show with local amateurs. This Broadcast Quality six part radio series produced by Steve Mendelsohn, WA2DHF, is available from ARRL Public Information Office.

Phase III: Toward the Ultimate Amateur Satellite

Part 3: With two OSCAR spacecraft performing well beyond expectation, we are clearly ready to transcend the "crawling stage" of the amateur satellite program. Phase III will bring us squarely into the long-sought "walking stage." It's been quite a journey since OSCAR 1 was launched 15 years ago.†

By Jan A. King,* W3GEY

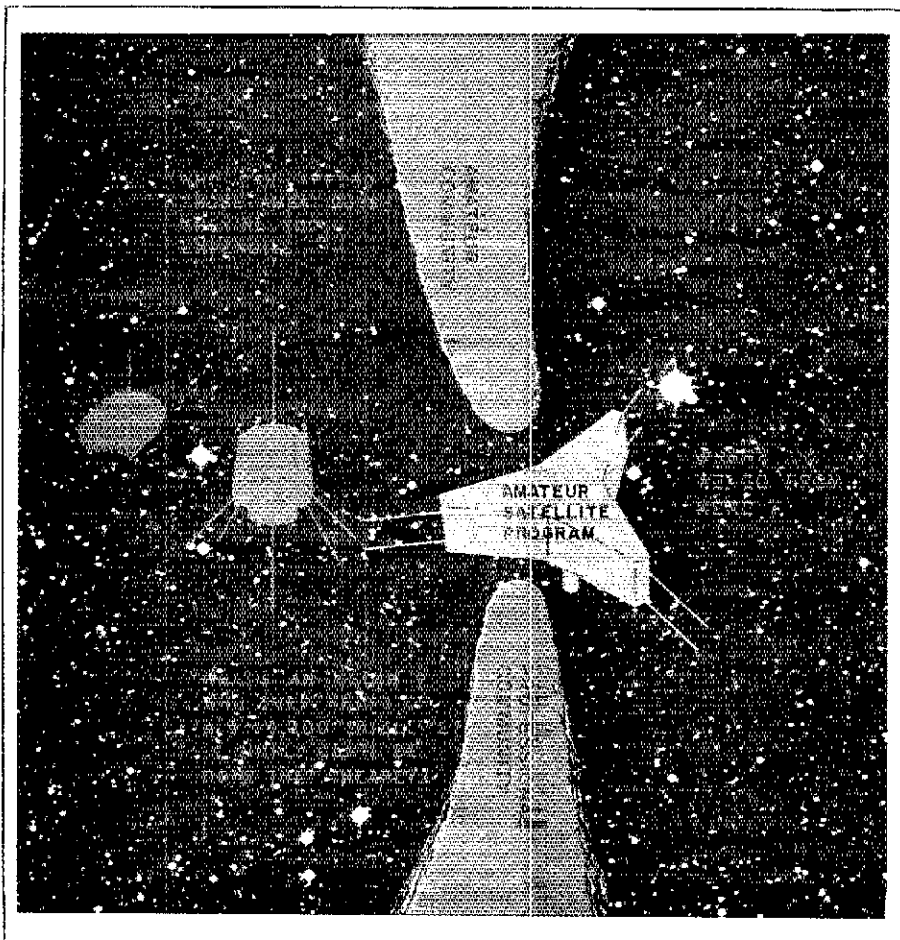
It's Christmas Eve, 1979, and you're about to tune into the latest and most exciting amateur satellite yet. You've read enticing predictions of five-hour round-table discussions that will span the entire Northern Hemisphere, and reliable propagation-free transmissions with inexpensive equipment. You're curious, even anxious, to see whether the bird will really do all these things. You excitedly switch on your 2-meter receiver. What do you hear?

Well, that depends. The very advantages the Phase III's elliptical orbit holds over previous spacecraft make it ripe for mass confusion that could rival CB channel 19 on July Fourth. With the satellite expected to spawn a large number of new users, the result could very well be chaos. AMSAT must find a way to avoid this situation if the spacecraft is to live up to its expectations.

This final article will discuss several management problems that face the builders of the Phase III spacecraft and the financial challenge that lies ahead.

Some Unique Problems

To date, amateur satellites have not provided a real alternative to the hf bands in terms of communications effi-



†Parts 1 and 2 appeared in *QST* for June and July, 1977.

*Project Manager, AMSAT-Phase III, P. O. Box 27, Washington, DC 20044

ciency. Both the duration of contacts and the distances between stations have been restricted. As a result, only amateurs interested in trying new communications techniques have been attracted to satellite work.

Phase III, however, will not only provide communications as efficiently as the low bands, it will actually do some things better. For example, nets with check-ins from five continents could be held for hours at a time without concern for propagation conditions. They could last for several hours per day with each check-in requiring less than 100 watts of transmitter power. The areas of the world an amateur could work will be only a function of time and not the probabilistic ionosphere as well. These advantages, coupled with continued crowding of hf bands and the increasing availability of good vhf/uhf equipment, will cause a tremendous jump in the number of satellite users. With no "skip" zone, as in hf communications, every satellite user can be heard by every other, and QRM could become so bad that it will limit the satellite's usefulness.

There has never been an hf band opening that permits every location in the Northern Hemisphere to be open to every other at the same time. But it will be an everyday Phase III occurrence. In order to avoid the inevitable confusion, techniques need to be worked out for sharing the 150 kHz of spectrum space available. Band plans, new operating practices and even new modes of operation may be necessary. Early international coordination is a must if chaos is to be avoided. To this end, AMSAT desires to form an international coordinating group to discuss this potential problem and methods of dealing with it.

A related problem is one of making amateurs everywhere aware of the capabilities and limitations of these satellites even before they are launched. Most amateurs still feel that satellite communication is possible only for highly technical individuals, not for the average amateur. It is not easy to overcome this feeling and it will take time to do so. Once operating procedures have been established for this new kind of com-

munication, an effective method of assuring their practice must be found. After launch, the satellite itself may prove to be the most effective tool to solve this problem, as bulletins and perhaps a series of lectures on satellite usage and practices may be transmitted directly to users via the spacecraft.

The Financial Challenge

Regardless of whether amateurs feel the cost of an amateur satellite is low or high, the fact remains that if there is to be a Phase III satellite within the next two or three years it will cost us between \$120,000 and \$180,000 per spacecraft. Although these figures may seem high, especially when compared to previous amateur space hardware, an example will show how inexpensive such a spacecraft is for the work it does. Although amateurs don't buy their communications as they do telephone service, let's suppose AMSAT wanted to sell the "channels" of its satellite to someone else. If we just wished to get our money back, we wouldn't have to charge very much. If the transponder's 150-kHz passband could be divided up into 50 channels and our spacecraft worked for five years, the cost for each channel would be a tenth of a cent per minute. As attractive as these economics are, one problem remains: Where do we get the first \$180,000? Why does it take \$180,000 or so in the first place?

Aerospace and the High Cost of Doing Business

While many satellite components are generously donated to AMSAT by industry, many must be purchased. The "high reliability" demanded by NASA means "high price"; a five-dollar IC screened to NASA standards sells for \$50. Solar panels cost about \$3,000 per square foot, or about \$13 per cell when mounted. The panels needed for Phase III will cost about \$30,000. The cost of material alone could be as high as \$50,000.

Professional services, most of them outside the electronics areas, must be purchased. Special machine work and a technician to perform high-reliability wiring are two examples of talents that

must be paid for.

It is also necessary to have a full-time manager to keep the entire project held together and running efficiently. This has been found to be the only effective method of keeping a project of this magnitude on schedule. It is estimated that the total of these professional services for Phase III will cost AMSAT about \$100,000. While this figure may seem high, it represents only about 10 percent of the total personnel requirements needed to build the satellites. Volunteers will still provide the vast majority of the many hours of labor needed to complete the work.

Additional funds needed for a variety of purposes add to the cost. Since AMSAT hardware projects are international, periodic overseas travel is a necessity. Some test equipment and a considerable amount of ground station equipment will also be needed for Phase III.

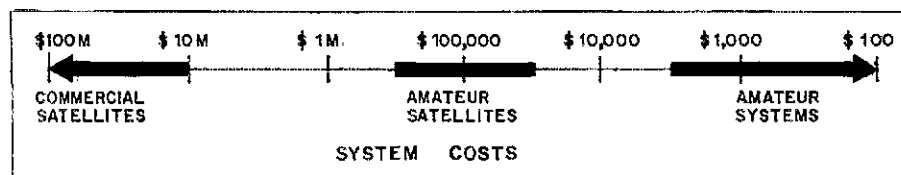
AMSAT's Approach to Raising Funds

Since most of the funds derived from AMSAT membership are used to provide services for its members, operate the two Phase II satellites in orbit and construct a third (A-O D, scheduled for launch next year), a major fund-raising effort will be needed to raise about \$250,000. This goal will provide for one Phase III satellite and allow a start on a second. AMSAT hopes to launch a new spacecraft about every two years. By the time this money is expended, it is anticipated that membership growth will be sufficient to allow the operation to be self-sustaining.

Since these satellites really will benefit all amateurs by making better use of the spectrum we already have available, AMSAT hopes to appeal to the entire radio amateur fraternity for support. While there are a number of different areas within amateur radio which may (and will) be appealed to, it is the large population of active operators that will form the satellite user audience and will provide a stable support base for the program. To give amateurs a strong sense that they are contributing to *their* satellite program, AMSAT has decided to actually sell them sponsorship of a portion of the spacecraft. Here is where you can help. AMSAT is asking all amateurs to help support the project by sponsoring one or more of the most popular Phase III components. Table 1 lists the items "for sale" and AMSAT's estimated cost for the system.

Sponsorship of multiple items such as batteries and solar cells is obviously encouraged. Names of individuals or groups donating more than \$1,000 toward Phase III will be inscribed on a metal plaque to be affixed to the inside of the spacecraft (much like the dedica-

In terms of cost, the amateur satellites occupy a mid-ground between individual amateur stations and comparable spacecraft built commercially. This presents a problem for those involved with building Phase III spacecraft: Professionals won't believe that functioning satellites can be built that cheaply, while rank-and-file amateurs find it hard to understand why these new amateur satellites are so much more expensive than previous ones.



Phase III Components for Sponsorship (Two Spacecraft)

COMPONENT	NUMBER NEEDED	COST PER UNIT
Solid-Propellant "Kick" Motor	2	\$10,000
Integrated Housekeeping Unit	2	\$8,000
Communications Transponder	4	\$5,000
Power Regulatory System	2	\$2,000
NiCad Battery Cell	±40	\$200
2 X 2 Cm Solar Cell with Cover Slide	±5,400	\$10

tion plaque in AMSAT-OSCAR 6). Here's at least one opportunity to get your name situated in a very high place — for several thousand years! Copies of the plaque will be provided to each donor. For those preferring the solar-cell part of the campaign, AMSAT will offer a certificate confirming the donation, which is tax-deductible, and specifying the location of "your" solar cells on the spacecraft.

The author prefers to think of the sponsorship of solar cells by satellite users in the following context. The amateur using the satellite for an average of an hour per day will use about seven watt-hours of energy a week from the transponder (1 watt X 7 hours) in terms of rf output. Due to the inefficiencies of the transponder and the spacecraft power system, about 16 watt-

hours of energy must be derived from the sun in order to provide this amount of rf energy. It turns out that two solar cells produce just over this amount of energy in a week's time.

Users may wish to consider their contribution as a payment for the energy used for their operations, just as they pay the electric power bill. Others may wish to think of it as using the power made available by their solar cells to provide their QSOs. (No fair using this rationale for increasing your uplink power level!) For more information on the fund-raising effort, look for the advertisement elsewhere in this issue or write AMSAT/Phase III, P. O. Box 27, Washington, DC 20044.

The Launch of Phase III-A

In December, 1976, the European

Space Agency (ESA) announced approval of AMSAT Phase III as a piggy-back passenger on the second test flight of its new ARIANE launch vehicle. The AMSAT proposal, in competition with dozens of others, was selected first (test flight no. 1 will have no payloads). AMSAT is now working directly with ESA to coordinate all the details associated with integrating Phase III-A into ARIANE/LO-2. The launch is scheduled for December, 1979, from the Guiana Space Center in French Guiana, S.A., just north of the equator. It will go into a synchronous transfer orbit which will be changed by the Phase III kick motor into the desired elliptical orbit.

Amateurs will then have a way to bridge the gap between continents for hours at a time, with none of the vagaries of propagation. It will be the culmination of years of hard work by volunteers and professional assistants. Will it be worth it? Time will tell, but for now it looks pretty favorable.

Won't you join us in the next step of our satellite program?

The writer hopes he has stimulated readers regarding the potential of the amateur satellite program and would like to thank Dr. Karl Meinzer, DJ4ZC, Dr. Marty Davidoff, K2UBC and Mr. Pete Thompson for their technical contributions to this article. **QST**

Strays 

WHAT IS A HAM?


- What is a ham?
- Is "he" a man or a woman?
- Is he young or old?
- Is he an engineer, a scholar, a carpenter, a butcher, baker or candlestick maker?
- A senator (a man of the world) or a homemaker (a shaper of the world to come)?
- Is it a sorority or a fraternity?
- Is it friendship or a bond of common shared experiences?
- Is it a desire to be capable of helping fellowmen or
- Is it a desire to learn and to know?
- Is it a desire to do and experiment or
- Is it just a desire of human beings to communicate?
- Just what is a ham? A ham is all this and more except one:
- A ham is not something you can put between two pieces of bread and take for lunch! — *Janice Shillington, WB9OJA*

□ The ARRL Technical Information Service has received numerous inquiries about Illumitronics coils. Raymond F. Rinaudo, W6ZO, advises us that the coils are still being manufactured but under a different producer's name. Information may be obtained by writing to Icore International, Inc., 18 N. Wolfe Road, Sunnyvale, CA 94086.


I would like to get in touch with . . .

- someone with information on carrier-current radio equipment and design of a simple broadcast station for a U.S. Army Hospital Chapel program in Nuremberg, Germany. Chaplain (MAJ), Paul E. Phelps, WA8JLZ/DA1PP, USAH Nuremberg, Office of the Chaplain, APO NY 09696.

THE HAM FAMILY



W4DYW
Everest



WA4SRD
Edith


DATE _____

TIME _____


RST _____

FREQ _____


MODE _____




WA4BQY
Ellen




WB40MB
Larry




WA4BSJ
Emily



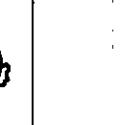
DL7SU
Goetz



WA4BVF
(DJØYL)
Elissa



WA4YMY
Barbara



WA4AAK
Evan

**PSE/TNX QSL DIRECT OR VIA ARRL
(DARC for DJ/DL)**

Though spread far and wide — from Germany to North Carolina — the McDades are still a ham family. Sure beats printing nine different batches of QSL cards!

A Delayed Brake Release for the Ham-II

For less than \$20 this delayed brake-release circuit offers protection against damage to the antenna and mechanism of a rotating array. It's a sound investment.

By Andrew B. White,* K9CW

There it is, peacefully resting atop your Texas-sized tower. You point to the spreading 40-meter beam with pride. The visiting amateur standing beside you is told of plans to mount a 20-meter array above the gleaming new antenna that already has brought down the plaster across the continent. He quietly listens to words of great expectations for the additional array.

After pride has popped the last button on your shirt and you've prodded your friend, Thoughtful Harry, for his sanction, he indicates his tacit approval. Even so, you sense a sign of concern. Breaking his near silence, he asks if you are aware of the possible damage to the antenna and rotator should you forget to delay the brake manually. Since this is your first towered beam, you measure his words carefully.

What Harry's voice of experience relates closely parallels the solution to a problem we had at our radio association. Thoughtlessness can be costly at any amateur station — whether club or individually operated. Because of the constant use of a rotating antenna it is susceptible to considerable damage if proper operation is not observed at all times. We had this in mind before our radio club purchased a new CDE Ham-II rotor system when our older unit failed. Unlike the Ham-M it replaced, the Ham-II provides a front-panel switch to control the solenoid brake in the rotator unit. The advantage of this switch is that an operator can allow the antenna to coast to a complete stop before engaging the brake if he watches the

direction indicator. Damage to the antenna or the rotator is a real possibility if the brake is engaged immediately after the power is removed from the motor. This is especially true for a large antenna array.

Because of the steady amount of activity at the club station, it was decided that a fail-safe device for the antenna system deserved priority. The product of our decision is explained in this article, showing a new rotor-control circuit for the Ham-II to automatically delay the brake. The system may be used for similar rotators. When constructed, it is compact enough to mount inside the Ham-II control-unit cabinet. The total cost is under \$20.

Several years ago an article in *The ARRL Antenna Book* described a brake-delay circuit for the Ham-M rotator.¹ Although that circuit could be adapted to the Ham-II, we had other problems found only at a club station. Our rotator turns both a Hy-Gain TH6-DX and a pair of 14-element 2-meter beams mounted at the 150-foot level . . . inconvenient for repairs, to say the least. Furthermore, some of our operators were not only forgetting to manually delay the brake but other operators, particularly those operating on 2-meter fm, had a tendency to rock the antennas back and forth several degrees to peak weak signals.

The circuit presented here offered the measure of protection needed by not only delaying the brake after rotation, but at the same time it disabled

the direction-selector switches. In this manner the antenna system coasts to a stop before rotation may begin in the opposite direction. The automatic delay prevents damage to the antenna system and rotator, even during a contest when the operator's attention is not on the rotator control.

Circuit Description

Fig. 1 presents the brake-delay circuit schematic diagram. S3, S4 and S5 are the existing Ham-II control unit brake release and direction switches. S4 selects clockwise (cw) rotation and S5 selects counter-clockwise (ccw) rotation. These switches are replaced by K3, K4 and K5, respectively, in the modified control unit.

A pair of NAND gates in U1 form a debouncing circuit for each direction switch to prevent false triggering of the brake from contact bounce. Pressing S4 causes pin 3 of U2 to go high (+V_{DD}), or to a logical 1, which forces pin 3 of U3 low (0), pin 11 of U5 high, and energizes both the brake relay K3 and the BRAKE RELEASED LED, CR1. In addition, pressing only S4 forces pin 10 of U2 low and pin 11 of U3 high, energizing K4, the cw rotation control relay. When S4 is released a short pulse appears at pin 2 of U4, triggering the monostable multivibrator. While pin 3 of U4 is high, the brake remains released, and the selection switches are disabled by the logic 1 on pin 9 of U3 and pin 13 of U3. In a similar fashion, pressing S5 energizes the brake relay K3, LFD CR1, and the cw rotation control relay, K5. Whenever one of the direction control relays is energized, the ROTATE LED, CR2, illuminates to

¹"Delayed Action Braking for the Ham-M Rotor," *The ARRL Antenna Book*, Thirteenth Edition, ARRL, 1974, pp. 281-282.

*102 Franklin St., Urbana, IL 61801

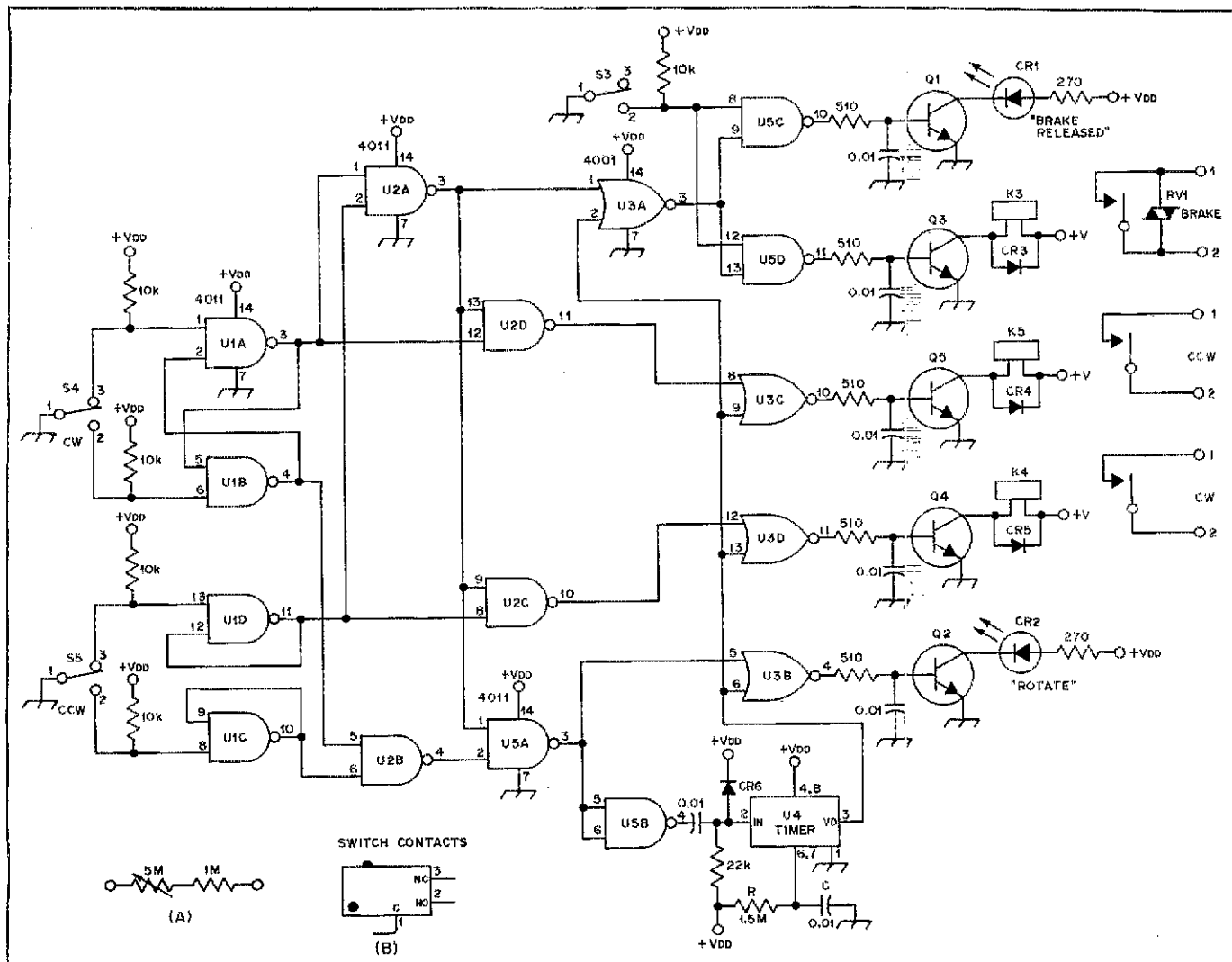


Fig. 1 — This schematic diagram shows the circuit for a brake-delay system for protecting the Ham-II rotator and antenna.

CR1, CR2 — Light-emitting diode, Motorola type MLED600 or equiv.
 CR3-CR6, incl. — Silicon signal diode, 1N914 or equiv.
 K3-K5, incl. — Switching relay, 12 V dc,

1200 ohms, 10 mA; contact rating 1 A; 125 V ac; Radio Shack 275-003 or equiv.
 Q1-Q5, incl. — Silicon npn transistor, 2N3904 or equiv.
 RV1 — Varistor, GE 750 or equiv.

U1, U2, U5 — CMOS quad NAND-gate IC, RCA CD-4011A or equiv.
 U3 — CMOS quad NOR-gate IC, RCA CD-4001A, or equiv.
 U4 — Timer IC, 555 or equiv.

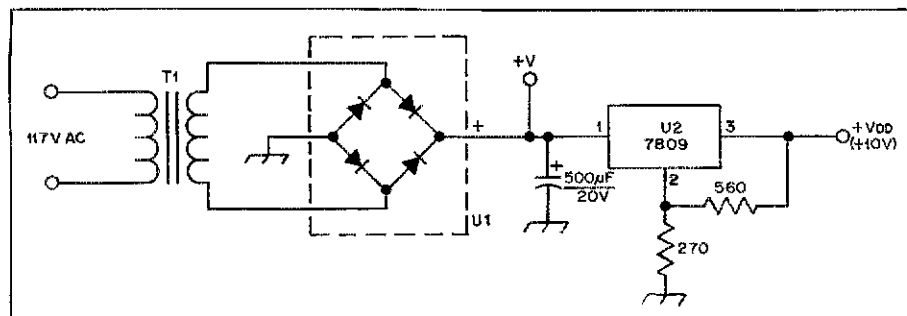


Fig. 2 — Regulated power supply for the delayed brake release system.

T1 — Power transformer; pri. 117 V; sec. 12 V, 300 mA; Radio Shack 273-1385 or equiv.
 U1 — Bridge rectifier, 50 PIV, 1.5 A; Radio

Shack 267-1151 or equiv.
 U2 — Monolithic three-terminal positive-voltage regulator, 9 V, 500 mA; Fairchild 7809 or equiv.

indicate the rotor is turning.

The circuit has been designed to detect the simultaneous selection of both rotation directions using a NAND gate in U2. If both are pressed, a

transition to 0 at pin 4 of U2 triggers the monostable multivibrator, forcing a brake-delay period. In this way, the rapid rocking of the antenna back and forth is eliminated. After the end of the

delay cycle, if both direction switches are still pressed, neither control relay is energized since both pins 8 and 12 of U3 are high, keeping Q4 and Q5 off.

If a longer delay is desired the brake can be released manually with S3. CR1 signals when the brake is energized, but no delay cycle is initiated.

The delay timer (NE555) is connected in a monostable multivibrator configuration. The components R and C at pins 6 and 7 of U4 determine the length of the delay. The values shown provide a delay period of about 3 seconds. An alternative is to use a potentiometer for R as shown in Fig. 1A to yield a variable delay of 2 to 8 seconds. For our antenna system, however, the fixed period is satisfactory.

Construction

CMOS integrated circuits were used in this design because of their high-noise

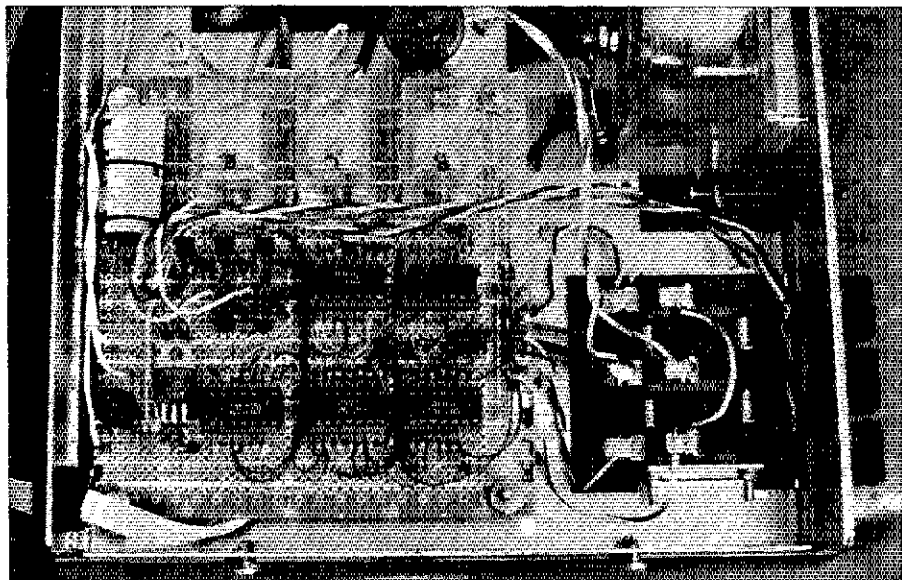


Fig. 3 — Modification of the Ham-II control unit showing the Vector circuit board and components.

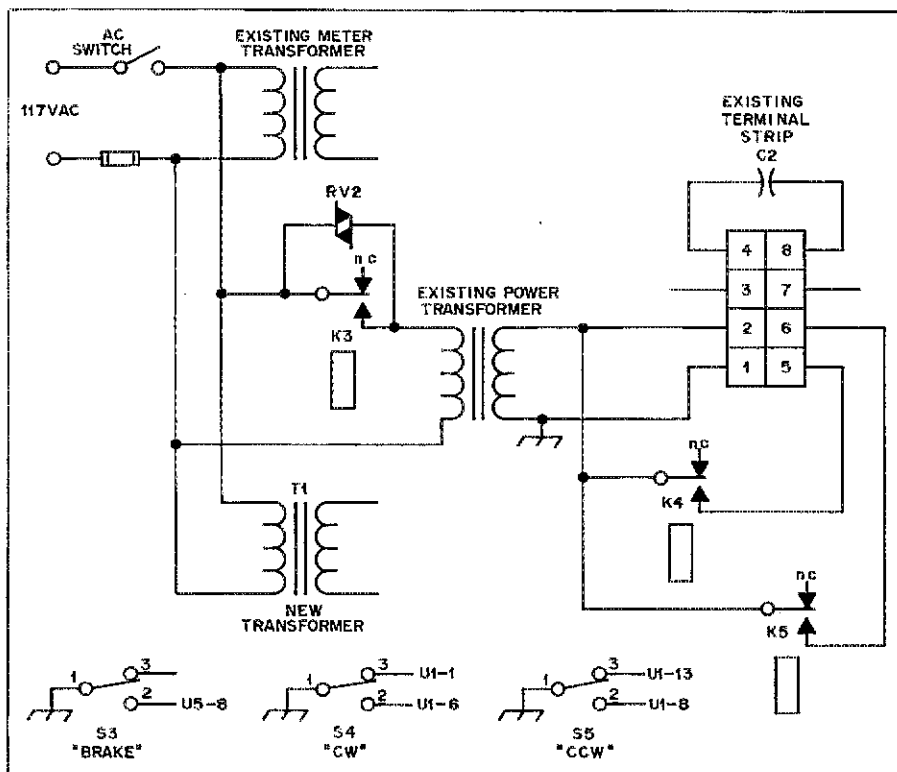


Fig. 4 — The Ham-II circuit modifications are shown in this diagram.

margin, low-power dissipation, and tolerance of varying supply voltage. CMOS units will operate with a V_{DD} ranging from 3 to 15 volts, although the 9-volt regulator shown in Fig. 2 is used in our unit. TTL circuits may be substituted but some immunity to rf would be sacrificed, and, of course, the pin connections of the devices are different.

The transistor drivers Q1 through Q5 are necessary since these CMOS devices cannot draw enough current to energize either the relays or the LEDs. The

0.01- μ F capacitor on the base of each transistor is included to eliminate false keying of the relays by stray rf. An added precaution is the transient suppressor shown across the contacts of K3. The brake relay connects the line voltage to the primary of the brake and rotation power transformer. Without the suppressor, the contacts of K3 would pit badly because of arcing when the relay contacts open.

The circuit as shown in Fig. 3 is constructed on a Vector IC breadboard



Fig. 5 — A view of the control panel of the Ham-II rotator.

circuit card using IC sockets and standard wire-wrap techniques. One could just as easily use a homemade printed-circuit board or any other fabrication technique since the layout is not critical.

Fig. 4 illustrates the Ham-II circuit modifications. Relays K3, K4 and K5 replace S3, S4 and S5 in the original diagram, and the primary of a small 12-V ac power transformer is connected to the control-unit ac power switch.

There is more than enough room beneath the Ham-II chassis to mount the delay-circuit card. It may be necessary to relocate the phasing capacitor, C2, above the chassis. The wires that were originally connected to S3, S4 and S5 are relocated, connecting them to the corresponding relay contacts. The switches are connected to the delay-circuit inputs. These switches are single-pole double-throw microswitches with the contact configuration shown in Fig. 1B. In our unit the LEDs are mounted below the switches in the front panel as pictured in Fig. 5.

Operation

The modified rotator control unit is used in the same manner as always except that the operation of S3, the brake release, is now automatic. Both LEDs, CR1 and CR2, are illuminated during rotation and CR1 (BRAKE RELEASED) remains on through the brake-delay cycle after rotation. Because the antenna will coast approximately 10 degrees, the operator must release the rotation switch about 10 degrees before the antenna reaches the desired direction. With practice, the early release becomes natural.

The delay circuit has performed flawlessly while being subjected to the demanding use found only in an active college club station. No interference with circuit operation is apparent even when using the kilowatt amplifier. This delay circuit would be worthwhile as an addition to any Ham-II rotator and could be modified for many other rotor control units.

A Novel Antenna Installation for a Sailboat

Although this antenna installation is designed for a boat with a mast, the idea could be applied to many towers. It's a "neat" way to rig a whip antenna up top.

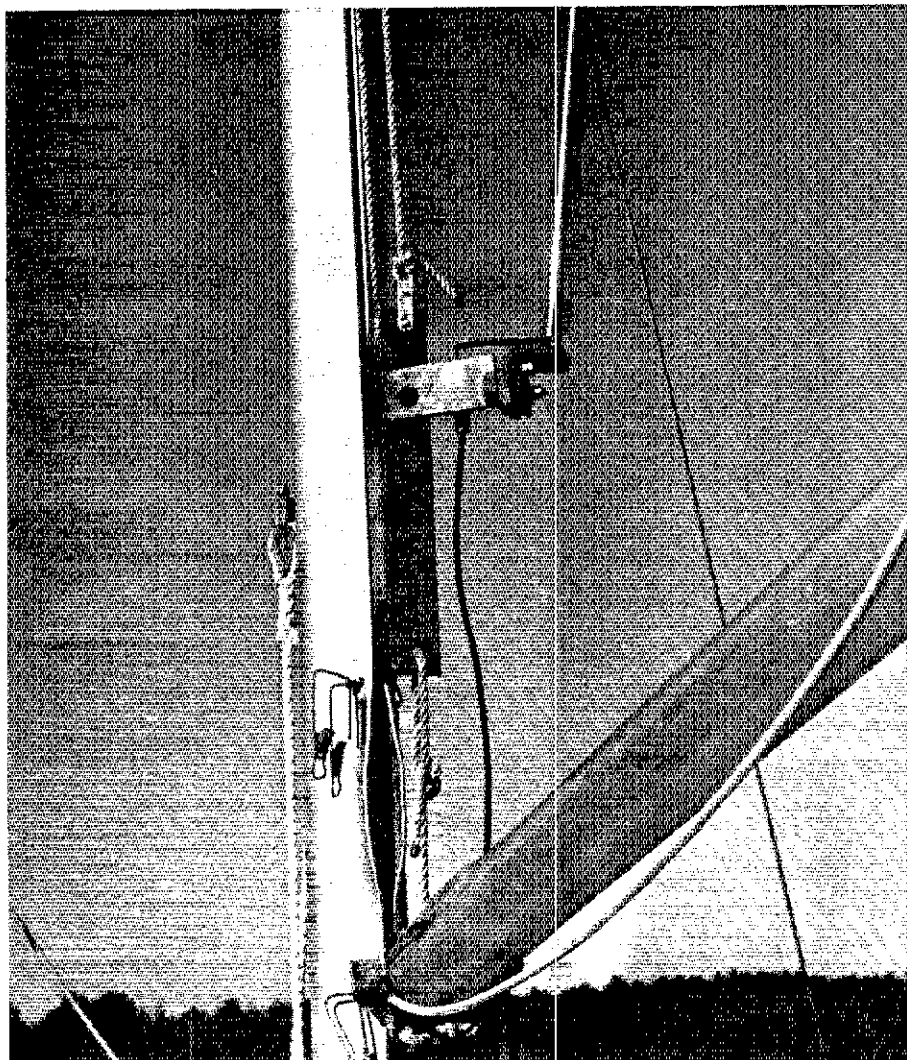
By Hayden A. Ross-Clunis, Jr.,* K4MU

A recent *QST* article¹ about an amateur-radio antenna installation on a sailboat aroused my interest. Sailing and amateur radio are my two favorite hobbies. Certainly, numerous options are available in making such an antenna installation, and the one I describe here may appeal to some of you.

First, it must be stated that any radio amateur who owns a cruising sailboat and who has not combined the two avocations is truly missing out on a lot of fun. I do not know of any exact definition of "Heaven on Earth," but a good approximation would be to bring your boat to an anchorage in some isolated creek or cove, relax while watching the sun set over the still water, enjoy a good meal and wind the evening up with a couple of hours on the air. This blend of hobbies is a unique and satisfying combination. It helps, however, to have a rig capable of 12-V dc operation plus an antenna which does not unduly affect the appearance or operation of the boat.

The Antenna System

My approach was to use an inductively loaded whip antenna mounted in such a way as to be removed easily for stowing when not in use. Admittedly, this is somewhat more expensive than using a simple wire multiband antenna, particularly if you buy a lot of top sections (one per band). However, the expense does not seem too bad if you slip down to the store and buy the top



*P. O. Box 68, Seaford, VA 23696

¹Wentworth, "Mobile Marine Under Sail," March *QST*, 1976.

This view shows the carrier installed on the mast. Note the pulley rope and stop, just below the carrier.

sections one at a time. (How's that for rationalizing?)

It was considered desirable to have the antenna clear of the metal rigging and spars, which decreed a masthead location. Multiband operation requires easy access to the antenna to change top sections. This in turn calls for either climbing the mast or lowering the antenna. The latter method was chosen.

The solution was to fabricate an "antenna carrier" which fits in the groove on the aft side of the mast and can be raised and lowered with its own halyard. The extra halyard has already proved handy, by the way, when the main halyard was lost accidentally up the

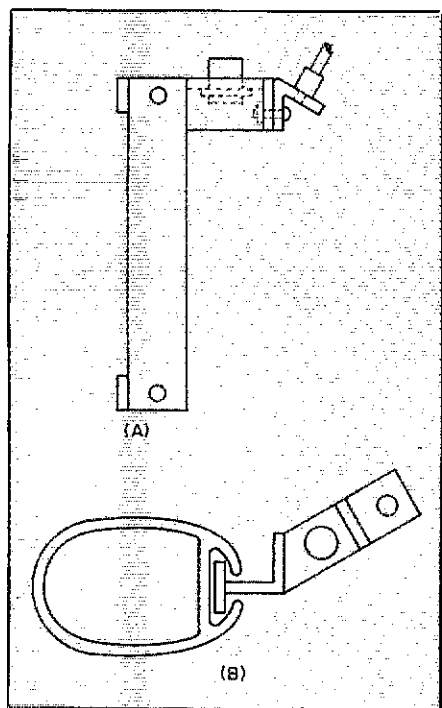


Fig. 1 — At A is a side view of the mount. At B is a cross-sectional view of the mast with the mount "foot" inside the track.

mast. The "feet" of the carrier, which fit in the groove, are about a foot apart. See Figs. 1 and 2. This provides a reasonably firm mount for the antenna, yet when fully raised, fits above the uppermost slug of the mainsail. The same arrangement, of course, will work with the more common sail track/slide arrangements.

The portion of the carrier supporting the antenna must protrude at an angle to offset the antenna enough to one side so that it will clear the uppermost portion of the mainsail. Also, it must be tilted slightly to allow the antenna to avoid the backstay on its way up and down, as well as to give it additional clearance from the clutter of gadgets

found at most mastheads. Obviously the carrier cannot be lowered to change bands when the sail is up, but this is no problem since the bulk of my operating is done while at anchor. However, at worst, it is just a few minutes' work to lower both the mainsail and carrier, change antenna top sections, and rehoist everything.

Corrosion has been no problem, since the carrier spends all of its "not-in-use" time stowed in the cabin. The outermost portion of the carrier, insulated from the rest, is drilled and tapped to accommodate the threads on the bottom of the antenna. It was found necessary to drill a hole and lock the antenna in place with a cotter pin, since even with a lock washer it would work itself loose over a period of time.

Construction details are shown in Fig. 2. The carrier was fabricated mostly from 1-1/2 X 1-1/2 X 1/8-inch galvanized steel angle. The "feet," item 2, are approximately 1 X 1 X 1/8-inch and are welded to item 1 as shown. The width should be such as to be a snug sliding fit inside the mast groove. Item 1 is a one-foot length of the angle iron. Holes were drilled near the top and bottom to allow attaching the halyard and downhaul. Item 3 is a five-inch length of angle iron, one end cut at a slant to provide approximately a 30° offset from the fore-aft centerline. It was welded to item 1. A small square of steel was welded into the outboard end to provide a flat plate for attaching items 4 and 5. An SO-239 connector (facing downward) was mounted at 6. Rf ground is via the carrier into the mast through such contact as exists between the "feet" and the sides of the mast groove. (Contact is good enough, although perturbations are noticeable if the boat happens to be rocking violently during transmission.) A wire is used to connect the center conductor of the SO-239 to a lug on item 7.

The insulator, item 4, is a simple 1/4-inch piece of plastic.

Item 5 is a short piece of angle iron, hammered into an angle of somewhat less than 90°. It was drilled and tapped at location 7 to accommodate the threaded bottom of the antenna. A nut was placed on the portion of the antenna protruding below, and this was drilled and locked with a cotter pin.

Antenna Performance

With the mast used for a "radial" system, the SWR is generally below 2:1. No loading problems have been encountered with an FT-101. It is possible that the newer all-solid-state rigs which do not have output loading controls and are more sensitive to SWR might want some external matching to keep their transistors happy, but the author has no experience in that area. There is no

noticeable rf floating around the cabin which is definitely not the case when Transmatch is used with an insulated backstay or other random wire for the antenna.

My antenna is rather sharply resonant, particularly on 75 and to a lesser extent on 40 meters. I generated a chart of settings for my boat's log which gives, for each band, the length of tuning stub versus resonant frequency. With aid of an old broken carpenter's rule, which is now standard equipment on my boat, the antenna can be quickly lowered and reresonated to any particular portion of the band.

The antenna is fed with RG-58/U. The coaxial line is pulled to one side and lashed to a shroud to keep it out of the way. It is then led through a ventilator into the cabin, or directly aft if the operating is to be done from the cockpit.

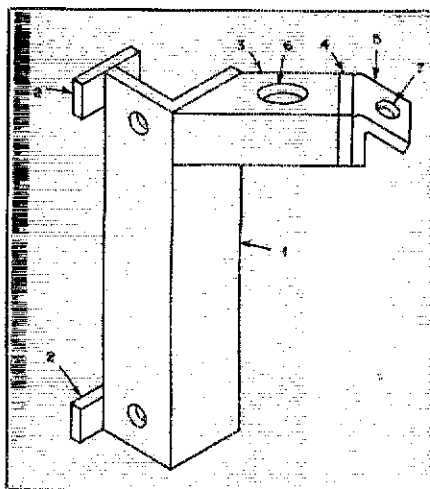


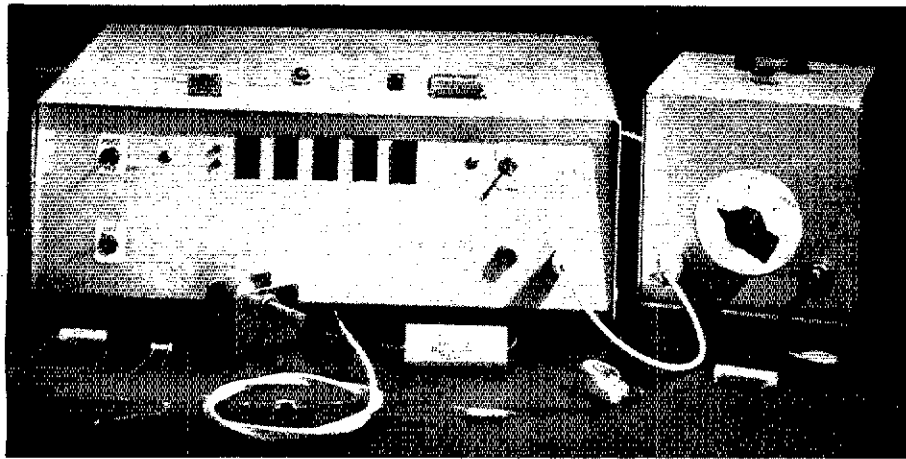
Fig. 2 — Construction details of the carrier, which is fabricated mostly from galvanized steel angle. See text.

As a matter of interest to other sailing hams, battery capacity is rarely a problem when using the three-tube Yaesu on an outboard-powered craft. A 100-ampere-hour battery has enough capacity for two or even three evenings of operating if other electrical loads are held to a minimum. For longer cruises we have recently come up with a setup where I can connect an automobile alternator to my outboard engine and put a constant 30-ampere charge into the battery. As to the performance of this antenna arrangement, I have worked plenty of DX, at least of the common variety, and have had many pleasant ragchew while being completely satisfied with my signal reports

Using a Frequency Counter as a Capacitance Meter

Unknown-value capacitors need no longer remain anonymous. "Identical-value" capacitors in a precision circuit need no longer be mismatched. Precision capacitance measurement can be yours with this addition to your frequency counter.

By Raymond F. Kramer,* W6ALF



The capacitance-measuring adaptor, right, and the author's homemade frequency/time-interval counter. Values from a few picofarads to several microfarads may be measured with high accuracy.

An inexpensive, easy-to-build accessory device which converts a counter into a digital capacitance meter makes a valuable addition to the instrument lineup in a ham shack. You can make such a device with two integrated circuits, one transistor, a rotary switch and a few resistors. No major modification of the counter is required. Its operation as a frequency meter is not impaired or affected. Four leads are tapped into the counter: +5 volts, ground, a tap to the 1-MHz point on the time-base chain

(this is brought out to a terminal on the Thirty Dollar Counter¹), and a tap to the count-enable line (or to the "clear" line in the Thirty Dollar Counter). The output line of the accessory is connected to the input on the counter. An input which will accommodate high-level signals (such as in the Thirty Dollar Counter) is preferred. Those counters with a high-gain input stage may be difficult to manage with the high-level signals. [A resistive voltage divider may be used to "knock down" the level at the output of the adapter if your counter has a sensitive input circuit. — Ed.]

This digital-capacitance meter is particularly useful in measuring capacitors in the low ranges of values — 5 pF or so — an area where analog capacitance meters are deficient because of low resolution and poor accuracy. The resolution with this device is 1 pF on the low range, and accuracy is significantly better than one percent in this range of values. Three ranges allow measurement of capacitors from 1 pF to 10 μ F. Range no. 1 is 99,999 pF full scale, no. 2 is 0.99999 μ F, and no. 3 is 9.9999 μ F. Each range may seem wide, but remember, the resolution on range no. 1 is 1 pF, with 10 pF on range 2, and 100 pF on range 3. The stability of readings is remarkably good and a pleasant surprise for such a simple instrument. For instance, a 1020-pF capacitor (nominally 1000 pF) read 1024 pF \pm 1 pF over a period of a week.

Counters

Any of the counters described in *QST* in the last few years will serve as the digital portion of this system. The cleverly designed Thirty Dollar Counter is very easily applied to this system. Others are only slightly more difficult to adapt. The one I use is a more elaborate counter than the Thirty Dollar Counter, but selecting and making points of connection was a trivial job.

All the counters described in *QST* are referred to as frequency counters. No mention, that I discovered, was made of the TIM (time interval measurement) mode of operation. In the fre-

*1236 E. Union Ave., Fullerton, CA 92631

¹References appear on page 23.

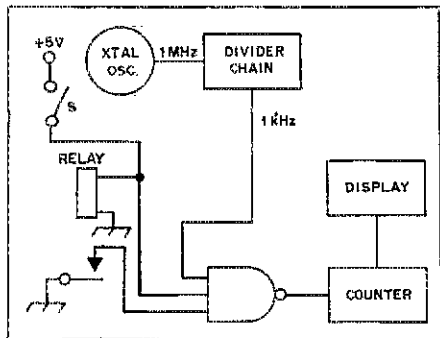


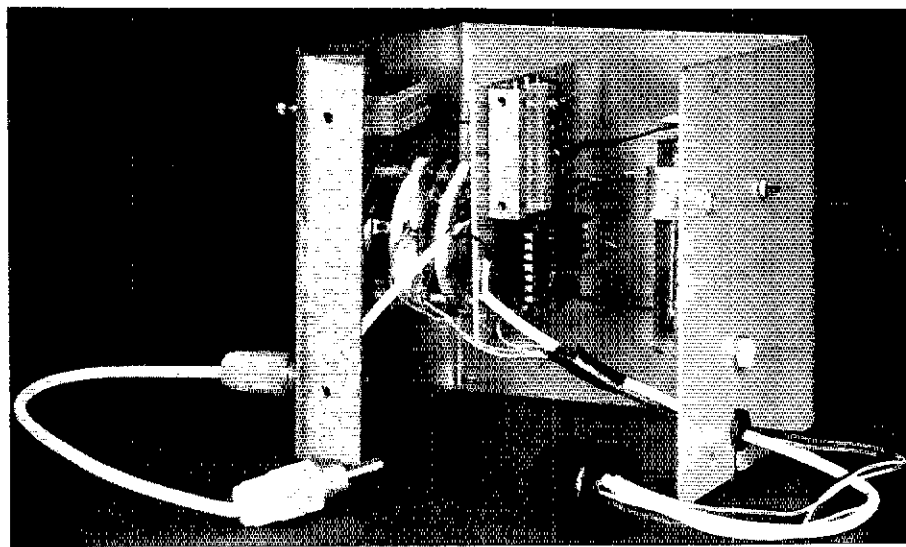
Fig. 1 — This simplified circuit illustrates the use of an electronic counter for a time-interval measurement, in this case the contact-closure time for a relay. When S is closed the three-input NAND gate is enabled and 1-kHz pulses are accumulated in the counter. When the relay contacts "make," typically a few milliseconds later, the NAND gate is disabled and the display indicates the number of milliseconds which elapsed since S was closed.

quency-counting mode, the time base opens the counter (count-enable command) to the signal under observation for precisely one second or for one millisecond. Cycles are counted in this interval and displayed. In the TIM mode, the count-enable command is turned on and off by the initiate and terminate signal of a process being measured. During this interval, pulses of known frequency (1 MHz in our application) enter the counter and are accumulated and displayed. The 1-MHz pulses are obtained from the time-base divider chain. An example from industry (see Fig. 1) is the measurement of contact closure time in relay operation. When the relay is energized by a switch closing, the counter is enabled and when relay contacts close, the count enable is turned off. During the count-enable ON time, 1-kHz pulses are accumulated and displayed. If greater precision is desired, 10 kHz can be used.

The TIM mode is employed in the digital capacitance meter application with a slight twist from the relay example above. The normal count-enable (one-second) pulse not only opens the counter gates to the 1-MHz pulse signals, but also starts the external measuring process. The measuring process takes a maximum of 99,999 μ s (essentially 1/10 s) when the count is terminated by the accessory unit. Thus, measurement is completed well before the count enable is turned off. Using this scheme the measurement is updated every two seconds.

Circuit

The heart of the accessory unit is a 555 IC, a block diagram of which is shown in Fig. 2. This versatile integrated circuit was used as the basis of an analog capacitance meter² and in a complete counter/digital-capacitance meter.³ The device described here is much simpler



The inner workings of the capacitance-measuring adaptor. The etched circuit board is supported by the range switch, and the multturn calibration pots may be adjusted through access holes in the cover (not shown). Power for the adaptor (other than U2) is obtained from the partially hidden 9-V battery; for convenience, a test-point jack on the rear panel allows measurement of the battery voltage without removal of the cover. Leads from the top of the board connect to the capacitance-measuring terminals on top of the cabinet.

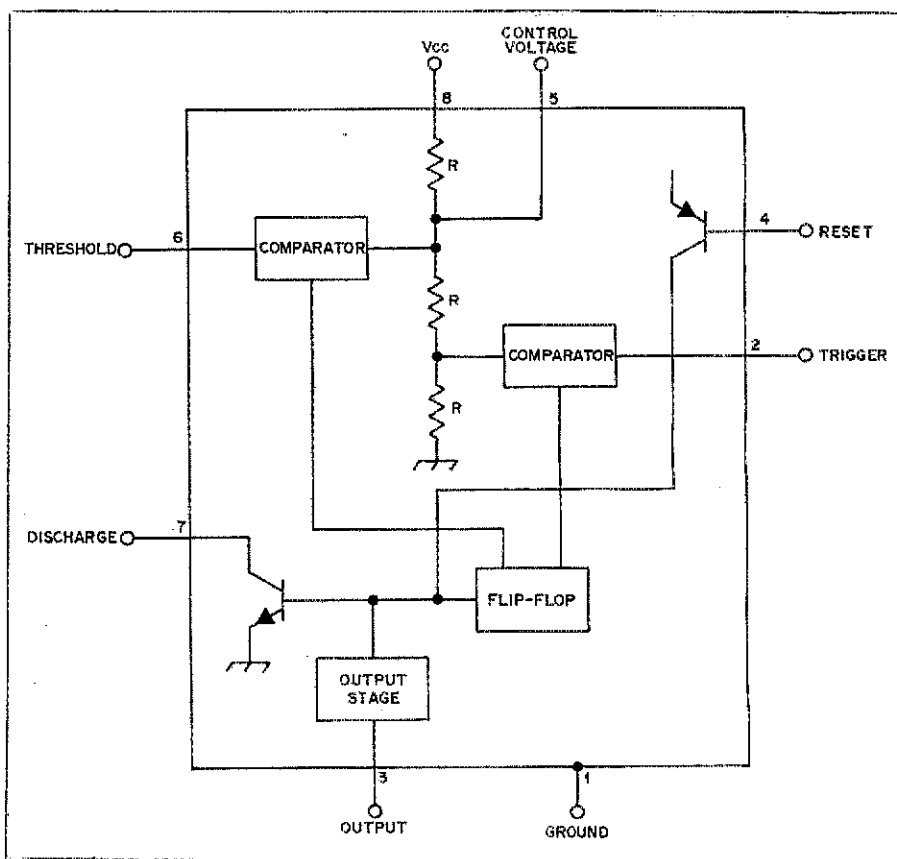


Fig. 2 — Block diagram of the 555 timer integrated circuit.

than either of those. The 555 consists of two comparators, a flip-flop, discharge transistor and output stage. An internal divider provides the comparison voltages. Now refer to the circuit diagram (Fig. 3) of the complete device where the 555 is shown as a block. A trigger

pulse is developed by applying the positive-going count-enable signal to pin 2 of U2A, then is differentiated by C1 and buffered by level charger Q1. The resulting negative-going pulse is applied to pin 2 of the 555 (trigger) and causes the flip-flop to change state. This cuts

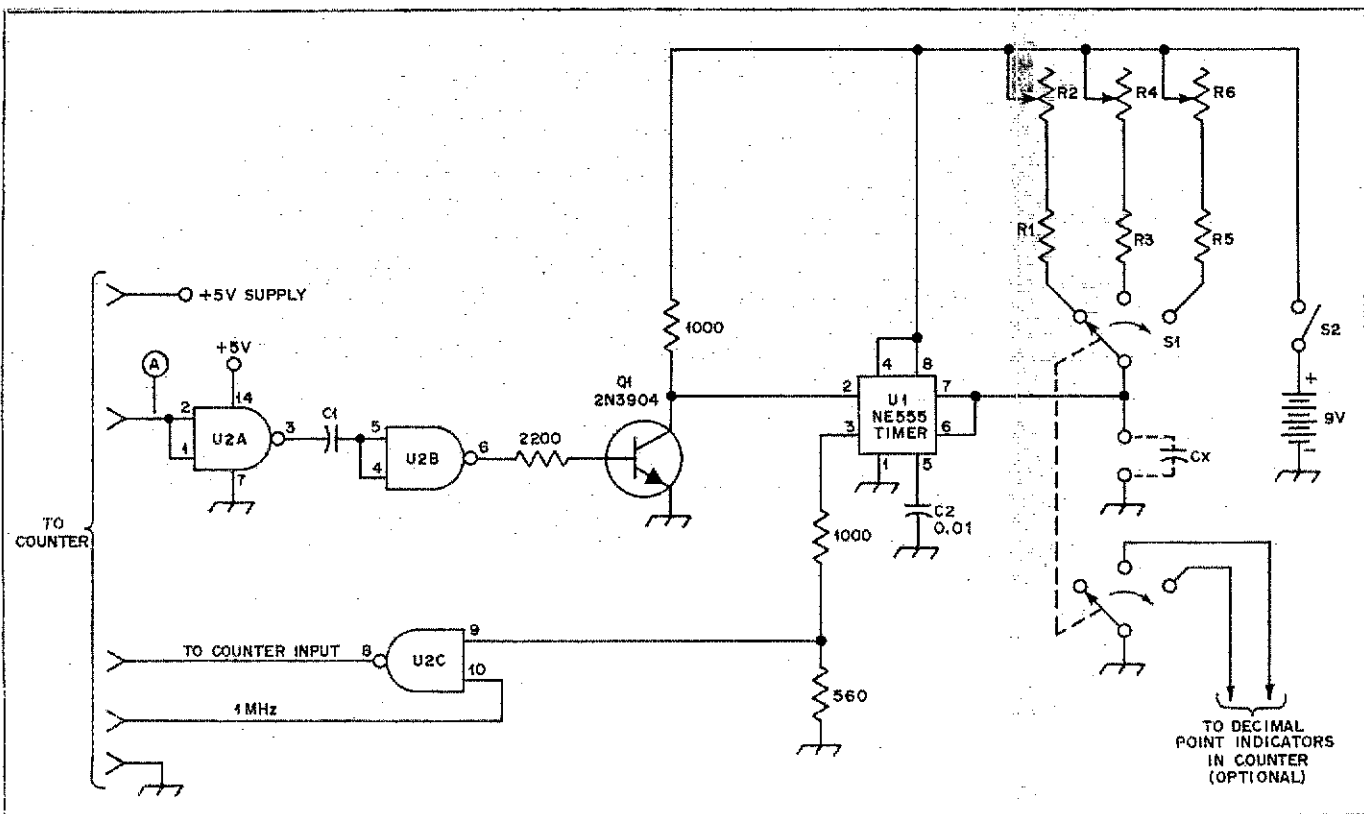


Fig. 3 — Schematic diagram of the capacitance-measuring adaptor for a frequency counter. All fixed resistors may be 1/4 watt. C_X is the unknown capacitance being measured. Point A is connected to obtain the positive-going count-enable command in the frequency counter (pin 8 of U18A in the Thirty Dollar Counter¹). Five-volt power is taken from the associated counter. See text regarding S1 positions.

C1 — 18 pF. With the Thirty Dollar Counter omit C1 and replace with a direct connection from pin 3 to pin 5 of U2.

R1 — 860 k Ω (390 k Ω and 470 k Ω in series, or see text).

R2 — Multiturn pot, 100 k Ω .

R3 — 86 k Ω (39 k Ω and 47 k Ω in series, or see text).

R4 — Multiturn pot, 10 k Ω .

R5 — 8600 Ω (3900 Ω and 4700 Ω in series, or see text).

R6 — Multiturn pot, 1000 Ω .

S1 — Dp3t rotary.

S2 — Spst toggle.

U1 — Timer IC, type 555.

U2 — Quad NAND-gate IC, type 7400; 1 section unused.

off the discharge transistor, thus removing the short circuit from C_X , and causing the output (terminal 3) to go positive, enabling gate U2C. With the short circuit removed, the capacitor charges exponentially through resistors R1 and R2 (position no. 1). When the voltage across C_X reaches $2/3$ of E_{CC} , the threshold comparator causes the flip-flop to change state, turning on the discharge transistor, and thus shorting capacitor C_X . At the same time, the output goes to zero, which disables gate U2C. During the time capacitor C_X was charging from zero to $2/3$ E_{CC} , gate U2C allowed 1-MHz pulses to be applied to the counter input. The time the gate was open is expressed as $t_H = 1.0986 RC_X$.

Time t_H is a simple linear function of C_X only, once R is fixed. Also, due to the design of the 555, t_H is independent of the supply voltage.

In applying the unit to the Thirty Dollar Counter, a jumper replaces C1, and pins 1 and 2 of U2A are connected to pin 8 of U18A in the counter. This is the COUNTER-CLEAR line and occurs at the same time as COUNT ENABLE. A 1-MHz signal is available from TP1 on

the panel of the counter. Obtaining +5 V and ground from the counter, and plugging in the output of the capacitance-measuring device to the counter input completes the interconnection. A three-pin plug and two pin jacks can be used.

Range selection is made by rotary switch S1. The range resistors used are composition resistors with R1, R3 and R5 each consisting of two 1/4 watters in series. This was done so the variable resistors, R2, R4 and R6 would span approximately ± 5 percent of full range; thus R2 is a 100-k Ω , multiturn pot, R4 is a 10 k Ω , and R6 is 1 k Ω . A better choice of resistors is the one-percent metal-film type IRC CCB 1/4 W — one each of 866 k Ω , 86.6 k Ω and 8.66 k Ω . These high-quality resistors are not readily available to most hams, and composition resistors may be used. A second section of S1 is used to illuminate the appropriate decimal point in the LED display on my counter. This is a frill not needed in the basic instrument.

A nine-volt transistor-radio battery is used to supply power to the 555 and charging circuit. The drain is only about

6 mA. Thus, if one doesn't forget to turn off the device after using it, the battery should last a long time. Up to 15 volts may be used on the 555 with an improvement in short-term stability of readings — particularly for larger values of C_X . It wasn't considered worthwhile to build a supply for such a small device; it'd be like having the tail wag the dog.

Construction

The largest component in the unit is the rotary switch. The circuitry is mounted on a small printed-circuit board, 2.4 \times 2.7 inches (61 \times 69 mm), which in turn is fastened to the switch. The rotary switch is a two-deck switch with the assembly screws spaced 1-1/4 inches. Mine was purchased in a local surplus store; however, a Mallory type 4M2225 should do the job. The pc-board layout, location of posts, and assembly to the switch are shown in Fig. 4. Internally threaded 4-40 \times 1/2-inch long spacers couple the switch and the pc board.

As an alternative, a perf board of the type with 0.1-inch hole spacing, and hole diameter 0.42 inch, may be used.

Component layout and mounting should be as shown for the pc board. A perf board a little larger than the pc board probably should be used for ease in wiring.

Leads from C_X to the switch and 555 should be kept short to avoid noise and 60-Hz pickup. When the unit was first breadboarded, clip leads about eight inches long were used to connect C_X . Ac pickup caused a slow cyclic variation in readings due to the 60-Hz magnetic field between the leads. Twisting the leads reduced the effect. The slow cyclic variation occurred because the time bases in the counter and the power-line frequency are not synchronous.

A steel can, 4 × 4 × 4 inches, was used (some magnetic shielding) to house the unit, with two binding posts on the top for connecting C_X . Small shielded cable was used to carry 1 MHz into the unit and for the output lead.

Most components are readily available. Sockets were used for the 7400 and 555 ICs. The pots are multiturn Beckman Helitrimms; however, those of other manufacturers are available on surplus markets. Ordinary, good-quality composition pots such as Allen-Bradley Ohmites can be used if more space is allowed. Adjustment might be a bit more difficult, but if the fixed resistors, either composition or metal film, are chosen so as to tweak the total resistance close to the desired value, then the range of the variable resistor can be reduced. Thus, if on range no. 1 the fixed resistors are selected to give 890 k Ω , then a 20-k Ω pot will probably provide enough adjustment range. The calculated optimum values are 900,000, 90,000 and 9,000 ohms for totals on R1 + R2, R3 + R4 and R5 + R6. This assumes the threshold voltage is exactly 2/3 of E_{CC} . The variation among 555s can be as much as 1 volt; thus the need for adjustment pots.

Calibration

Capacitors of known value were used to calibrate the device. Before adjusting the calibration pots to get the known value on the display, note the minimum capacitance shown when no capacitor is connected to the binding posts. This value must be subtracted from the reading when a capacitor is being observed, to obtain the correct value of capacitance. In my unit the minimum is 30 pF. Circuits could be devised, in either the analog section or digital section to compensate for the minimum capacitance automatically. However, the added cost and complexity did not seem warranted.

A known value of capacitance at the low end of the range and one at about midrange in the no. 1 range should suffice. With the small value capacitor

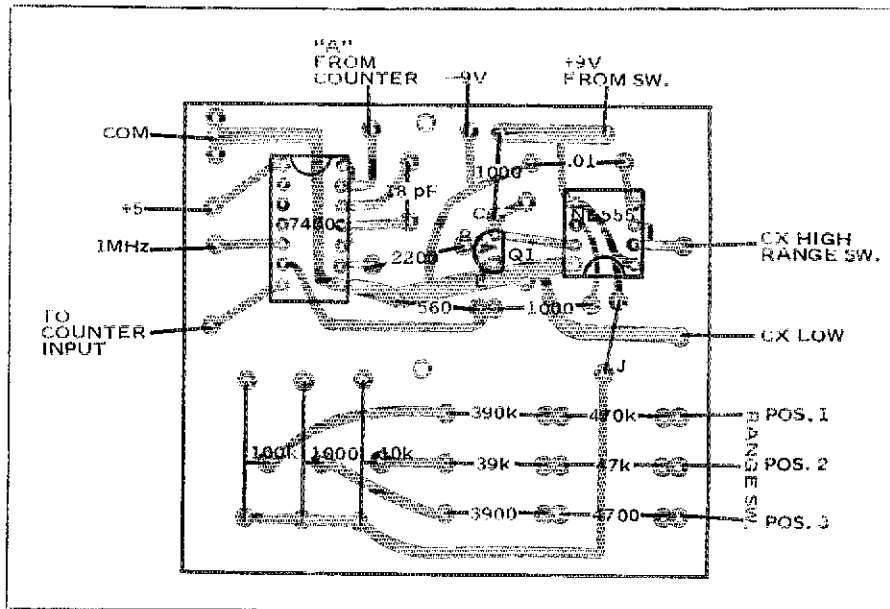


Fig. 4 — Circuit-board etching pattern for the capacitance-measuring adaptor. The pattern is shown from the foil side of the board with gray representing copper. Decimal-value numbers alone represent capacitance in microfarads. Whole-number values with no units represent resistances in ohms. All components are mounted on the nonfoil side of the board. Ready-made circuit boards can be obtained directly from the author for \$3.25 postpaid.

connected, say 1000 pF, adjust R2 until the display reads 01000 (five-digit counter) plus minimum capacitance. If the minimum is 30 pF, the display should read 01030. Connect a large value of capacitance, say 50,000 pF (0.05 μ F), and check the reading as 50030 \pm 100. Polystyrene capacitors give steadier readings, and thus should make adjustment easier. Short-term errors of about 0.25 percent of the reading have been observed at the high end. Adjustment at the low end on range no. 1 should be made very carefully and the high-end observation is simply a check. A small hundreds-digit error there is not important in most cases (about 0.25 percent of reading). At the low end such an error in digits is intolerable.

With the 0.05- μ F capacitor connected, switch to range no. 2 and adjust R4 until the display shows .05000, i.e., 1/10 of the reading on range no. 1. Switch to range no. 3 and adjust R6 until the display reads .00500. No attempt is made to compensate for minimum capacitance on the high-capacitance ranges.

Standard capacitance for calibration and adjustment are the most difficult items to obtain. All other components are readily available. Perhaps a technician or engineer friend can measure a few for the builder, or a club might keep a few standard values on hand for loan to members. Perhaps a high school physics lab might allow use of a bridge or Q meter. Sometimes one-percent capacitors are found in surplus. Some surplus houses sell a package of poly-

styrene capacitors containing a wide range of values. A number of 5-percent values are included: A test of one package turned up a number of capacitors which fell within 2 percent of their marked value. Best stability and repeatability were obtained with polystyrene capacitors — the type with radial leads and encapsulated in clear plastic. Of course, the accuracy of measurement is no better than the standard used for calibration.

Uses for the Digital Capacitance Meter

Besides identifying unknown or doubtful-value capacitors, other applications became apparent. Capacitance of twisted pairs of wires, suspected of coupling pulses to adjacent circuits, indicated 15 pF per foot; a small coaxial cable suspected of loading a source, 28 pF per foot. Plotting capacitance versus angle of rotation of variable capacitors is another interesting application. Matching capacitors for, say, filter applications is easily accomplished and should make this a particularly useful device.

A word of explanation is in order about the physical layout. The multiturn calibration pots are oriented so that the adjustment screws are available at the side of the cabinet. This is a real convenience for calibration, but you should avoid the temptation to twiddle the adjustments unnecessarily.

Thanks are due WB6SPB for building the unit from just a schematic diagram and some over-the-air instructions, and

for applying it successfully to his Thirty Dollar Counter.

We have digital watches, clocks, DVMs, frequency meters and calculators. A digital capacitance meter follows the trend.

Appendix

The voltage across a capacitor C charged through a resistor R from a source E_{CC} is given by

$$V = E_{CC}(1 - e^{-\frac{t}{RC}}) \quad \text{or} \quad (\text{Eq. 1})$$

$$t = RC \ln \frac{1}{1 - \frac{V}{E_{CC}}} \quad (\text{Eq. 2})$$

From this,

$$t_H = RC \ln \frac{1}{1 - \frac{V_H}{E_{CC}}} \quad (\text{Eq. 3})$$

where t_H is the time required to reach the voltage V_H . If V_H is selected as $2/3$ of E_{CC} (555), then

$$t_H = RC \ln 3 = 1.0986 RC \quad (\text{Eq. 4})$$

(note the independence from the power supply voltage).

Full scale on range no. 1 is 99,999 pF; with a clock frequency of 1 MHz, t_H must be 99,999 μ s at full scale. Thus $R1 + R2 = t_H/1.0986C = 10^9/1.0986 \Omega = 900 \text{ k}\Omega$. Similarly, for $R3 + R4$ and $R5 + R6$.

Error Analysis

From Eq. 1;

$$dV = \frac{E_{CC}}{RC} e^{-\frac{t}{RC}} dt$$

At full scale

$$e^{-\frac{t}{RC}} = \frac{1}{3}; \text{ thus } dV = \frac{E_{CC}}{3RC} dt$$

With $E_{CC} = 9$; $RC = 0.09$ (full scale); then

$$dV = \frac{300}{9} dt \approx 33 dt$$

Thus for a t of 1 μ s, $dV = 33$ microvolts, a rather small voltage. The charging circuit, then, is sensitive to noise and pickup. Leads should be kept short and good shielding provided. The sensitivity to noise is a well-known disadvantage of the ramp type of A-to-D converter — a close relative of this device.

Since the noise voltage, dV , is inversely proportional to C , we see that much higher levels of pickup are required to disturb the readings at low values of C . If C is 100 pF, 33 millivolts of noise causes 1- μ s (1 count) variation in reading.

Note, also, dV varies directly with E_{CC} , thus a 15-volt E_{CC} improves the noise sensitivity by a ratio of 15/9.

A constant-current source to provide charging current for the capacitor would lessen the noise sensitivity somewhat. With a constant current source

$$V = \frac{it}{C} \quad \text{and} \quad dV = \frac{i}{C} dt$$

at full scale, range no. 1

$$\frac{i}{C} = \frac{V}{t} = \frac{6}{10^5 \times 10^{-6}} = 60$$

Thus $dV = 60 dt$.

For a t of one μ s, $dV = 60 \mu$ V, almost twice the 33 μ V calculated for the simple RC charging current.

Errors over the longer term appear due to aging of resistors and the temperature coefficient of resistance of charging resistors ($R1$, $R2$, etc.). Also, the divider resistor in the 555 is similarly affected. The effect of long-term errors is minimized or completely eliminated by periodic calibration with a standard capacitor.

It should be noted that a Signetics SE555 is manufactured whose errors are approximately half those shown for the Signetics NE555 and other run-of-the-mill 555s. Obtaining the SE555 at the usual ham outlet may be impossible.

Other sources of error in the 555 are Drift with temperature: 50 ppm/ $^{\circ}$ C
Drift with supply voltage: 0.01%/volt
Threshold current: 100 nanoamperes.

The conditions for measuring threshold current are not defined; however, it appears the current flows into the threshold comparator, thus subtracting from the current through $R1 + R2$ to the capacitor. Consequently, readings of capacitor values should be a maximum of about 1 percent of reading high.

Presumably, a high-impedance interface could be used to couple the capacitor to the threshold terminal of the 555.⁴ The added complexity was deemed not worthwhile.

In addition to the error due to threshold current, resistance across the capacitor can cause a major error. Electrolytic capacitors, for instance, can have high leakage currents, thus, capacitance measurement of electrolytics with a simple device such as this can have large errors. Such use is not recommended where accurate data are desired.

An indication of the magnitude of this error is given by the equation for charging time (see Eq. 3).

$$t_H = \frac{RC}{\frac{R}{R_X} + 1} \ln \left[\frac{1}{1 - \left(\frac{R}{R_X} + 1 \right) \frac{V_H}{E_{CC}}} \right]$$

R_X = leakage resistance across C_X ; and $R = (R1 + R2)$; see Fig. 3. When the

ratio $R/R_X = 1/100$ (leakage resistance ≈ 90 megohms on range no. 1), t_H is increased about 1.0 percent over the t_H when $R_X = \infty$, thus, the capacitance readings are about 1 percent high. For $R/R_X = 1/500$ the error is approximately 0.1 percent.

Capacitors with very, very low leakage currents such as polystyrene and mica give highly stable readings which agree very closely with values obtained on commercial digital-capacitance meters. Low-voltage ceramics showed fluctuating readings (10 percent or so), while high-voltage types (Central Radio Labs, 450 V) were quite stable. It appears this error is an important one when $(R1 + R2)$ is large, i.e., range no. 1. Fortunately, most capacitors measured in this range are mica, polystyrene, etc., so leakage resistance is very high.

Many counters have clock frequencies other than 1 MHz available. These may be employed in this device, sometimes to an advantage, as we shall see if we rewrite Eq. 4 for t_H in terms of counts (counter display).

$$t_H \times f_c = \text{counts} = 1.0986 R f_c C \quad (\text{Eq. 5})$$

If we select R and f_c so that

$$1.0986 R f_c = 10^{12} \quad (\text{Eq. 6})$$

then each count equals 1 pF. In the instrument described f_c is 1 MHz, a clock frequency common to many counters, thus

$$R = \frac{10^{12}}{1.0986 f_c} = \frac{10^9}{1.0986} \approx 909 \text{ k}\Omega \quad (\text{Eq. 7})$$

for a resolution of 1 pF per count.

A clock frequency of 10 MHz would allow us to reduce R to 90.9 Ω with the same resolution. Other values of f_c would change R accordingly.

The lower value of R reduces errors due to the effect of shunt resistance. However, the lower value is not a complete blessing, since R becomes rather small for the high-capacitance range, about 910 ohms, resulting in relatively high battery drain. Also, series resistance of the capacitor becomes a significant contributor to error.

Of course, one could switch f_c to 1 MHz (or other frequency) and keep R at a value which limited battery drain. Many combinations of f_c , R and resolution may be obtained if added switching is used.

References

- Anderson, "The Thirty Dollar Counter," *QST*, January, 1974. Also see Feedback, *QST* for March, 1974, p. 83.
- Hall, "Direct-Reading Capacitance Meter," *Ham Radio*, April, 1975.
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Solar-Electric Power and the Amateur

How practical is solar-electric power? Dollars versus utility, can amateurs run their stations from converted solar energy? We think the answer is "yes!"

By Doug DeMaw,* W1FB

Ten hours of bright sunshine over the Gulf of Mexico could provide enough energy to power the entire USA for six months! The hang-up is our inability to convert that much energy to electricity in a practical and economic manner. Also, the ecological impact that could result from shrouding the Gulf with miles of solar panels is worth contemplating: The change in water temperature could have far-reaching effects on sea life and mankind. But for now, let's examine the conversion of solar energy to electricity on a small scale, comparatively speaking.

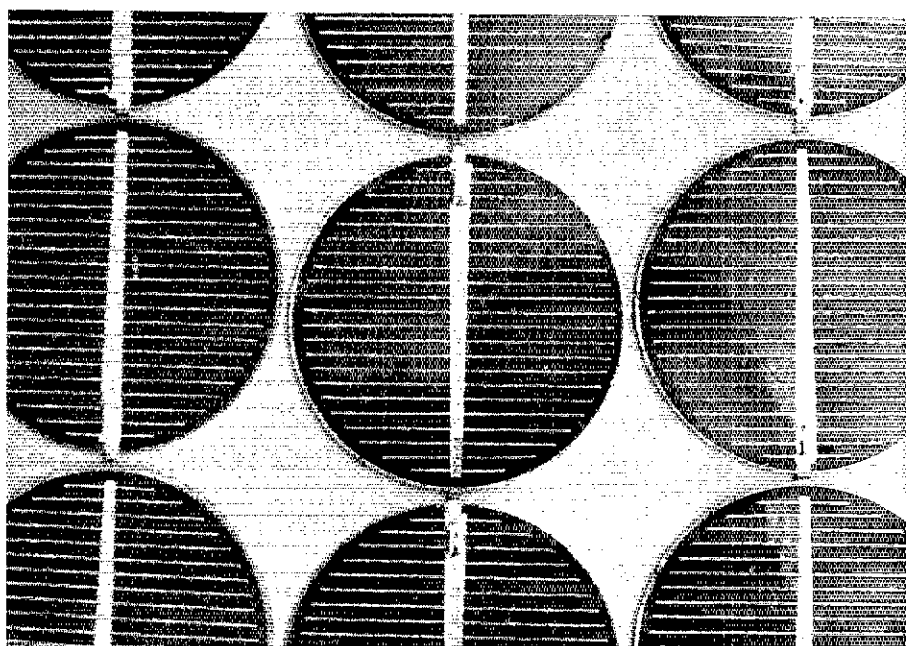
Campbell (WICUT) of the Hq. staff demonstrated the limited utility of early-day solar-derived electricity when he wrote his article, "Solarized QSO," for September 1955 *QST*. He used selenium photo-electric cells to develop a mighty 2.8 volts at 2 mA! That gnat-sized power supply was used to operate a one-transistor transmitter on 1.8 MHz. Although QSOs were had with nearby amateur stations, the system was more novel than practical.

Today we can generate amperes of current at convenient voltage amounts by means of silicon pn cells wired in series. A typical medium-priced solar panel might deliver, say, 14 volts at 1.5 amperes.¹ The output from the cells would be used to charge an automotive type of storage battery, or more than one such battery in a parallel combination.

Banks of solar panels can be connected in parallel to deliver many amperes of current at a specific voltage.

*ARRL Senior Technical Editor

¹Footnotes appear on page 27.



Space-age art? No, but it certainly represents space-age technology. These are 3.5 inch (89 mm) diameter solar cells, each of which produces approximately 0.5 volt at 1.5 amperes.

Systems of this kind are being used as power sources for navigational aids on offshore oil-drilling rigs, for commercial land-mobile repeaters and for railroad signaling and control equipment. If we purchased four solar panels, each with 36 cells capable of supplying 1.5 amperes, we'd be spending roughly \$2500 to obtain 14 to 17 volts at 6 amperes (peak sunlight-power output). That price would not include the storage batteries. You may find yourself wondering why anyone would want to invest that much money for a relatively

low-power generator. Well, as a long-term investment at a 2-meter repeater site it could be less costly than conventional electricity, especially if the repeater was located in an area where commercial rates existed! Or, how about using solar-electric power on a choice mountaintop where commercial power is not available? Many excellent repeater sites go unused because power lines pass miles from the summits.

A smaller solar-power system (14 volts at 0.7 ampere) would be suitable for running a 10-watt solid-state re-

peater and the accessory equipment. Such a panel could keep a pair of 12-volt car batteries charged if the repeater was not used heavily at night. The investment (less batteries) would be on the order of \$200.

Solar Cells and How They Work

Solar cells are semiconductor devices that convert light directly into electricity. The basic material used in fabricating solar cells is silicon. A cylindrical crystal of the material is "grown" from a hot melt of silicon. The crystal is doped with a small amount of impurity. Depending upon the nature of the impurity the crystal will conduct negative (n) charges (electrons) or positive (p) charges (holes). Phosphorous can be used to make the crystal an n type. Boron is suitable for making the crystal a p type. The resultant n or p type of crystal is sliced into wafers 0.01 to 0.02 inch thick.

When a photon from the sun strikes near the pn junction a negative- and positive-charge pair is produced. The electron will travel toward the n type of silicon and the hole will move toward the p type of material. If wires are attached to the p and n regions of the chip, the developed electricity can be made to flow through an external load to do useful work. A single wafer can develop approximately 0.5 volt in bright sunlight. The greater the cell diameter the higher the output current. For example, a 55-mm cell would deliver about 0.5 volt at 0.6 ampere. A 22-mm cell would produce 0.5 volt at 0.1 ampere. Fig. 1 illustrates the manner in which a single cell operates. Some typical current-versus-voltage characteristics for five series-connected solar cells are shown in Fig. 2. These data pertain to a model 1200 solar-electric assembly which is manufactured by Solar Power

Corporation.² The individual cells are 2.24 inches (57 mm) in diameter. As a close approximation, roughly 0.16 ampere can be obtained from each square inch of cell surface exposed to bright sunlight. The maximum power which can be delivered to an external load is typically 11 to 12 percent of the total solar energy incident on the cell.

Storing the Energy

There are very few applications in which the direct output from a solar panel would be used to operate electrical equipment. It is customary to use a rechargeable storage battery as a buffer between the solar-electric generator and the load (Fig. 3). In this manner the battery receives a charge during periods of high sunlight. At times when the sunlight is low, or during darkness, the battery provides all of the power for the load. The capacity of the storage battery must be chosen to meet the demands of the equipment which is to be powered by the solar-electric system. More than one battery can be used (parallel connection) to increase the capacity of the stored energy.

Battery Selection

It is important to choose a battery which exhibits a low self-discharge characteristic. The losses for lead-calcium or pure-lead grid types of storage batteries are generally 1 percent of rated capacity per month. Lead-antimony grid types are not recommended because their initial (new) self-discharge is 7 to 8 percent of rated capacity per month. As the battery ages this characteristic increases to as much as 40 percent of capacity per month. In plain language this means that the greater the self-discharge the larger the solar panel must be to maintain the desired battery charge. Most lead-acid automotive bat-

teries are suitable for use with solar panels. Nickel-cadmium batteries are satisfactory also.

Attention must be paid to the environment in which the storage battery is used. Most batteries are rated for operation at so-called normal temperatures, between 0 and 30°C. If abnormally cold temperatures are expected (-20°C or less) the battery should be buried or contained in an insulated housing. When other than normal temperatures prevail the battery capacity must be derated. A battery should never be allowed to discharge to the point where the electrolyte will freeze. Table 1 shows the relationship between the freezing point and the specific gravity of the electrolyte. NiCad batteries are more tolerant of abuse than are lead-acid types. They will recover fully from freezing and complete discharge (provided cell-polarity reversal does not occur). NiCads are not as likely to be damaged from overcharging as would be the case with lead-acid batteries. However, the advantages of NiCads are usually offset by high cost and voltage inefficiency (charging voltage 15 percent higher than discharging voltage, compared to a 5-percent change for lead-acid batteries).

If the solar-panel voltage (number of series-connected cells) and current output (number of cells paralleled versus cell diameter) have been matched to the load with care, a self-regulating system will result. However, if the solar-panel output exceeds the load requirement by more than 30 percent, an external voltage regulator may be necessary to prevent the battery from being overcharged. The calculations for designing a matched system are not simple ones, especially in amateur radio applications where the operating cycle is impossible to predict. A good example of the latter

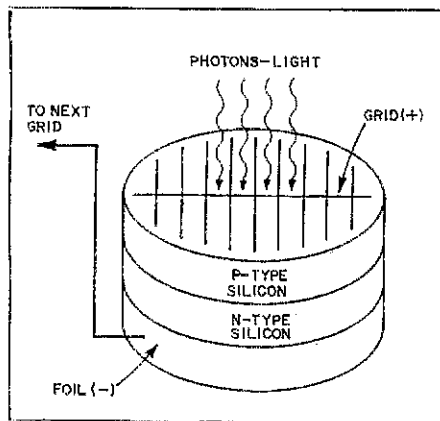


Fig. 1 — Diagram of a single solar cell. The wire grids on the top are the positive terminal. A foil coating on the lower side of the cell serves as the current collector and is the negative terminal of the device.

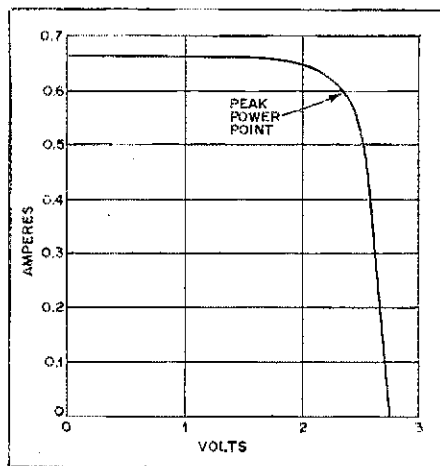


Fig. 2 — Current-versus-voltage curve for five solar cells connected in series. Each cell delivers 0.5 volt at 0.6 ampere.

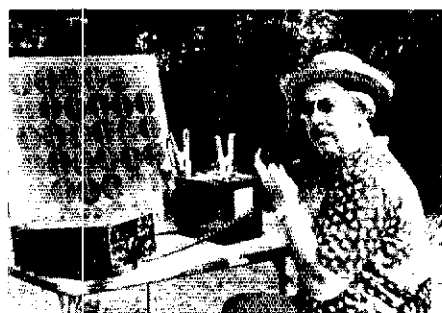


Fig. 3 — The author with a solar-powered hf-band station. A two-week test period proved that an automobile battery could be charged adequately from the large solar array to operate a Yaesu FT-301D for many hours. Starting at sundown, the station was used on 20-meter cw for as long as four hours without battery depletion. The transmitter draws 20 amperes during key-down periods. The receiver draws 1.1 amperes.

is seen in the case of an open repeater that could remain in standby for hours, or might receive constant use for many hours.

Fig. 4 shows a basic regulator circuit for use with solar panels. The diagram is similar to one which Solar Power Corporation suggests in their data booklet, *Solar Electric Generator Systems*. This regulator permits the solar-array/battery system to function at maximum efficiency when the battery is less than fully charged. During this period the regulator consumes only 0.03 ampere-hour/day. It introduces no extra voltage drops in the system. When the battery voltage exceeds a preset level, the regulator proportions the current so that just enough passes into the battery to keep it fully charged. The remainder is shunted through a dummy load (R1).

Fig. 5 shows a less desirable go/no-go type of regulator. When the battery voltage reaches a level determined by VR1, K1 actuates and routes the solar-panel output into a dummy load (R1). The primary limitation is that the battery is either attached or detached (relative to the solar panel) at a given time. Furthermore, there is always the possibility of mechanical problems with the relay.

Practical Systems

Two solar-electric systems have been tested at W1FB. The first was a 13-volt, 100-mA array made from Poly Paks surplus cells.³ Ten size AA NiCad cells were connected in series to serve as the battery buffer between the solar panel and the load (Fig. 6). A 50-volt, 1-ampere silicon diode was installed between the solar array and the battery pack (standard practice) to prevent the batteries from discharging back through the solar panel when the light level was low or nonexistent. A Schottky-barrier diode would be more suitable for the purpose because it has a lower forward-voltage drop (0.3) than a silicon junction diode (0.7 to 0.8). The greater the voltage drop, the more cells needed to produce a specific output voltage. The Schottky diode is more costly than the pn junction type of diode.

The accompanying photograph shows how the solar cells for the small array were installed in a wooden picture frame (6 × 9 inches). The foundation was a piece of stiff white cardboard. Small-gauge wire was used to connect the 26 cells in series, and each cell was affixed to the cardboard by means of Stix-On 1 × 1-inch mounting squares (adhesive coated on both sides).

An aluminum backplate was made for the picture frame. It contained a 1-1/2-inch L bend at the bottom, and was attached to the wood frame by means of small screws. A hole was drilled in the center of the L bend to

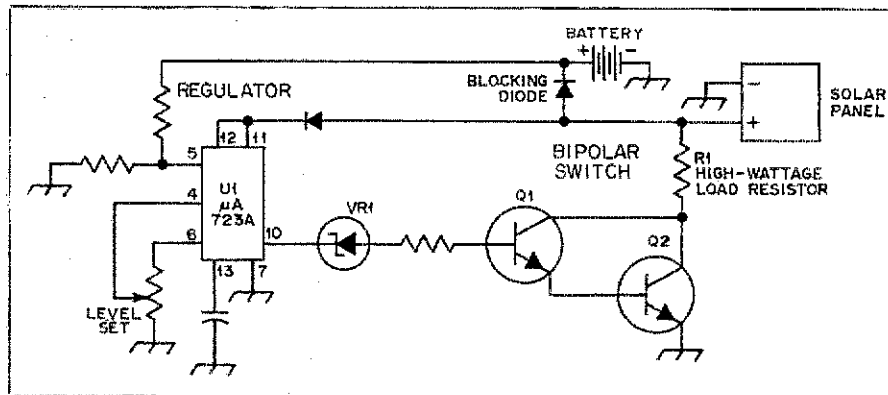


Fig. 4 — Representative diagram of a low-current-drain regulator for use with a composite solar-power system. Component values will depend upon the operating voltage and load currents for the particular system.

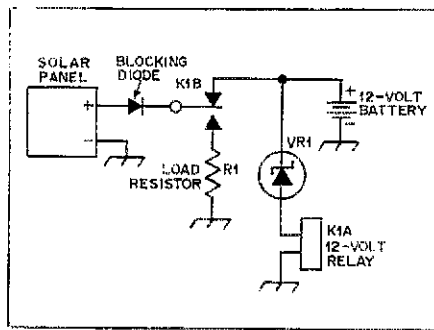


Fig. 5 — A simple go/no-go regulator for preventing a battery from being overcharged (see text). VR1 would be chosen to permit K1 to close when the battery voltage reached 15.

permit the composite array to be installed on a camera tripod. This technique was used to allow the array to be aimed at the sun as it moved across the sky. The blocking diode was mounted inside the picture frame. A terminal lug was affixed to the L bend for use as a connection point for the two wires leading from the solar array. The batteries and the equipment were attached to the same lugs.

It is not necessary to track the sun with a solar array unless maximum exposure is necessary. A typical installation in the northern hemisphere would have the solar array facing south. The inclination angle of the panel would be between 45 and 65 degrees. The array would face north if it was installed in the southern hemisphere.

A low-power solar-electric system of the type just described is entirely suitable for QRP work. The writer used the Tuna-Tin 2 and the Herring-Aid 5 as a 40-meter cw station with the 100-mA solar panel.⁴ Numerous cw QSOs were possible before the NiCad pack needed recharging.

A word of caution is in order at this

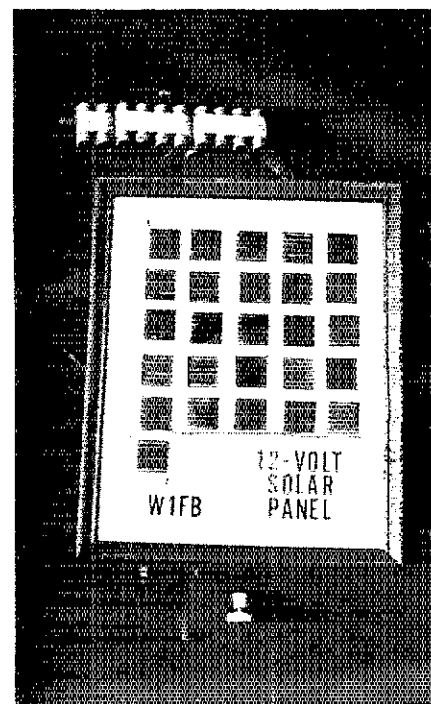


Fig. 6 — View of the homemade QRP solar array. The cells deliver approximately 100 mA each, at 0.5 volt. A 6 × 9-inch picture frame serves as the housing for the array. It is mounted on a camera tripod.

Table 1
Freezing Points of Lead-Acid Battery Electrolyte

SPECIFIC GRAVITY (@25° C)	FREEZING POINT (° C)
1.300	-71
1.283	-71
1.266	-60
1.249	-61
1.232	-40
1.215	-32
1.198	-27
1.181	-22
1.164	-18
1.147	-15
1.130	-12
1.115	-10
1.100	-8



Fig. 7 — W1CCKK of the ARRL hq. staff checks the no-load output voltage of the commercial solar panel during a period of bright sunlight. A reading of 17.93 volts was obtained (battery disconnected).

juncture: Use extreme care when handling and soldering the tiny solar cells. They are very thin and brittle. The unused stick-on pad in the photograph offers mute testimony to the author's mishandling of one of the cells — it cracked in half! Excessive heat when soldering can ruin the cells: Use a very light-wattage iron to join the cells, and do your soldering quickly!

A Larger Solar Array

Not everyone is enthusiastic about QRP operation, so it seemed proper to depart from the "Child's Book of Solar Energy" to something more muscular. Solar Power Corporation was good enough to loan a 14-volt, 1.52-ampere panel to the ARRL for some tests and a product review. The model chosen was their E12-01369-1.5. It is rated at 13.5 volts (charging point) to 17.5 volts (peak-power point). See Fig. 7. The

current is 1.53 amperes (charging point) to 1.45 amperes (peak-power point). The wattage rating is 20.7 and 25.4, respectively.

The cells are protected from the natural elements by means of a double layer of ultra-violet-stable silicone rubber. Solar cells should not be covered by any material which filters the sunlight excessively, as the output from the array will be degraded. Tests were conducted with the homemade 100-mA array and it was learned that the clear-glass picture-frame insert caused a drop of 0.1 volt from the array of cells. Although the drop was not significant, it illustrates the effect under discussion. The silicone-rubber window has a self-cleaning property (attention repeater operators!). Rain will remove most of the dust and dirt which could filter the incoming photons.

A J. C. Penney lifetime automobile

battery was purchased for use with the large solar panel. The latter came equipped with a built-in blocking diode, so no additional apparatus was needed. A Yaesu FT-301D transceiver (all solid state) was selected as the ham rig for the tests. ...

A peak current of 20 amperes is taken by the FT-301D (100 W output on transmit), and the drain during the receive mode is roughly 1.1 A. The battery was allowed to charge during the writer's work day so that operation in the evening would be possible. After a day of bright sunlight (panel facing south at 60 degrees of tilt), the battery potential measured 15 V. Following two hours of cw operation (with normal listening periods) after sundown, the battery voltage read 13. On one occasion the 40-meter operation continued for four hours, after which the battery (under load) was delivering 12.5 volts.

It is reasonable to conclude that two storage batteries could be used in parallel to assure many hours of night-time hamming. Alternatively, the transmitter power could be halved at the expense of only 3 dB, thereby extending the useful output time of the battery.

In Summary

It is this reporter's opinion that solar-derived electrical power is entirely practical for low and moderate energy demands. Beyond the feeling of extreme satisfaction one derives from using sun power to operate a ham station, utility should be considered: There are many practical applications, such as Field Day, camping trips, repeater operation in remote areas and emergency communications. The primary drawback is related to inclement weather — rainy or snowy periods when the sun "jest ain't there" to do its thing! Perhaps a wind-powered system could be used as an adjunct to a solar array: The wind usually blows when the weather is bad!

Footnotes

- ¹ See *QST* "Product Review," this issue.
- ² Solar Power Corp., 5 Executive Park Dr., North Billerica, MA 01862.
- ³ Poly Paks, Box 942, South Lynnfield, MA 01940.
- ⁴ DeMaw and Rusgrove, *QST* for May and June, 1976.

Strays

□ You've heard the story of Kunta Kinte, but have you heard of Knut Kaasa? We'll let his long-lost relative Palmer A. Lien, W0LTB, tell the story: "One night seven years ago I heard station LA8IG calling CQ from Nor-

way. His name was Knut Kaasa, and he and his wife (both blind) lived in Brekka, in Telemarken. After asking a few questions we found that we were related. We exchanged letters, and I now have information on my family history going back to the 1600s. Pictures of my

parents' old homes are now on hand, plus other information that would otherwise have been lost."

It's undoubtedly unusual to discover your "roots" via amateur radio, but Lien says he and Kaasa have a bond beyond that of their wireless contact.

Designing Solid-State RF Power Circuits

Part 1: Solid-state rf power amplifiers present design problems unlike those encountered with vacuum tubes. But those problems are not insoluble. This three-part series shows how the experimenter can "roll his own."

By Richard K. Olsen,* N6NR

As much as some would hate to admit, the influence of the vacuum tube in rf power amplifier design has greatly diminished. Through the efforts of solid-state pioneers such as Helge Granberg, OH2ZE, the dream of a solid-state kilowatt is now a reality.¹ Solid-state design, coupled with advances in microstrip and complex multilayer stripline techniques, has generated a new breed of vhf and uhf land-mobile transceivers which are much smaller and efficient than their old tube predecessors. Also consider the lineup of available add-on amplifiers which enable a person to convert his hand-held radio to a mobile radio by merely slipping it into a sleeve housing. How many people remember carrying around a hand-held transceiver, two thirds of which was filled with 10 pounds of batteries?

This new technology has naturally generated a new "rule-book" for power amplifier design, which in many cases the experimenter has not been exposed to. This new technology is not any more difficult than that associated with tubes and there are those who feel (and I agree) that in most cases the design of solid-state PAs is simpler.

In this series we will explore the world of solid state from transistor to antenna connector. We will examine the Smith Chart for its role in rf design and learn how to use it as a tool for design and analysis. We will learn to use the transistor data sheet, to select a proper device for the job, and to extract the

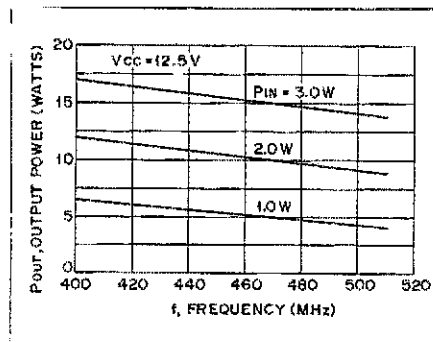


Fig. 1 — Output power versus input power and frequency for the Motorola MRF618 transistor. This information, and that of Figs. 2 through 4, would be available to the experimenter/designer through a data sheet obtained from the manufacturer of the device being considered.

necessary data for the design of an amplifier. Then we will go through a design exercise from start to finish, encompassing theoretical and practical design, testing and evaluation. By the time we are through, there will be enough material for you to utilize the basic design tools to create an amplifier suiting your own needs.

Design Criteria and the Data Sheet

The first thing you should do in designing an amplifier is to list your objectives or "design criteria." This will aid you in choosing the proper transistor for the job and clarify the minimum requirements that the amplifier will have to meet during testing and evaluation.

Our design exercise in this text will be to design a hand-held transceiver

amplifier for the 450-MHz band. The questions that must be answered include input drive, output power, supply voltage, frequency and operating bandwidth. From these questions we can now generate a list which will dictate the requirements that must be fulfilled by our design. They are as follows.

Available input drive = 1 to 2 watts
Minimum output power = 10 watts
Supply voltage = 12.5 to 13.6 volts
Freq. and bandwidth = 430 to 450 MHz

Now we must select the proper transistor for our application. Nearly all of the major semiconductor manufacturers have tables which list categorically all of their devices as to supply voltage, frequency band, output power and gain. They can be obtained from either the marketing department or literature distribution centers of each of these companies.

After looking down the list of devices we come upon the MRF618 which is made by Motorola. The sheet shows that the minimum gain at 470 MHz is 6 dB at an output power of 15 watts and a supply voltage of 12.5 volts. This device is the closest one to our needs. Next we obtain the data sheet and from the data sheet we can obtain all of the dynamic and electrical characteristics we need for our design.

Fig. 1 shows a graph of output power vs. frequency at 12.5 volts for several input power levels. Since 450 MHz is the upper limit of our band usage, we can see that at 2 watts input the output power is about 11 watts, falling well within our output power requirements at minimum supply volt-

*4292 Quapaw Ave., San Diego, CA 92117;
Engineering Consultant to Swan Electronics, 9233 Balboa Ave., San Diego, CA.
¹ See the bibliography listing at the end of this part of the series.

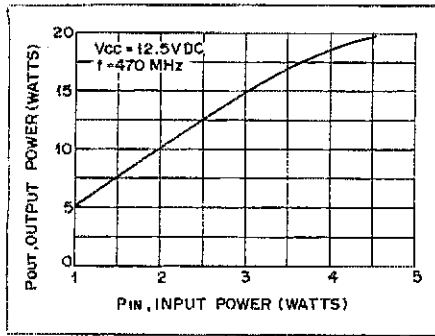


Fig. 2 — Output power versus input power for the Motorola MRF618 transistor.

age. Figs. 2 and 3 are useful for giving us a rough estimate of how much power output can be obtained for various supply voltages and input power levels.

Fig. 4 is a portion of the Smith Chart which describes the input (Z_{in}) and output (Z_{OL}) load impedances from 400 to 500 MHz. For the moment we need only be concerned with the table in the lower right-hand corner. This table tells us that at 450 MHz, Z_{in} is approximately $3.0 + j5.5$ ohms and that Z_{OL} (Z_{out}) is approximately $3.0 + j2.5$ ohms. This information is critical as it is the starting point when we design our input and output transformation circuits.

From the data sheet we also see that this device is capable of withstanding a 20:1 load VSWR at all phase angles, at rated power output and supply voltage. What this means is that the MRF618 can deliver rated power to any type of load, whether it be capacitive or inductive or anywhere in between, which represents a 20:1 VSWR, without being damaged. This is important when considering what can happen during day-to-day use of the amplifier, such as a forgotten antenna connection.

Other bits of information which we will examine later are mechanical specifications. These are important when considering physical layout of the amplifier.

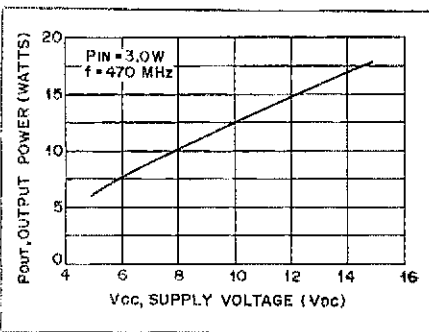


Fig. 3 — Output power at 470 MHz versus supply voltage for the Motorola MRF618 transistor.

Now we are ready to generate another list which we will use in our design exercise.

Test $V_{CC} = 12.5$ V dc and 13.6 V dc
 P_{out} vs. P_{in} at 1 and 2 W input
 P_{in} vs. P_{out} at 15 and 10 W output

Test Frequency = 450 MHz

$$Z_{in} = 3.0 + j5.5 \Omega$$

$$Z_{OL} = 3.0 + j2.5 \Omega$$

There are more things that can be learned from the data sheet. These will be discussed later in the text.

Simplified Smith Chart Mapping Techniques

One of the most important tools used in rf circuit design is the Smith Chart. It functions very well as a "road map" for plotting the direction and magnitude of impedance transformation when designing or analyzing the components of an rf circuit. To understand how to use the chart effectively, we must first examine its mechanics and learn how to interpret the many bits of data that can be extracted from it.

Series-Equivalent Impedance

First of all, the type of Smith Chart displayed in many publications represents the impedance coordinates for a series-equivalent circuit. Fig. 5 is an example of a series circuit containing a given amount of resistance (R_S) and inductive or capacitive reactance ($\pm jX_S$). The relationship for the impedance (Z_S) of a series-equivalent circuit can be mathematically represented by the formula

$$Z_S = R_S \pm jX_S \quad (\text{Eq. 1})$$

The small "j" or j operator, as it is called, is very simply a symbol used to indicate a value of reactive component in a complex impedance. The plus (+) or minus (-) sign indicates whether it is inductive or capacitive, the plus (+) indicating inductive reactance and the minus (-) indicating capacitive reactance. The R is pure resistance. The R and jX components, therefore, combine to represent what is called "complex impedance."

Fig. 6 is a version of the Smith Chart that has had all of the circles removed except for those representing $Z_S = 50 \pm j50 \Omega$. The centerline of the chart represents pure resistance from zero to infinity ohms, reading from top to bottom. The perimeter of the circle represents pure inductive and capacitive reactance in ohms reading from 0 at the top to infinity at the bottom. The full circle intersecting the 50- Ω point on the resistance scale is a plot of all points in the chart where $Z_S = 50 \pm jX_S \Omega$. More simply, this means that all along the

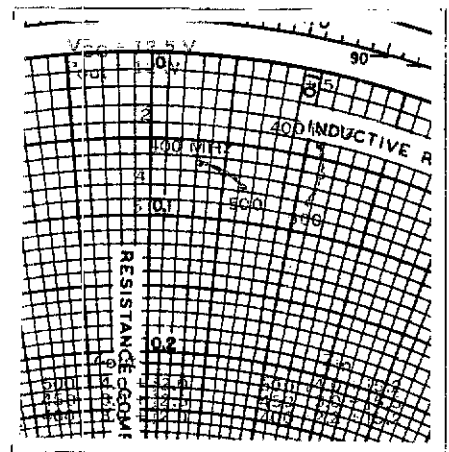


Fig. 4 — Series-equivalent impedance of the Motorola MRF618 transistor versus frequency.

circumference of this smaller circle the resistive component of Z_S remains constant at 50 Ω . Therefore, this is called a "constant resistance circle."

The two semicircles that intersect the 50- Ω points on the outside of the chart are plots of all points where $Z_S = R_S \pm j50 \Omega$. The points along the right-hand semicircle represent a constant reactance of $+j50 \Omega$. If these semicircles were drawn to include all points outside the chart, they would also be complete circles and therefore are called "constant-reactance circles."

We can now use the simplified chart to locate or define a specific complex impedance value. In this case we wish to define points A and B which lie on opposite sides of the centerline. Starting at $R_S = 50 \Omega$ and moving left, we notice that we intersect the line representing $-j50 \Omega$ at point A. This point is therefore defined as $Z_S = 50 - j50 \Omega$. Starting from $R_S = 50 \Omega$ again, move to the right this time, and intersect the line representing $+j50 \Omega$ at point B. Point B, therefore, is defined as $50 + j50 \Omega$. This is the basic procedure to use when defining or locating any series-equivalent impedance (Z_S) on the Smith Chart.

Parallel-Equivalent Admittance

We now know how to evaluate series components in an rf circuit, but what of

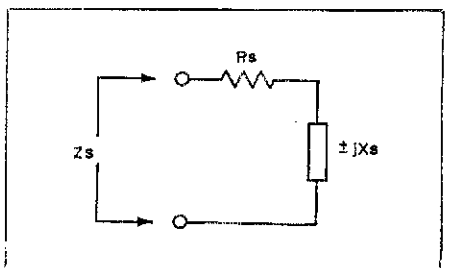


Fig. 5 — Series-equivalent circuit.

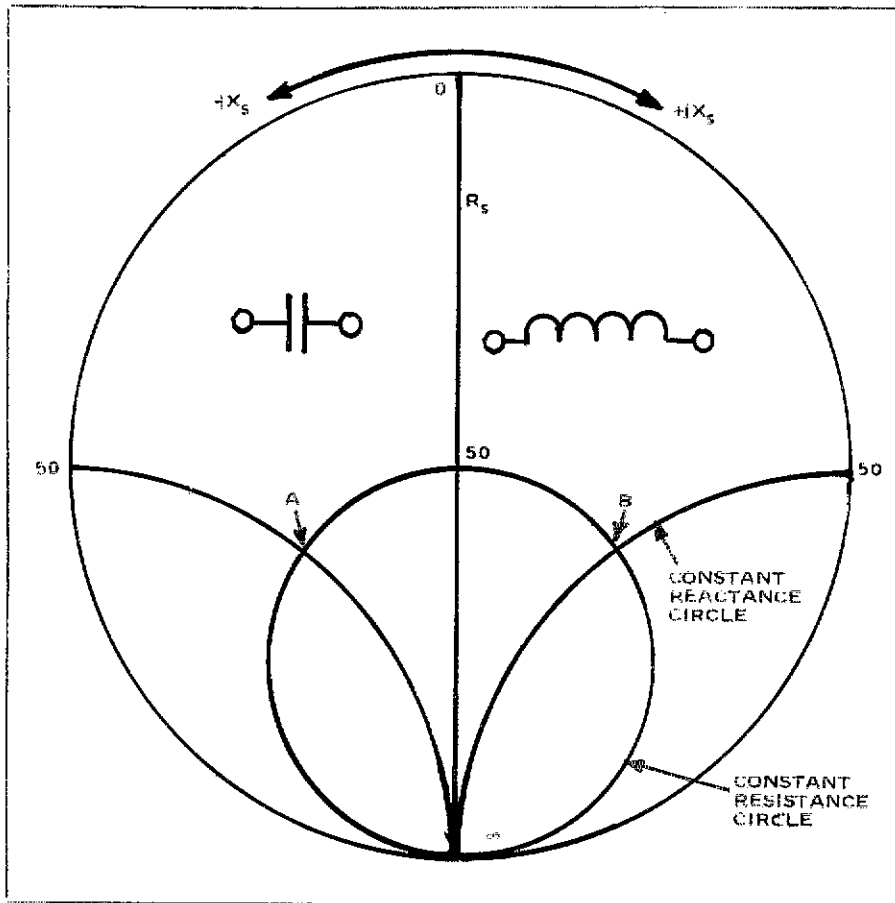


Fig. 6 — Simplified Smith Chart for impedances.

parallel components? The Smith Chart can also be used to evaluate parallel components but we must invert our way of thinking and utilize the concept of parallel admittance instead of impedance. Because admittance (Y_P) is the opposite of impedance, we can define it mathematically.

$$Y_P = \frac{1}{Z_P} \quad (\text{Eq. 2})$$

Therefore, if we have a parallel-equivalent impedance of 50Ω , the parallel-equivalent admittance would be $1/50 \Omega$ or 20 millimhos (mmhos). By using Y_P convention we can now express ourselves once again in the additive property.

$$Y_P = G_P \pm jB_P \quad (\text{Eq. 3})$$

G is conductance, the inverse of resistance, and B is susceptance, the inverse of reactance. (Refer to Fig. 7.) The sign before the j operator has now taken on a new meaning, positive being capacitive and negative being inductive. The following equations illustrate the change from series-equivalent impedance to parallel-equivalent admittance.

$$G_P = \frac{R_S}{R_S^2 + X_S^2} \quad \text{and} \quad (\text{Eq. 4})$$

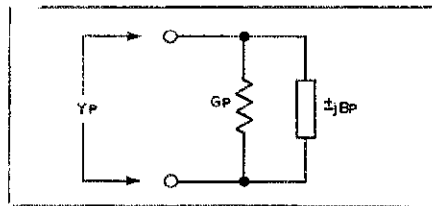


Fig. 7 — Parallel-equivalent circuit.

$$B_P = \frac{-X_S}{R_S^2 + X_S^2} \quad (\text{Eq. 5})$$

Fig. 8 is similar to Fig. 6 but this time with circles to represent $Y_P = 20 \pm j20$ mmhos. The reason why the chart appears inverted will become apparent a little later on. In this chart, G_P is plotted along the centerline and B_P is on the perimeter of the chart. The center circle is the "constant-conductance circle" and the outer arcs are the "constant-susceptance circles." Point A can, therefore, be defined in the same manner as with Fig. 6 and is found to be $20 + j20$ mmhos. And point B is defined as $20 - j20$ mmhos. Now we have a means by which we can define both series and parallel elements in a circuit.

By taking Fig. 8 and laying it on top of Fig. 6 and adding most or all of the remaining circles, we arrive at Fig. 9.

This is a very popular chart form used by rf circuit designers (Form ZY-01-N, Analog Instruments Company, Inc.*). The centerline now contains values of R_S and G_P and the perimeter contains values of not only X_S and B_P but wavelengths to and from the generator.

Circuit Analysis

Before we go ahead, we must first understand the meaning of normalized impedance. Normalized impedance (Z_N) is defined as the actual impedance of the device (Z_S) divided by the system impedance (Z_A). Mathematically,

$$Z_N = \frac{Z_S}{Z_A} \quad \text{Further,} \quad (\text{Eq. 6A})$$

$$R_N = \frac{R_S}{Z_A} \quad \text{and} \quad (\text{Eq. 6B})$$

$$X_N = \frac{X_S}{Z_A} \quad (\text{Eq. 6C})$$

The system impedance can be simply defined for our use as the impedance represented by the center point on the Z_S - G_P line.

The advantage of a chart like Fig. 9 is that it may be used for a circuit employing any system impedance. Since we will be using a $50\text{-}\Omega$ system, our center point (which was defined in Fig. 6 as 50Ω) will equal $50/50$ or 1.0. The center point in Fig. 9 is just that, 1.0. Hence the name, "Normalized Impedance and Admittance Coordinates."

Fig. 10A shows a typical input-transformation circuit consisting of a connector, parallel capacitor, series inductor and transistor base. Since this is to be a hypothetical-case situation, let us state that the input impedance for the circuit is to be $50 + j0 \Omega$ and the Z_{in} of the transistor is $10 + j0 \Omega$. C1 and L1 of Fig. 10 perform the required impedance transformation between these two impedances. Now that we have the impedance data, the circuit can be redrawn as in Fig. 10B, with the coaxial input port as the generator and the Z_{in} of the device as the load.

At this point I would like to state that the most commonly accepted convention for design and evaluation using Smith Chart mapping techniques is to start from the load and work back toward the generator. Using Eqs. 6B and 6C, we can plot our starting point, Z_{in} , on the Smith Chart as shown in Fig. 11. The plotted value is $0.2 + j0 \Omega$. Our value of Z_G is 50Ω , plotted as $1.0 + j0 \Omega$. We can now calculate how much reactance we need for each component, C1 and L1.

As shown in Fig. 10, we desire to

*Smith Charts may be obtained at most university book stores. They may also be ordered (100 for \$13 postpaid when remittance is enclosed) from Analog Instruments Co., P. O. Box 808, New Providence, NJ 07974.

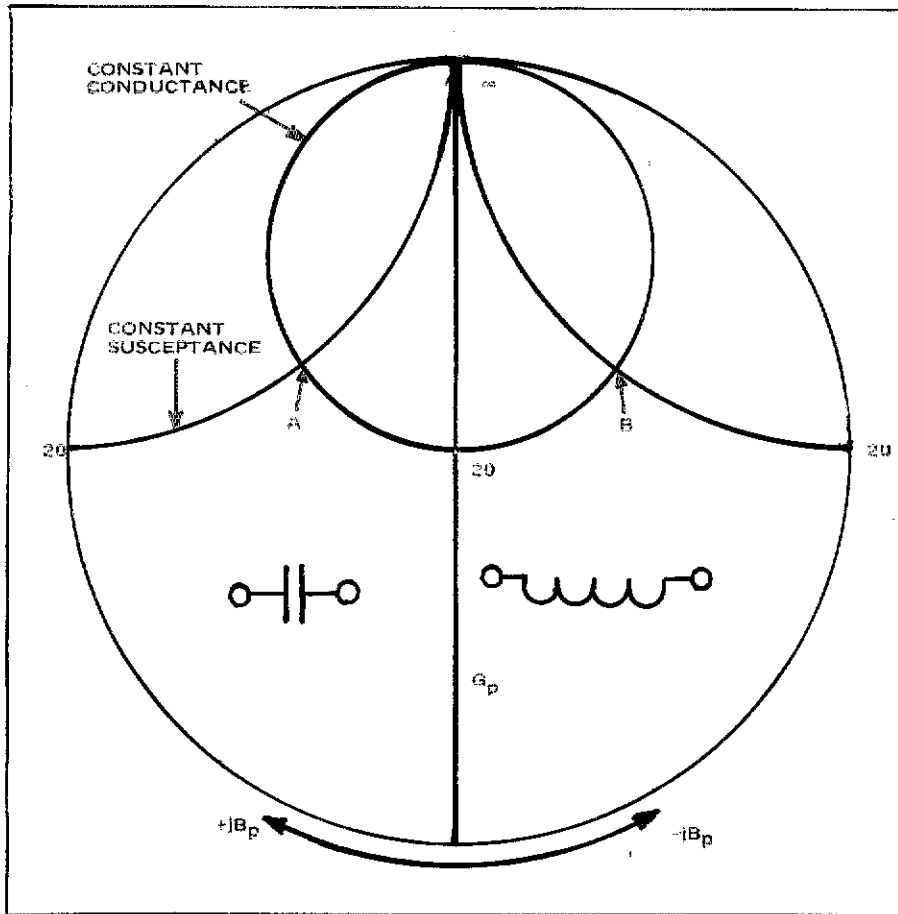


Fig. 8 -- Simplified Smith Chart for admittances.

add an inductive reactance (L1) in series with Z_{in} to transform the impedance to 50Ω (normalized value of 1.0). We represent this on the Smith Chart (Fig. 11) by plotting the value $0.2 + jX_S \Omega$, where X_S represents the inductive reactance of L1, as shown in the diagram of Fig. 10B. Initially, we do not know this value for X_S , but we do know that the plotted impedance will lie somewhere on the 0.2 constant-resistance circle. And since C1 is an element in parallel with Z_G , we must treat the combined impedance (C1 and Z_G) as an admittance. The following equations apply.

$$Y_N = \frac{Y_P}{Y_A} \quad (\text{Eq. 7A})$$

$$G_N = \frac{G_P}{Y_A} \quad (\text{Eq. 7B})$$

$$B_N = \frac{B_P}{Y_A} \quad (\text{Eq. 7C})$$

where Y_N represents the normalized admittance and Y_A the system admittance (1/50 or 0.02 in this case). From these, the combined admittance of C1 and Z_G is $1.0 + jB_P$ mhos, where B_P represents the capacitive susceptance of C1, also shown in Fig. 10B. Initially we

do not know this value either, but we do know that the plotted admittance will lie somewhere on the 1.0 constant-conductance circle. The solution to our problem, then, may be found from the Smith Chart by locating the intersection of the 0.2 constant-resistance circle and the 1.0 constant-conductance circle.

So, starting with Z_N of $0.2 + j0 \Omega$ on the centerline, we move toward the region of $+jX_S$, as shown by the arrow in Fig. 11, to the circle representing a constant conductance of 1.0. This occurs at point A. Since C1 is a parallel element we plot its transformation by following the constant-admittance circle and moving toward the $+jB_P$ area, as indicated by the second arrow in Fig.

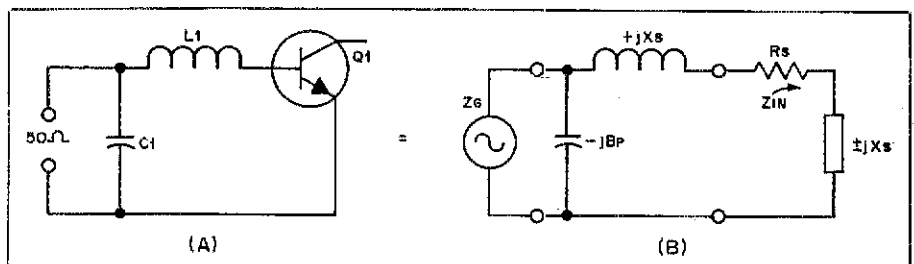


Fig. 10 -- Hypothetical input circuit for a power amplifier. Components C1 and L1 perform the matching transformation from the desired circuit input-impedance value to the input-impedance value of the transistor, represented at B by $R_S \pm jX_S$.

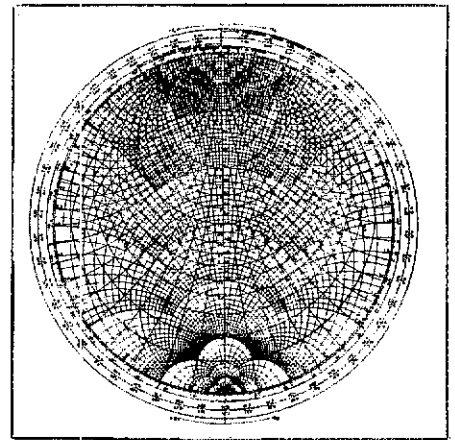


Fig. 9 -- Smith Chart showing "Normalized Impedance and Admittance Coordinates" (Analog Instruments Co. ZY-01-N).

11. In doing this we arrive at $Z_G = 1.0 + j0 \Omega$, which is the value of Z_G , so therefore the circuit is properly transformed with the component values indicated on the chart at point A.

We determine the correct circuit values by first reading the normalized impedance and admittance values from the Smith Chart at point A. The impedance may be read as $0.2 + j0.4 \Omega$, where the 0.4 represents the normalized inductive reactance of L1. From Eq. 6C, where this 0.4 equates to X_N , we may determine that the required inductive reactance (X_S) is 20 ohms. And from the usual reactance equation we may determine the required inductance at our intended operating frequency.

As just shown, the normalized impedance of L1 in series with the input impedance of Q1 is $0.2 + j0.4 \Omega$. But since C1 is a parallel element, we need to transform this impedance to an admittance. This may be done simply by reading the admittance coordinates at point A in Fig. 11, $1.0 - j2.0$ mhos. This value represents the parallel-admittance equivalent of L1 and the series input impedance of Q1 as shown in Fig. 10A. The purpose of C1 is to cancel the susceptive $-j2.0$ portion of this parallel equivalent, so the normalized capacitive susceptance of C1 must be $+j2.0$ mhos (B_N). From this and Eq.

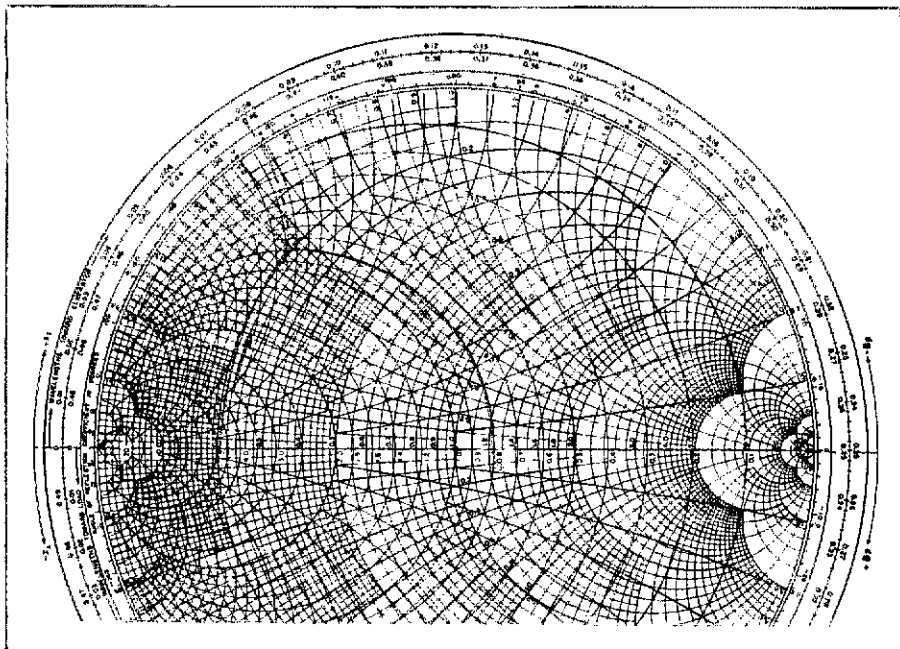


Fig. 11 — Solution of input-circuit transformation problem with the Smith Chart.

7C, the required susceptance for C1 (B_p) is 0.04 mho. We may convert parallel susceptance (B_p) to parallel reactance (X_p) simply by taking the reciprocal; $1/0.04 = 25 \Omega$. From the reactance equation we may then determine the required capacitance for C1 at our intended operating frequency. From this procedure, we have determined that an inductive reactance of 20 ohms for L1 in Fig. 10A and a capacitive reactance of 25 ohms for C1 will provide the proper match for a 50-ohm circuit input to the input impedance of the transistor.

If you follow through on this exam-

ple and calculate the values required for L1 and C1 at 450 MHz, the actual components may be difficult to obtain. This problem can be solved through the use of a microstrip transformation, which will be covered in Part 2 of this series. Part 2 will appear in a subsequent issue of *QST*.

QST

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Feedback

□ If you'd like a diagram showing the interconnecting cables for the LSB adapter described in the May *QST* article entitled "Independent Sideband for Your Drake TR-4C," send an s.a.s.e. to League hq.

□ In the article "More PEP — Less Paint" in Hints and Kinks (*QST* for July, 1977), the configuration of the bridge rectifier shows the diodes CR1-CR4 incorrectly drawn. They should be reversed.

□ In the Simulated Emergency Test results, July *QST*, the report for the counties of Hardin, Marion and Wyandot (OH) were inadvertently left

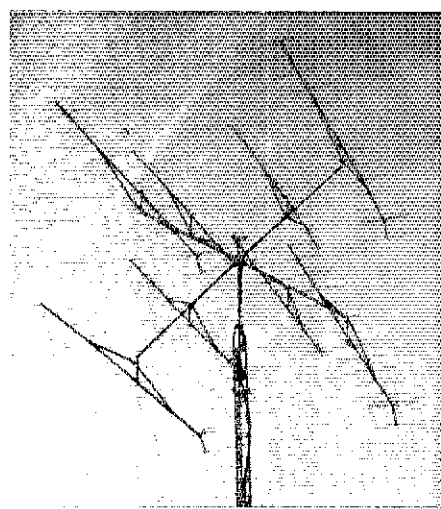
out. Emergency Coordinator WB8ED0 reported a total of 314 points, which increases the total of the Ohio section to 6,924 points. Also, the call sign of Paul Danzer should have read N111.

Strays



□ Good community relations paid off recently for Dr. Charles Greene, W2CPI, of Clayton, NJ. When high winds damaged the guy wires securing his TA 36 at 70 feet, he called on the Washington Township fire department for assistance. The commissioner himself went up to inspect the damage — and decided to replace all six guys.

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Two meters has hit Europe in a big way, as Karl Zimmer's "Monster" array testifies. Karl DC2ZG, is an electronics manufacturer.

Updating the Noise Blanker

Is the performance of that New-Look Noise Blanker up to par? Don't push the panic button until you read this!

By S. Henry Frankel,* WB2DQP

A New-Look Noise Blanker That Works¹ does — but not without problems. It knocks out noise but the intermodulation distortion has proved to be rather annoying on the 80-, 40- and 20-meter bands. Switching on the noise blanker caused reception with a hashy background. To benefit those amateurs who installed the SBA-104-1, I developed a modification to counteract this problem. The updated noise blanker now *really* works!

A threshold control replacing the ON-OFF switch will permit the noise

¹ Frankel, "A New-Look Noise Blanker That Works," *QST* for January, 1977.

*1021 Douglas Ave., Wantagh, NY 11793

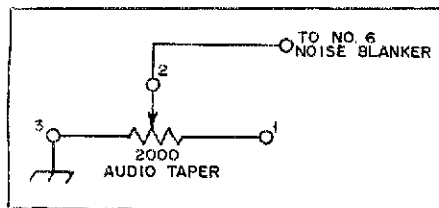


Fig. 1 — The threshold control for the SBA-104-1 noise blanker.

blanker to be activated gradually, so that most of the noise can be eliminated without using the full blanking capability. Optimum setting of this control will vary depending on noise levels and band conditions.

If the noise blanker is being used with the Heath SB-303, the rf attenuator control on the front panel may be used. To do so, it is first necessary to remove the inner leads of the coaxial line from lugs 1 and 2 of the control, R704. Solder these loose leads together and slip a short length of sleeving over them to prevent their shorting to the chassis or other parts of the circuit.

The R704 control provides a maximum of 600 ohms, but more resistance is required. Connect a 1000-ohm resistor to slot no. 6 on the noise-blanker board. From the other side of this resistor, connect a wire to lug no. 2 of R704. This provides from 1000 to 1600 ohms, depending on the control setting, and should cover the complete range from full blanking (as if the switch were ON) at a minimum resistance to no blanking (as if the switch were turned OFF) at maximum resistance.

The value of the 1000-ohm resistor

is critical and there may be slight variations from resistor to resistor. One should be chosen carefully in order to obtain both full blanking and no blanking at extreme settings of R704.

A similar solution may be applied to other receivers. Also a 2000-ohm audio-taper control may be connected between slot no. 6 on the blanker board and ground. Select the appropriate side lug of the control so that maximum resistance occurs at the fully clockwise position. This will make it easier to optimize the control setting, which is between 1000 and 2000 ohms. **QST**

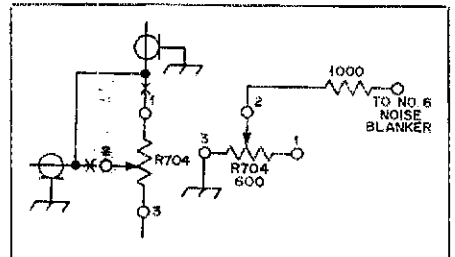


Fig. 2 — Modified threshold control using the rf attenuator of the SB-303.

Still More on the SBA-104-1 Noise Blanker

By Al Davis,* WA2KOC

This additional information may be very helpful to those amateurs who wish to install the SBA-104-1 noise blanker in the Heathkit HW-101 transceiver. Al Davis, WA2KOC, who collaborated with S. Henry Frankel, WB2DQP, in developing the article, "A New-Look Noise Blanker That Works" (QST for January, 1977),

recommends the following changes in order to assure satisfactory operation of the blanker and the HW-101.

For proper impedance matching within the receiver section of the HW-101, it is essential that R2 (3300 Ω) be removed from the top of the L3 (located on the noise-blanker circuit board). Without

this correction, the blanker will not function properly. The impedance of the HW-101 at the point of insertion of the blanker is high, while the impedance of the SBA-104 is low.

Removal of R2 results in much higher Q in the output circuit of the blanker. For that reason C15 (150 pF) was removed as well as R3 (33 Ω). To allow adjustment for maximum gain, a trimmer capacitor (150 pF) was in-

*20 Candle Lane, Levittown, NY 11756

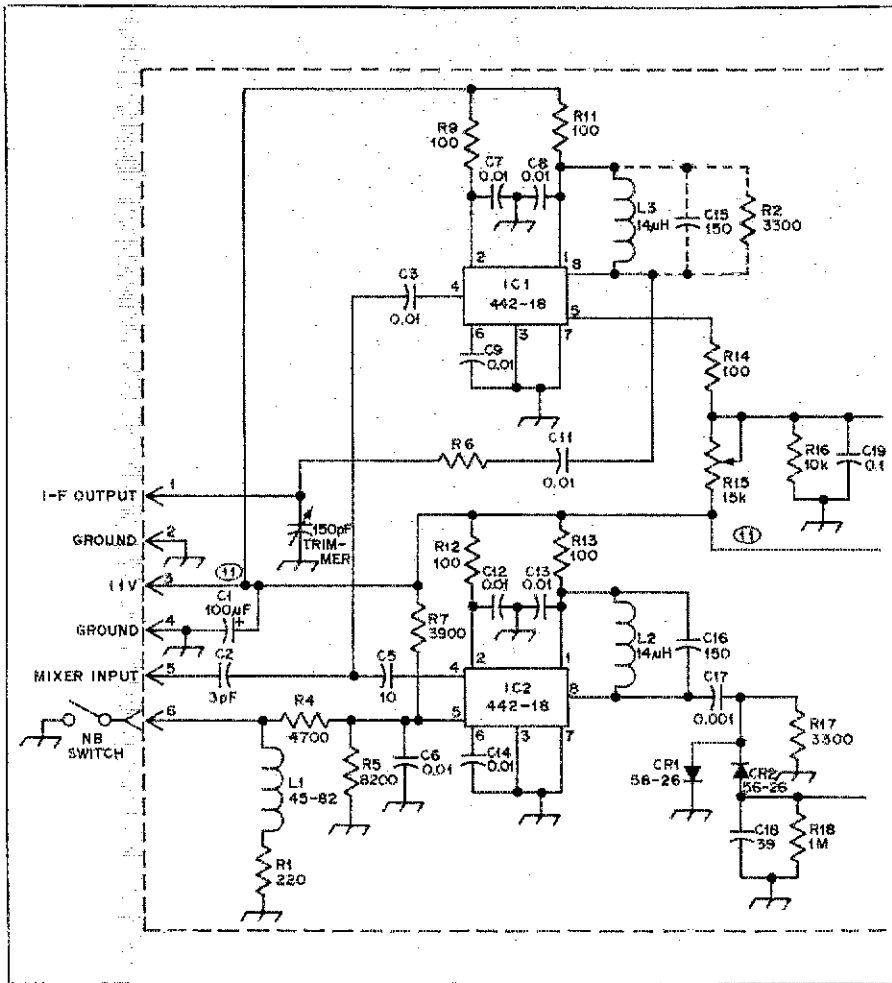


Fig. 1 - Diagram showing minor modifications to the SBA-104-1 noise blanker for interfacing with the HW-101.

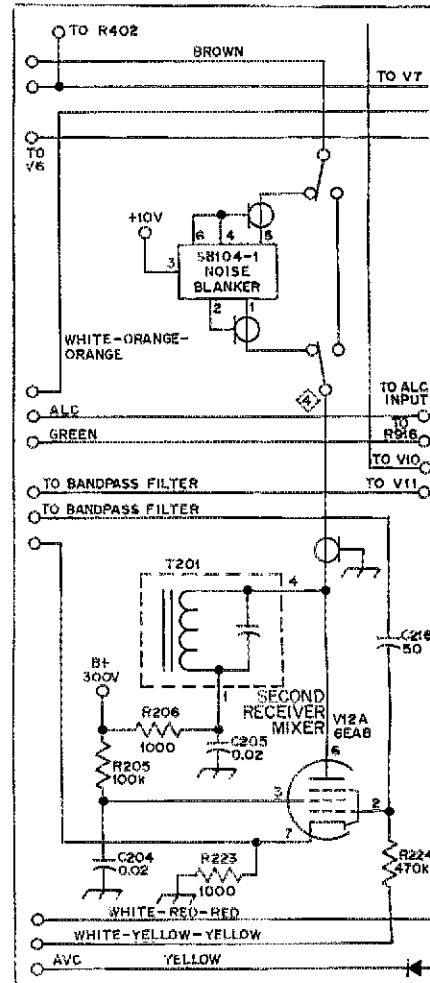


Fig. 2 - A portion of the HW-101 schematic diagram is shown to illustrate how the noise blanker is inserted in the second mixer circuit.

stalled in place of R3. This change also compensates for cable capacitance, which was not a problem with the original circuit. However, it becomes a matter of concern with the modified high-impedance arrangement.

Installation of the noise blanker is not difficult. It may be fastened to the front-to-back metal shield located in the bottom compartment of the HW-101. Two small L brackets may be used to secure the blanker to the shield. There is

ample room for the unit beneath the band-pass circuit board.

Original cables from the HW-101 are used for the necessary connections. These should be maintained at their original lengths to minimize detuning in the HW-101 circuits. Some retuning will be required once installation of the blanker is completed.

The blanker may be completely bypassed by means of a dpdt switch. When strong signals are being received,

this offers an advantage. The push-pull switch on the rf gain control may be converted for this purpose. As indicated by Frankel,¹ a threshold potentiometer may be employed as an alternative to using a switch for the purpose of engaging or disengaging the noise blanker. It is a good compromise.

¹ See "Updating the Noise Blanker," on page 33.

Strays



More than 700 hams applied for the Extra Class license in April alone. Desire to upgrade has never been greater. WIAW code proficiency runs show a substantial interest in higher speeds. And now a high-speed code cassette is available from Hq. This quality cassette, containing one half hour at both 15 and 20 wpm with both plain text and code groups, sells for only \$5 postpaid.

Who sez hams are lazy and don't upgrade! W4RF tells us that 3500 hams attended the Charlotte (NC) Hamfest, March 26-27. The FCC brought 300 610 forms for their usual exam-giving on Saturday morning. But 500 people wanted to be tested! Local hams made efforts to produce 200 photocopies of the 610s and exam times were extended until Sunday noon! - WA1STO

FEEDBACK

In the 1977 Simulated Emergency Test Results (page 86, July QST), the report of the Dallas County ARS was accidentally left out. Emergency Coordinator K5LZA reported a point total of 758, which brings the score of the Northern Texas section up to 1200. We regret the oversight that caused the omission.

Mark 40... and Still Going Strong

Dedicated in service, united in spirit and strong in heritage, the Mission Trail Net observes 40 years as an independent phone traffic net serving the California area.

By Jim Price,* WB6DPV

One January evening in 1937, the first of four operators checked in to the 160-meter a-m phone net session on 1804 kHz. Five minutes later it was all over. One message had been handled. Such was the inauspicious beginning of the Mission Trail Net (MTN), "born out of curiosity — (to see) whether or not messages could be handled by voice in as expeditious a manner as they had been moving on cw." This year MTN celebrates its 40th anniversary.

Just an Experiment?

Primarily a California net, MTN was the brainchild of Chandler Stewart, W6JRU, Bob Carter, W6NTU (father of the net) and Port Evans, W6BF, now W7YP. One year after its birth, membership surged to 56, five of whom are still active members: NTU, YP, W6ANR, W6KZF and W6JSB.

The obviously successful experiment continued until Dec. 7, 1941, the termination of on-the-air activities for exactly five years. United by the comradeship so integral a part of ham radio, the group held together during the war years by correspondence and by occasional personal meetings.

Following the war, MTN reconvened and established itself as a primary phone traffic net in California, despite several necessary frequency moves over the years. In 1969, 3928 kHz became MTN's home address for the 7 P.M. (PST) nightly sessions. The net has maintained an average membership of about 130.



WB6YSG receives the Net's Doghouse Award — not the most coveted, but surely the most amusing.

Newsletter Keeps Group Informed

The threads that bind the organization's feeling of community are several. One is their newsletter *The Blazer* published monthly since September of 1937 with the 1942-46 lapse an exception. The newsletter collection now provides a comprehensive net history. Similarly, an annual "Roundup" get-together in June gives opportunity for the on-the-air friends to meet in eyeball QSOs. It is at this gathering that the new, yearly elected Board is installed.

Incentive Awards

Also at the Roundup, MTN presents several annual awards to its members. The most time-honored and prized of these is the Jim Moran (W6HLZ) Award, given to the member who's done the most for the net in the year prior to the Roundup. The award was established in 1955 in honor of its namesake.

The Lyle Carpenter (W6KVQ) Traffic Award is given to the member who handles the most message traffic each year. Established in 1973, as a memorial to a true traffic man, the award has been presented to those stalwart traffic people who are the essential backbone of a system.

Finally, the net presents a rib-tickler award, another product of MTN tradition. For years, MTNers who bungle on the air have been banished to the MTN Doghouse for a month-long stay to right their ways. So, each year a big red fireplug, containing a bottle of spirits, is presented to that lucky person who has "blown it" the most and gets to spend the entire year in the doghouse. The award is perpetrated by its recipient presenting it to some other deserving soul at the subsequent Roundup.

Down to Work

The MTN annals document extensive participation by the net and its members in public service work. Various earthquakes (Tehachapi, CA and Alaska), fires (Mt. Shasta, Santa Barbara), floods, automotive accidents and rescue attempts have over the years kept MTN in session many hours past its usual hour to hour-and-one-half nightly meeting. Yet, not all of MTN's work is of this life-and-death variety. During normal sessions net members handle written message traffic averaging between five and 10 messages per night, phone patches, and net business. Proud of its 40 years of public service and friendliness, MTN maintains open doors to all new check-ins.

A Crowbar-Proof 12-V Power Supply

If you hit this power supply with a crowbar, you'll smash it! But short the +12 volts to ground as often as you like, and it'll just wink at you and keep on playing.

By Charles R. Watts,* WA6GVC

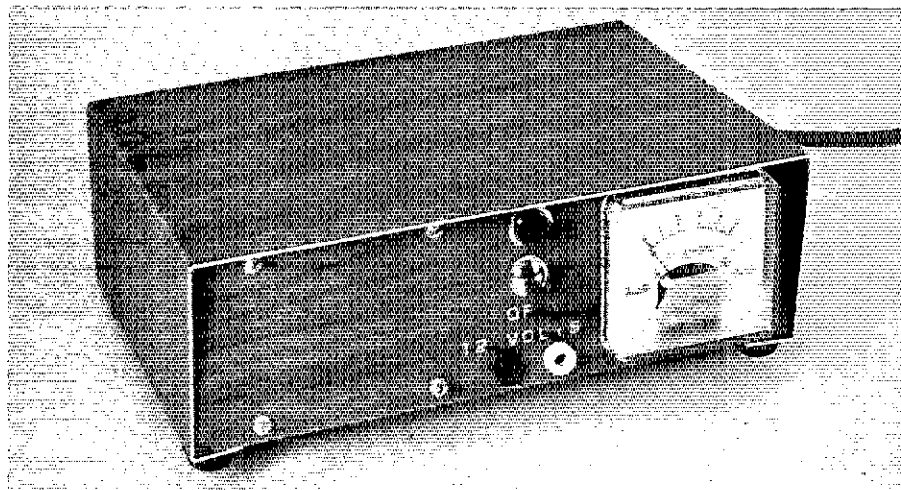
Have you ever been working on a project, one you'd been developing for months, when accidentally you shorted the power-supply line to ground? Did the whole thing, power supply and all, go up in smoke because the short-circuit-protection feature of your power supply *failed*? Well, I have. And I didn't feel too good when it happened, either. After the experience of seeing several months of research go up in smoke, I decided to build a power supply that I knew would shut down when a short occurred. The result is the crowbar-proof power supply described in the following paragraphs and shown in the photos.

A Bit on How It Plays

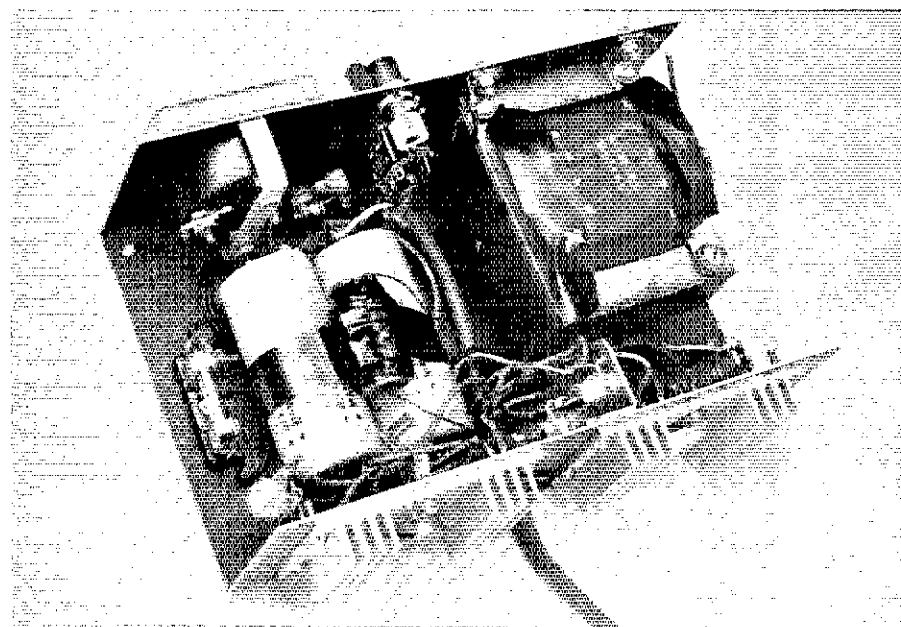
Several methods could have been chosen for obtaining a regulated, short-circuit-protected 12-volt power supply, but the simplest approach is usually the best. The simplest method in this case seemed to be the use of the ubiquitous three-terminal voltage-regulator IC.

Because this power supply will also be used in transmitter design work, current-carrying capability of the supply would have to be on the order of 5 amperes or so. As there are no three-terminal regulators on the market (yet) that will supply this amount of current, a series pass regulator would have to be employed to obtain this high current. With proper selection of component values, specifically R2, the shutdown-current threshold can be set.

The National Semiconductor LM340K-12 is used in this circuit. The "K" designates the TO-3 package type which can be mounted on an external heat sink. And the LM340 will handle 1 A at 12 volts. A transformer which will deliver approximately 18 volts under an 8-A load should be used. As pointed out in a previous discussion of IC regu-



The 12-V power supply has just one control — a power switch. An incandescent panel lamp indicates when the power is on, and the meter indicates the load current.



The power transformer and the two filter capacitors occupy most of the space inside the enclosure, a Radio Shack 270-261 (3-1/2 X 9 X 6 inches). The solder lugs of the power transformer are taped to prevent their shorting to the enclosure cover; taped to the filter capacitors is R2. The heat sinks are for U1 and Q2.

*12 Draper St., Springfield, MA 01108

lators,¹ at least a 3.5- to 4-volt differential between the input voltage to the IC and the output potential is necessary due to the voltage drop across the regulator and the series pass element.

The circuit given in Fig. 1 will result in half-current-foldback limiting when the output of the power supply is shorted. This means that as the current increases, the voltage will start to drop and then the current being delivered by the supply will also start to drop. But because this is a half-foldback circuit, the current will only drop to approximately 3 A while the voltage drops to a value near zero. (With the output of the supply shorted, I measured the voltage to be 0.018.)

Some Construction Ideas

The fact that this unit is wired by the point-to-point method will gladden the heart of many old-timers (some young-timers too, I'll bet). But the truth of the matter is that there just wasn't any better way to do it. The regulator IC and the pass element (Q2) are mounted on heat sinks which are attached to the rear of the chassis. The chassis used is a Radio Shack (Archer) 270-261 which has artificial wood-grain vinyl covering. This covering must be scraped away from the area where the heat sinks are to be attached, to allow the chassis to aid the heat sinks in dissipating the heat. The rectifier diodes

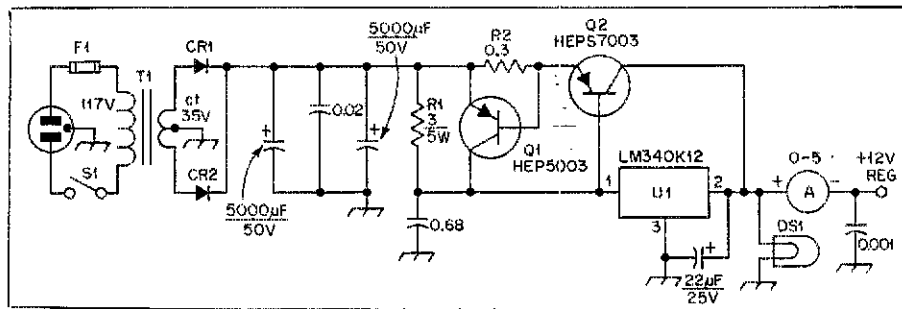


Fig. 1 — Schematic diagram of the power supply. Rectifiers CR1 and CR2 are type HEP R0103 or equiv. The transistors in the pass/current-sense circuit are Q1 — HEP 5003; Q2 — HEP S7003. The meter is a Shurite type 8203Z. All of the components used (with the exception of R2) are not critical. See text for information on R2.

are of the stud-mounting variety. They are attached to an L-shaped bracket which can be fabricated from a small piece of aluminum or a piece of L channeling. L channeling can be purchased at a local hardware store. Be sure to use heat-conductive silicone compound between all the parts where you want a heat transfer to take place — diodes, pass transistor, IC, L brackets, heat sinks and chassis. The current-sense element, Q1, is mounted to the chassis with one of the screws that holds the heat sink of Q2 to the chassis.

As can be seen in the photograph, the remainder of the components are placed throughout the rest of the open area inside the chassis. The large round object in the center of the two electrolytic capacitors is R2. This resistor is made by winding several feet of no. 22

enameled wire around a phenolic form to make a 0.3-Ω 60-watt resistor. The only thing to keep in mind when making this resistor is that it will be carrying the full current of the system under a full-load or short-circuit condition. The power switch, current metering and a light on the front panel finish the unit.

It's the Wink That Tells

The output voltage of the power supply will be between 12 and 12.5 volts. The regulation is very good right up to the current knee. At 4.5 A, the drop is only 0.2 volt, and the output goes to near zero at 5 A. With this power supply you'll know when you've reached the current knee. The pilot lamp will start to dim, and if you have a short-circuit condition, it'll wink at you.

¹Hall and Watts, "Learning to Work with Integrated Circuits," Parts 1 and 2, *QST* for January and February, 1976.

Strays

NAME HR IS 8080

□ A few short years ago, microprocessors did not even exist. Today they are handling dozens of tasks around the ham shack, from contest logging to beam heading. The rapid growth of the personal computing field, especially among hams, means it is only a matter of time before the first totally automated amateur radio station comes on line.

The present and future uses of microprocessor technology in the ham shack, as well as computer-controlled satellites and satellite ground stations (and much more of interest to the radio amateur), are on the program at the Personal Computer 77 show in Atlantic City, NJ, August 27-28. Representatives from ARRL, AMSAT and other organizations join with commercial exhibitors and speakers in a jam-packed weekend.

Heathkit will have its new computer kits on display for the first time, and speakers include the inventor of the first electronic computer, the authors of the *Bugbooks*, and many other well-known personal computer enthusiasts.

PC 76 was the top show of its kind last year; PC 77 promises to be even better. And all proceeds from the show go to support the AMSAT Phase III satellite program. For further information, contact PC 77, Rte. 1, Bbx 242, Mays Landing, NJ 08330.

□ When Raymond Andrews, KØLZR, gives the daily ham radio weather report for southwest Kansas on broadcast radio stations KIUI and KUPK in Garden City, few listeners realize that he is blind. But neither do the hams traveling through the area using the 31/91 machine or the Kansas mobile frequency of 3.920 MHz. A member of the

Sandhills ARC in Garden City, Raymond won special recognition when his team raised more money for the new repeater than anyone else. He also assumed weekend net control of the daily Southwest Kansas Weather Net, and has acted as base station net control during severe weather alerts in tornado country.

FEEDBACK

□ Governor Brown's message was not relayed by W3BNV to WA3OMF as indicated in "The 1976 Presidential Bicentennial Relay," *QST* for June, 1977. The message was transmitted by W6ASA via OSCAR 6 on orbit 18939 to W3BWU and then to WA3DMF on orbit 18950 for delivery to W3FA. The accompanying chart on page 63 should indicate that the message was via WA3DMF.

Know Your Receiver

Selectivity and band-pass tuning — it really isn't black magic!

By Don R. Tyrrell,* W8AD

The first of the many characteristics and specifications of a receiver that the newcomer usually looks for, and is concerned about, is sensitivity. It stands to reason that if a receiver is sensitive it will "hear" signals well, and if it isn't, it won't.

He or she will soon discover that a sensitive receiver "hears" many signals at the same time. The desired signal may actually be buried in the clamor! Along with certain other important considerations, the receiver must be able to separate stations, as well as hear them.

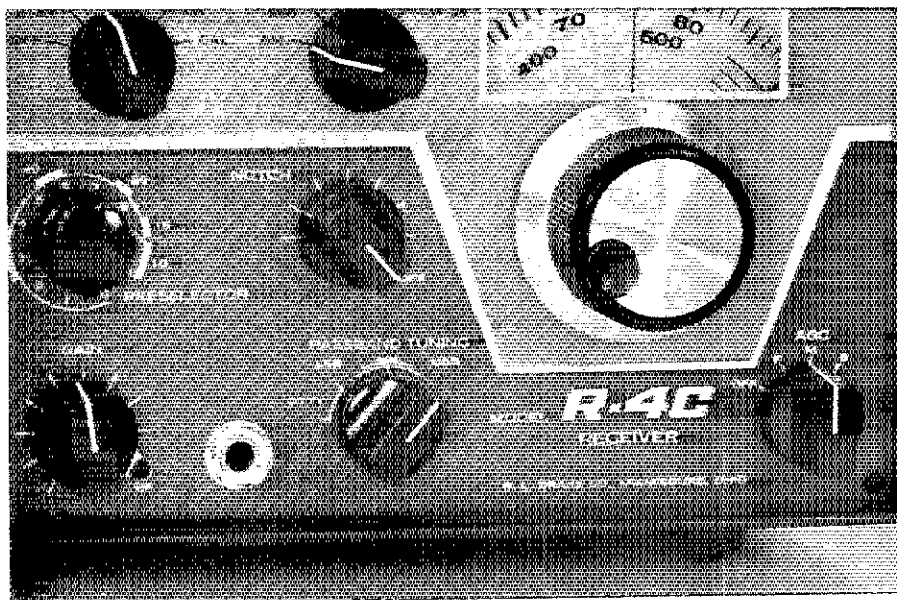
Enter Selectivity

The characteristic that permits a receiver to select a particular signal and reject the rest is known as selectivity. Selectivity can be envisioned as the width of a doorway through which signals pass. If it's too wide, many signals get into the receiver, but if it's too narrow, the desired signal may not be able to squeeze through.

In a receiver this doorway is the selectivity filter, with the distance across the top of the doorway known as the *filter width*. The shape of the sides of the doorway, comparing the width at the bottom to the width across the top, is known as the *shape factor*. Unfortunately, they can't be exactly straight up and down. The smoothness across the top of the doorway is the *ripple factor*. These characteristics are shown graphically in Fig. 1 and work together in the following ways:

Filter Width — If it's too wide, too many signals get through, and if it's too narrow for a given signal width, the desired signal can't get through properly.

Shape Factor — Even though the width at the top of the filter may be



carefully selected to pass just the signal you want, if it flares out too wide at the bottom, other undesired signals will be received. The shape factor is actually the measured ratio of the bottom width to top width of the filter, with a ratio of 2:1 or better usually considered acceptable.

Ripple — If the response across the top of the filter is uneven, the frequencies that correspond to the higher points will be amplified more than the frequencies which occur at the lower points, and distortion can result. All filters exhibit some ripple, but, generally speaking, the smaller the amount the better it is.

As can be seen, the narrower the door opening or filter width, the fewer are the signals that will get through. If this is so, and if it is desired to copy only one signal at a time, why not make filter widths that are super narrow?

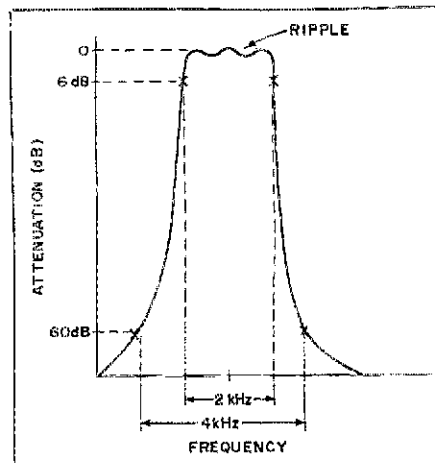


Fig. 1 — The shape factor of the filter is the "flare out" measured between the 6- and 60-dB points. In this example the ratio of 4 kHz to 2 kHz yields a shape factor of 2:1. The filter width is commonly measured at the 6-dB points and is, in this case, 2 kHz.

*540 Richard St., Miamisburg, OH 45342

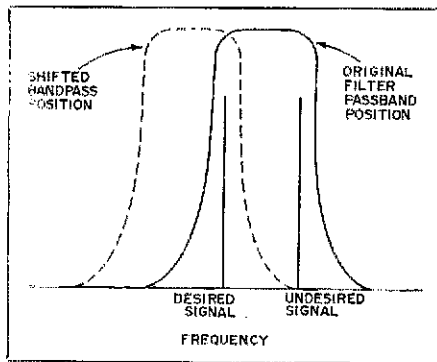


Fig. 2 - This drawing shows how an interfering signal can be attenuated by shifting the position of the passband around the signal.

There are two basic reasons why they are not made super narrow. First, every signal occupies a finite bandwidth. This requires that a certain receiver bandwidth be selected accordingly. A typical a-m signal is approximately 4 kHz wide (remember, a-m has both sidebands present), ssb is approximately 2.1 kHz wide, and even cw, which is normally thought to be just a "stick" of energy, actually has some bandwidth dependent on the keying rate at the transmitter.

Second, from a manufacturer's point of view, it is not practical to produce a super-narrow filter with near a 1:1 shape factor for economic and producibility considerations. It would simply cost the user far more than the return in performance would justify. Filter widths of 250 or 500 Hz are practical for cw, and economically feasible to produce.

Look again at Fig. 1 and think about the various bandwidths required for different types of signals; it should become clear that one pitfall to avoid is the use of a filter that is wider than necessary. Too many other signals can sneak through, along with the desired one.

The Case for Band-Pass Tuning

Let's assume now that we wish to operate cw, and switch in a 500-Hz filter since we know that the 2.1-kHz ssb filter is too wide and will allow too much QRM from stations nearby the frequency.

As a broad generalization, the nominal keying rate of a ham QSO is such that the cw signal occupies a bandwidth of approximately 100 Hz. We find the signal that we wish to copy and place it in the passband (or door opening) of the filter by proper VFO adjustment. However, we find that a nearby interfering signal is also in the passband along with the desired one. After all, the signals are about 100 Hz wide and the passband is 500 Hz wide.

The situation is this. We selected the narrowest filter available, but there is still QRM from a signal within the passband of the filter. What can we do? Well, not much if we have a "fixed" selectivity system. On the other hand, looking now at Fig. 2, what if we could move the whole passband to the left?

Notice that the desired signal is still in the passband, but that the uninvited guest is now standing out in the cold - unable to create any more disturbance. If the undesired signal happened to be on the left of the desired signal, then we would move the passband to the right. The ability to shift the passband around to get rid of interfering signals is known as *band-pass tuning*.

This example illustrates the usefulness of band-pass tuning in cw work. Such tuning can also be a help in reducing interference from heterodynes and "splatter" of ssb signals, depending upon the relative frequency of the interference with respect to the desired signal.

After one gets the hang of using band-pass tuning, it's hard to get along without it. It's somewhat like power steering on a car - it helps get the job done in tight places.

Band-Pass Tuning - Technical Description

The "how" of band-pass tuning won't be pursued too deeply here except for a brief block-diagram explanation for those who have some additional technical curiosity. Also, Fig. 2 is the *apparent* way that band-pass tuning works, and is presented for simplicity and clarity.

We should point out that in an electronic band-pass tuning system the actual passband of the selectivity filter doesn't change its position with regard to the center frequency. The *effect* of that happening, however, is present - as shown in Fig. 2. To be technically correct, the signals are actually passed across the passband, instead of the

passband being moved across the signals.

Take the Drake R4C receiver for example. The simplified block diagram for the band-pass tuning section is shown in Fig. 3.

With the exact frequencies shown, the 5645-kHz i-f is added to the 50-kHz band-pass-oscillator frequency in the mixer. The sum, 5695 kHz, is applied to the crystal filter. If the filter passband is exactly centered at 5695 kHz, then a signal at the intermediate frequency will be passed through for detection.

Let's say we want to receive a cw signal and that for this example we have selected a filter with a width of 1.0 kHz. This means the filter will pass frequencies from 5694.5 to 5695.5. To keep things simple in this example, let's not concern ourselves with the shape factor.

We have a desired signal now at an i-f of 5695 (which came in at 5645 before mixing) which is within the filter passband. Let's assume a nearby signal at 5695.5 (which came in at 5645.5 before mixing) is also getting through causing serious interference. What can we do? In Fig. 3, the band-pass tuning control was set for a frequency of 50 kHz. Simply reset it to a frequency of 50.5 kHz and see what happens.

The 5645-kHz signal (desired) now adds to 50.5 kHz in the mixer producing a new frequency of 5695.5 kHz. This signal is within the filter passband and therefore will still be received. The 5645.5-kHz signal (undesired) now also adds to 50.5 kHz in the mixer, producing a new frequency of 5696 kHz. This signal is now *outside* of the filter passband, and is therefore no longer detected.

Thinking back to Fig. 2, it's just as though we have moved the passband to the left, leaving the undesired signal out of the passband.

With band-pass tuning, selectivity has two basic component parts - filter width and filter position. Either taken alone is sometimes not enough when interference sounds like New Year's Eve on Times Square. QST

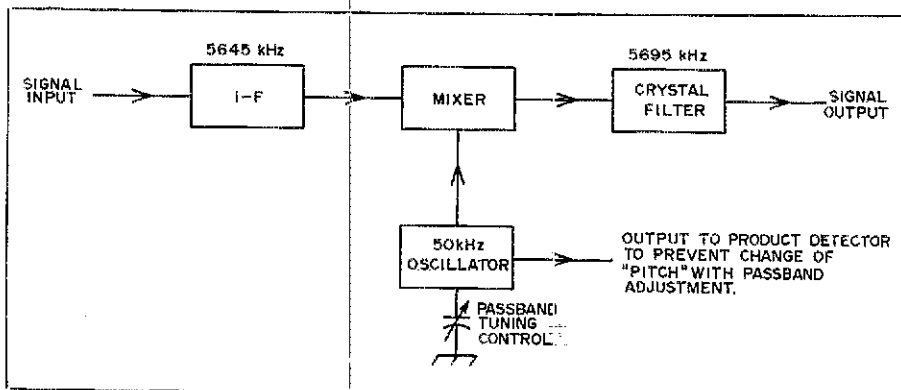


Fig. 3 - Basic diagram of how the Drake band-pass tuning system works. See text for details.

Active Low-Pass Filters for CW or SSB

Many old and some new receivers need help in the selectivity department. Improve the performance of your receiver. Put an active low-pass filter in your audio chain.

By Tony Berg,* W1OT



Active low-pass filters can be used to attenuate undesired high-frequency audio response in either direct-conversion or superhet receivers which have inadequate i-f selectivity. For cw reception, a beat note of up to 1 kHz is usually desired; however, interfering signals may produce audible responses up to 5 kHz. Further, an audio low-pass filter can have advantages over an audio band-pass filter for general cw reception. First, the frequency of the beat note can be as low as desired and as high as the filter cutoff frequency, rather than being restricted to a fixed and narrow range. Second, if a superhet produces an audio image (response on the other side of zerobeat) for a very strong cw signal, the use of a band-pass filter may yield an annoying peak in the audio image. There is no detectable peak with a properly designed low-pass filter.

The filter shown in Fig. 1 is intended to be used at a point in the receiver of low audio level. The filter is designed for unity gain and has an input buffer, three cascaded active low-pass filter stages, and an IN-OUT switch. The 4136 is a 741 type of quad op amp having

low noise and high-input impedance characteristics, both of which are advantageous in this application.

Voltage follower U1A provides a high input resistance (5 megohms typical, 300 kilohms minimum) to minimize

Table 1

	CUTOFF FREQUENCY, Hz			
	700	900	2500	1000
R1, R3, R5	20k Ω	16k Ω	5600 Ω	14.07k Ω
R2, R4, R6	75k Ω	62k Ω	22k Ω	53.98k Ω

any loading on the receiver circuitry. It also provides a low output resistance to properly drive the UIB filter circuitry. Identical low-pass filter stages UIB, UIC and UID have unity gain. A second-order 0.5-dB Chebyshev design¹ is used for each, providing a good compromise between skirt steepness and band-pass flatness. The overall response of the three cascaded filters is 1.5 dB down at the cutoff frequency, about 36 dB down at twice the cutoff frequency, and about 60 dB down at three times

cutoff. R7 and R8 provide a "pseudo ground" of half the supply voltage eliminating the need for a negative supply. Source resistor R_s represents the termination resistor of either the receiver product detector or its existing audio low-pass filter. If there is no such resistor, the receiver audio gain control can be used. In this case, the filter is inserted between the arm of the potentiometer and the connection to it. Note that the bottom end of R_s must be disconnected from chassis ground and connected to the active filter pseudo ground. Also, since both the filter input and output are at a dc potential of half the supply voltage, they must be capacitively coupled by capacitors C_c , which may already exist in the receiver. The suggested minimum value for load resistor R_L is 2000 ohms.

Table 1 shows standard resistor values for cw cutoff frequencies of 700 and 900 Hz, depending on individual preference, and an ssb cutoff of 2500 Hz. For the benefit of those who wish to experiment with other cutoff frequencies, the calculated values for a 1-kHz cutoff are also listed. Resistance values are inversely proportional to cutoff frequency. For a given cutoff, the capacitance values may be multiplied by

¹ *Rapid Practical Designs of Active Filters*, D. E. Johnson and J. L. Hilburn, John Wiley and Sons.

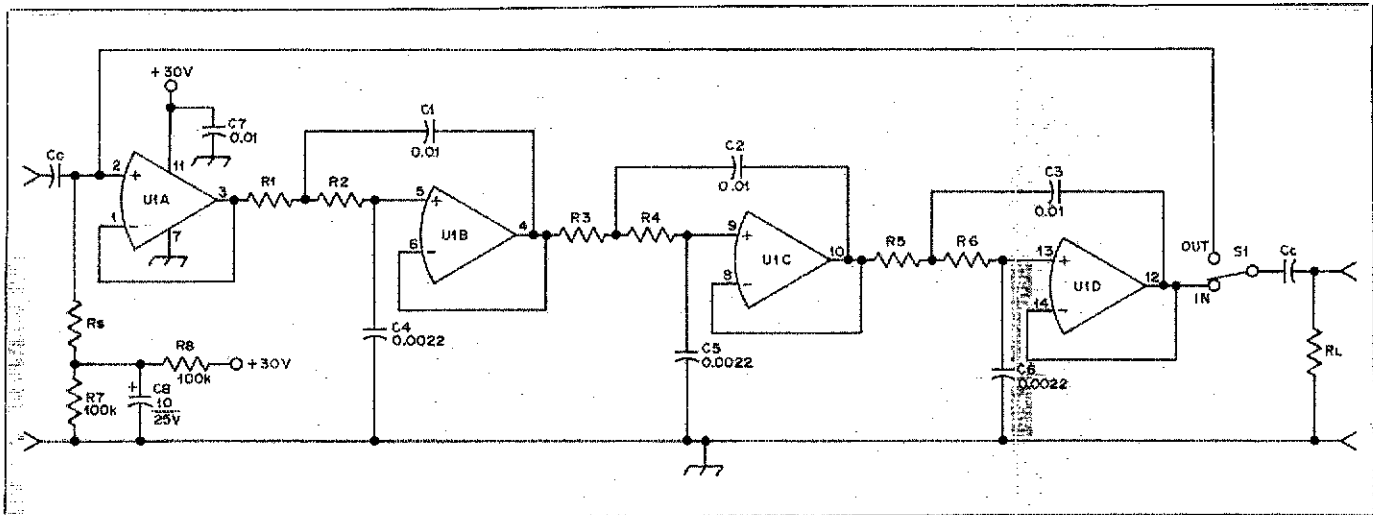


Fig. 1 — The schematic diagram of the low-pass audio filter. All capacitor values are in μF . Polarized capacitors are electrolytic.

C1-C3, incl. — Mallory type SXM 110 or SX 110 or equiv.
C4-C6, incl. — Mallory type SXM 222 or SX

222 or equiv.
R1-R6, incl. — See Table 1.

S1 — Spdt switch.
U1 — Fairchild μA 4136, Raytheon RC 4136 or equiv.

a factor greater than one and the resistance values divided by the same factor. For example, C1 through C3 and C4 through C6 may be changed to $0.1 \mu\text{F}$ and $0.022 \mu\text{F}$ respectively, if the values for R1 through R6 are divided by 10.

For best agreement between predicted and actual cutoff frequencies, resistors and capacitors having a tolerance of 5 percent or less should be used, but 10-percent tolerance components

may be used if 5-percent tolerance units are unavailable. Polystyrene capacitors are recommended since they are of high quality, inexpensive, and are manufactured in 5-percent and 2.5-percent tolerances. Other suitable capacitor dielectrics are Mylar, polyester film and mica.

The circuit may be operated at supply voltages from as low as 6 volts to an absolute maximum of 36 volts. Sup-

ply current over this range is nearly constant at about 7 mA. In vacuum-tube receivers, the supply voltage may be obtained from the B+ through a dropping resistor, or from the cathode of the audio output tube if it has the proper dc potential and is bypassed to ground. The photo shows how the filter may be constructed on half an Experimenters PC Board, Radio Shack part number 276-151. QST

Strays



Continuing its tradition of commemorating space missions, the Jet Propulsion Lab Amateur Radio Club (W6VIO) plans to mark the launch of the Voyager spacecraft. From August 20, 1977, at 14:30 UTC, W6VIO will be on the air with bulletins and data, as the Voyager I lifts from its launchpad at Cape Kennedy on its mission to the planet Jupiter. Twelve days later, Voyager II will blast off on a path which will put its arrival in the vicinity of Jupiter four months earlier than Voyager I. Both spacecraft will arrive at their destination by December of 1978.

The purpose of the mission is primarily to obtain photographic coverage of Jupiter and Saturn. The distance to Jupiter is about 500 million miles. Saturn is about a billion miles from Earth.

At the Saturn/Jupiter encounters, W6VIO will be on the air during the fly-by periods with operations on cw and ssb, 2-meter fm, 220 MHz and

SSTV. The launch operation beginning August 20 will last for seven to nine days, depending on interest from the amateur community. Rick Ward, N6BF, is chairman of the Voyager Commemorative Committee.

FEEDBACK

Gremlins were at work again in July 1977 *QST*. In the article by Hall, "A Simple Approach to Complex Circuits," a misleading typographical error appears near the top of the first column on page 40. In response to Jack's question about admittance, Gus really said, "Admittance is the reciprocal of impedance, or $1/Z$." Another typo appears near the top of the first column on page 41, where i is shown in place of the operative j . Mathematicians do use the letter i , but electronics engineers prefer the j since i is often used to represent current. — *KITD*

QST Congratulates . . .

K7NKL Bill Skylstad, Catholic priest

of the Spokane diocese, who was elevated in May to bishop of the Yakima, WA, diocese.

Bill Schrempp, K7RY, a deacon of the Spokane diocese of the Catholic church, who was recently ordained a priest. . .

The special station set up at the first All-Africa Boy Scout Jamboree at Jos, Nigeria, attracted more than 1,700 visitors during its two-week-long operation recently. Operating under the call sign 5N2NAS/m, Nigerian amateurs worked 372 stations. An impressive display showed visitors how they could join the amateur ranks, the role amateurs play worldwide—and the awards and QSL cards used. Anyone who heard or worked 5N2NAS/m or anyone who worked any 5N2 station between March 23 and April 30, 1977, is eligible for the First All-Africa Boy Scout Jamboree Award. QSLs are not required. Just send 5 IRCs to 5N2NAS, P. O. Box 448, Apapa, Lagos, Nigeria.

Technical Correspondence

The publishers of QST assume no responsibility for statements made herein by correspondents.

CHANNELIZATION OF TEN METERS

With the ready availability of 23-channel CB equipment at low cost, many of us in the Los Angeles area are using converted CB rigs for 10-meter operation. The transceivers, which run approximately 4 watts output, are quite handy on a-m phone.

In order for the rigs to be compatible with one another, we converted them to operate on the frequencies given in Table 1. We have designated 28.80 MHz as our "national listening frequency." That is the channel we monitor when not in QSO. As soon as we hook up with someone, we'll QSY up or down so we do not "hog" the listening frequency. *Alan Kaul, W6RCL, 3000 W. Alameda Ave., Burbank, CA 91523, and Norm Lefcourt, 7713 Wilkinson Ave., W. Hollywood, CA 91605*

Table 1

Ten-meter channels: 28.80 MHz is designated as the official listening frequency in the Los Angeles area.

CHANNEL	MHz
1	28.76
2	28.77
3	28.78
4	28.80
5	28.81
6	28.82
7	28.83
8	28.85

MORE ON THE VHF QUAGI

In my article on the vhf quagi,¹ some information was included in the original manuscript which did not appear in the published version. The information summarized the reasons why a combination of quad and Yagi elements appears to be superior to an array consisting entirely of quad loops. I'd like to present that information here.

Although quads of up to four elements have repeatedly proved superior to similar size Yagis, as Lindsay and others have pointed out (see references in my original article), there is some evidence that quads lose their advantage as the boom becomes longer. Both Orr's handbook on quads and my empirical findings with quads and Yagis suggest this conclusion. Even Orr's second edition maintains that longer quads have less edge over equal-size Yagis than do shorter ones.

In fact, if a long-boom quad is superior to a long-boom Yagi, as Lindsay's research would indicate, it is mainly because of the superiority of the quad loop as a driven element, and not because a loop has any advantage over a half-wave linear element as a parasitic director. This is confirmed by the research of Appel-Hansen, a Danish scientist with an anechoic test chamber at his disposal. His work, published in *IEEE Transactions on Antennas and Propagation* (July 1972), indi-

cated that an array combining full-wave driven element and reflector loops with the Yagi type of rod directors outperformed an all-loop array, especially when the boom length exceeded two wavelengths. Under those conditions, he reported that a hybrid array outperformed an all-loop array by about 1 dB.

This certainly supports the conclusion that a hybrid array on the quagi principle should outperform an all-quad array in long-boom configurations. Of course the driven quad loop retains its advantages over the dipole driven element of an all-Yagi type of parasitic array. And this says nothing of the other advantage of the hybrid over an all-quad array . . . simplicity and light weight. — *Wayne Overbeck, Ph.D., K6YNB, Pepperdine Univ., Communications Div., 24255 Pacific Coast Highway, Malibu, CA 90265*

GROUND-FAULT INDICATORS AND EMI

The National Electrical Code now requires ground-fault-indicator (GFI) circuit breakers on circuits where receptacles may be reached from the ground or wet locations. This caused WA4VCL a big problem when he moved. In a hurry to get back on the air, he stuck a 19-inch wire into the antenna jack on his 2-meter rig. He got into the WR4AFA repeater well.

He also got it into the wiring of his mobile home and tripped the GFI breaker which fed the heating circuit for his outside water pipes. They froze and burst, as he was not familiar with a GFI breaker.

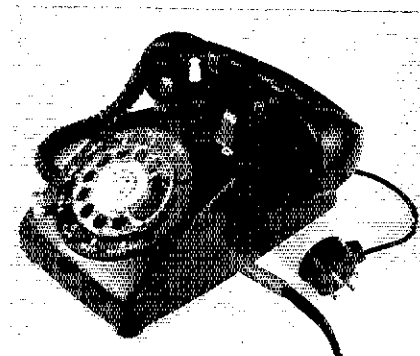
GFI breakers can be identified by a PUSH TO TEST button. In the future we should check to see if our rigs trip such breakers. I am sure there is some way to bypass such breakers and eliminate the problem. — *Ariel M. Elam, K4AAL, Rte. 1, Box 62, Antioch, TN 37013*

NEW TELEPHONE INTERCONNECTION ARRANGEMENT

A new manual phone-patching or "interconnection" arrangement is being offered by a number of telephone companies. The new arrangement is designated "QKP." It is similar to the familiar QKT arrangement, but it has the voice-coupler circuitry incorporated into the telephone instrument housing. The advantage offered for hams is that with a QKP, the phone-patching setup can be moved from one room to another with ease, provided that the telephone service on the premises has the standard jacks used with portable telephone instruments.

A standard 1/4-inch jack is included in the telephone instrument base for connecting the external equipment. As with the QKT, an exclusion key is used to control the voice-coupler connection, and an optional turn button can be ordered to act as a cutoff switch for the handset transmitter and/or receiver. The QKP can be supplied for either

rotary dial or tone signaling service. As the QKT and QKP are electrically identical, the information in *Technical Reference PUB 42101* applies to both arrangements. — *George Schleicher, W9NLT, 1535 Dartmouth Ln., Deerfield, IL 60015*



The QKP "interconnection" instrument. It has the voice-coupler circuitry, located inside the case, and accepts a standard 1/4-inch plug.

IC-22S PROGRAMMING WITH DIODES

Having recently obtained one of the new ICOM IC-22S PLL synthesized 2-meter fm transceivers, I decided to see if it could be put to use as an OSCAR uplink rig; this turned out to be quite simple. I list below the necessary steps, along with explanations.

To set up one or more frequencies for use on OSCAR, it is necessary only to calculate the diode positions used, insert appropriate diodes, run a key lead and go. Table 1 provides information on the diode-insert positions for all available OSCAR frequencies for either OSCAR 6 or OSCAR 7; note that only certain ones are usable for both. These were determined by the formula provided in the ICOM manual.

$$\text{Freq. (MHz)} = \frac{144.39}{0.15} = N$$

N is used to calculate the diode positions; i.e., 145.935 MHz yields an N of 103. The next lowest diode number is 64, so 103 minus 64 = 39, minus 32 = 7, minus 4 = 3, minus 2 = 1, minus 1 = 0. Hence, to set up for 145.935 MHz, insert diodes in the board corresponding with 64, 32, 4, 2 and 1 (identified as D6, D5, D2, D1 and D0 on the matrix board).

To operate on any of these special frequencies, be sure to set the transceiver either on the center position of the offset switch (SPX) or on DPX A — do not use the DPX B position, as this will shift the transmit frequency 600 kHz higher.

To permit keying of the unit, run a single lead from pin 2 (diagonally opposite the grounded/shield lead, which is pin 4) on the microphone connector, inside the unit, back

¹ Footnotes appear on page 43.

to any one of the unused pins on the ACCESSORY socket. Pin 8 of this socket is factory wired to ground. I used pin 9 for my "hot" keying lead. Then connect key leads to the matching accessory plug provided (pin 8 plus your hot-lead pin) and plug into the socket. I found it more pleasant to turn the volume all the way down to minimize keying "thumps" in the transceiver audio.

I performed this minor surgery on my ICOM with only slight trepidation. Normal use and appearance of the unit are unaffected. While using only this unit (at about 10 watts output) to a 5-element Yagi, I was able to work through OSCAR 6. I noted with pleasure that the cw note was stable and chirp-free, although there was some roughness due to power-supply ripple. This simple modification should enable many other would-be satellite communicators like me to at least try OSCAR. — Gary L. Foskett, W1ECH, David Rd., Durham, CT 06422

MORSE TO ALPHANUMERIC CONVERTER REFINEMENTS

A troublesome race problem in the automatic calibration circuitry of Riley's Morse Code To Alphanumeric Converter together with dissatisfaction with the operation of the calibration circuit on the air led me to the following simplification of his circuit. Integrated circuits U10, U17, U18, and U23 through U30 were eliminated. Their function, to automatically track variations in code speed, may be handled manually with a 20-k Ω potentiometer replacing the 27-k Ω resistor in the clock circuit. In practice, little adjustment is necessary because the circuit will detect characters properly from speeds of -30 to +100 percent of the correct setting with no adjustment of the potentiometer.

With the preceding changes the B inputs to the digital comparators must be fixed as follows. Choosing a dot length of 32 (a more-or-less arbitrary choice) requires the U19-20 pair to be set to 64 (binary 1000000), the U15-16 pair also must be set to 64, and comparators U13-14 must be set to 160 (binary 10100000). This can be accomplished by connecting the appropriate pins to ground (binary 0) and +5 V (binary 1).

While operating in this mode the potentiometer is adjusted so that neither all dits nor all dahs are received. To detect dahs an LED can be connected to the dash output of comparators U19-20, using one of the inverters of U7 as a buffer-driver. The adjustment of the potentiometer is not critical. Many operators seem to run their characters together, but this is easily taken care of by adjusting the potentiometer so that it is near the setting where all dahs or 1's are received.

I used a counter to study my most persistent noise problem (short pulses which the converter interprets as a dot or a series of dots) and found that the pulses were almost always less than one half the dot length of 32 clock pulses. Fig. 1 shows the circuit built to remedy this. It rejects mark pulses which are less than one half the dot length, these being due to noise. Assume the 7493 binary counter is clear; when the mark signal from the fixed threshold detector goes high, the 7493 counts. If the count is less than 14, then the mark-out signal remains low. At the end of the mark signal the counter is cleared by the 74123 one-shot. Thus, all pulses less than 14

Table 1

Diode positions for the IC-22S for OSCAR work.

	FREQ. MHz	N	DIODE INSERT POSITIONS										
			128 D7	64 D6	32 D5	16 D4	8 D3	4 D2	2 D1	1 D0			
OSCAR	145.860	98		X	X								
7 "A"	.875	99		X	X							X	X
Only	.890	100		X	X					X			
Both	.905	101		X	X					X			X
A-O 6	.920	102		X	X					X	X		
And	.935	103		X	X					X	X		X
A-O 7	.950	104		X	X				X				
OSCAR	.965	105		X	X				X				X
6	.980	106		X	X				X			X	
Only	145.995	107		X	X				X			X	X

*Not recommended — may interfere with OSCAR beacons. Note: it is possible to program frequencies in 15-kHz increments only.

counts are interpreted as part of a space. If the count reaches 14, then the 7310B goes low, inhibiting further counting and causing the mark-out signal to go high. At the end of the mark signal the counter is cleared and the mark-out signal goes low, giving a space.

If the digital noise-discriminator circuit shown in Fig. 1 is used, then the dash comparators U20-21 should be set to 64 - 14 = 50, the space comparators U15-16 to 64 + 14 = 78, and the word-space comparators U13-14 to 174. Again, convert these numbers to binary and connect to ground or +5 V for 0 and 1, respectively.

As mentioned in February 1976 *QST* (page 59), Riley's circuitry is illegal because the display portion puts out a modulated rf signal on a commercial television frequency for the TV monitor. To make the circuit legal several approaches are possible. One approach is to modify the circuit to operate a video monitor without modulating and transmitting a TV carrier. Another approach is to use a Signetics 2513 to operate a MAN 2 dot matrix, giving a one-character display. That approach is described quite well in an article by Steber and Reyer,³ and it was the ap-

proach I used.

A third possible approach to the display problem is to use the new four-character display; Hewlett-Packard HDSP-2000, which can in fact be combined with a Signetics 2516 character generator to give a four-character display, an eight-character display, etc. The appropriate circuit information may be obtained from Hewlett Packard. The drawback to this approach is simply cost.

Finally, I would like to point out that one of the most useful aspects of the code-converter idea is in learning the code. One can connect a key and practice to his heart's content, with instantaneous feedback in what will probably be called a "sight and sound" approach. — Marvin L. De Jong, W4LWY, Department of Mathematics-Physics, The School of the Ozarks, Point Lookout, MO 65726

¹Overbeck, "The VHF Quagi," *QST*, April, 1977.

²Riley, "A Morse Code to Alphanumeric Converter and Display," in three parts, *QST* for October, November and December, 1975.

³Steber and Reyer, "The Morse-A-Letter," *Popular Electronics*, January, 1977.

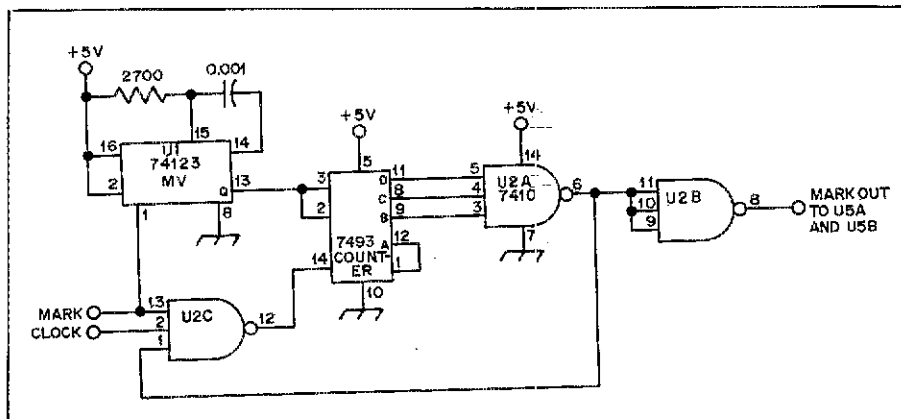


Fig. 1 — A digital noise discriminator circuit for the Morse to alphanumeric converter.

Product Review

Trio-Kenwood TV-502 2-Meter Transverter

Never let it be said that Trio-Kenwood engineers let grass grow under their feet. For the past few years those engineers have been assembling one of the most complete product lines available to the amateur fraternity, and at a reasonable price. The last piece of their equipment to appear in these pages was the TS-820 hf transceiver. To no one's great surprise, the rig was a smashing success.

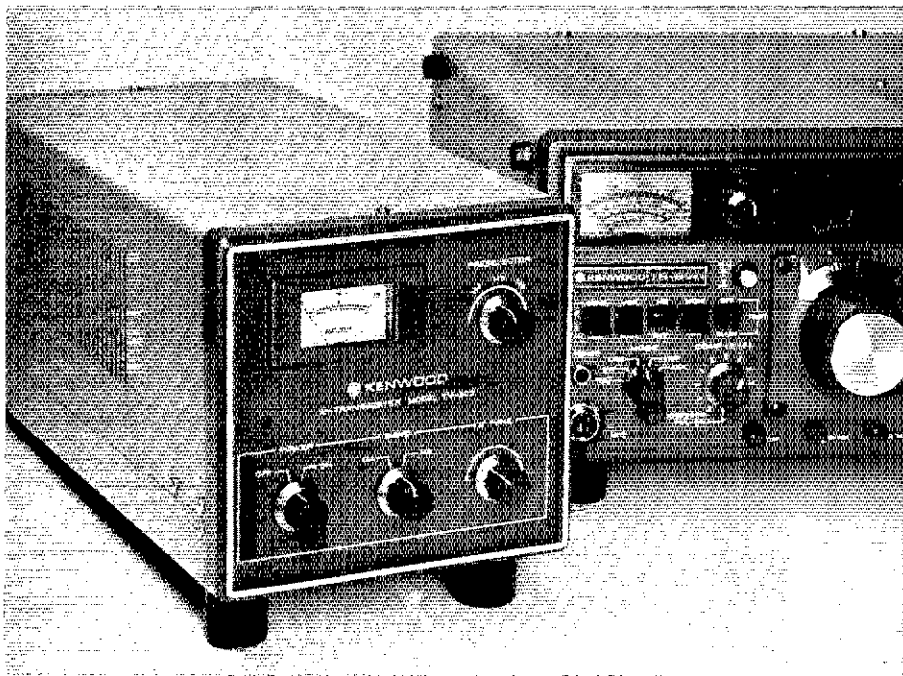
While the TV-502 2-meter transverter cannot be considered a new piece of equipment on the amateur scene, it is worthy of attention. When it was originally introduced (early 1976), the transverter was designed to mate up with the Kenwood TS-520 transceiver. A multiconductor plug and jack assembly, along with a single-shielded cable with phono type connectors on each end, are all that are required to marry the two units together. Apparently the Trio-Kenwood people realized that they would have a winner in the 502 because the TS-820 transceiver comes all set up for operation with the transverter. This is not to give the impression that the transverter can be used only with these two pieces of equipment. Actually, any transceiver or separate transmitter-receiver combination that covers the frequency range from 28.0 to 29.7 MHz can be used. A certain amount of cable rewiring will be required if the transverter is to be used with hf equipment of other than Trio-Kenwood design — something any competent ham should be able to handle.

Circuit Details (Receive Section)

Signals arriving at the '502 antenna terminal are first routed through the antenna-transfer relay and then to a single-section helical resonator labeled PRESELECTOR on the front panel. This high-Q circuit helps to keep strong in-band signals that are removed from the operating frequency from overloading the receiving converter.

Next in the received-signal chain is a fixed-tuned, band-pass filter which feeds the rf amplifier, a dual-gate MOSFET device. The drain of the rf amplifier sees a double-tuned band-pass circuit adjusted to cover the entire 2-meter band. A dual-gate MOSFET mixer combines the 144- to 146-MHz signal energy with either 116- or 117-MHz local-oscillator power to provide an i-f of 28.0 to 29.7 MHz. The front panel IF TUNE control is used to adjust the mixer drain circuit to resonance at the i-f.

A common local oscillator is used for both the transmit and receive mixers. Three bipolar transistors are used. One functions as the oscillator, one as a frequency tripler and one as a buffer amplifier. Diode switching is used in selecting which crystal is connected to the oscillator circuit. This eliminates the need for running long signal leads to the crystal-selector switch. One crystal is supplied with the



transverter (38.666 MHz) which provides coverage from 144 to 145.7 MHz. The second crystal (39 MHz) is available as an option which will provide additional coverage from 145 to 146 MHz. The front panel switch marked BAND selects which crystal is connected to the oscillator circuitry.

Circuit Details (Transmit Section)

Low-power energy from the hf transceiver or transmitter in the 28.0- to 29.7-MHz range is applied to the primary of an rf transformer. The secondary feeds a pair of JFETs connected as a balanced mixer. The front-panel IF TUNE control is used to adjust the transformer primary to resonance at the i-f. Local-oscillator energy is applied simultaneously to the two FET gates.

Output from the mixer is fed through a band-pass filter to a dual-gate MOSFET amplifier. The voltage on gate 2 of this device is derived from the final transistor protective circuitry. If the load that the final transistor is asked to operate into is substantially different than 50 ohms resistive, a control voltage is applied to gate 2. The degree of mismatch between the output of the transverter and the antenna determines how much gain this stage will supply. For an open or short circuit at the antenna terminal the stage will be completely shut down. Very little power will be fed through to the remaining stages, effectively protecting the final transistor.

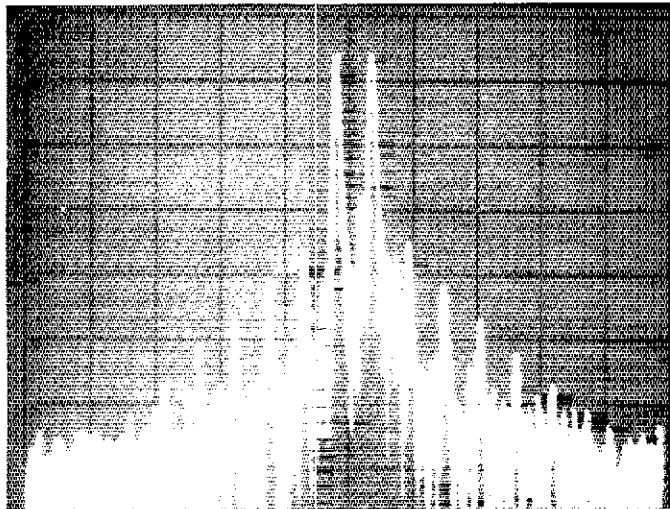
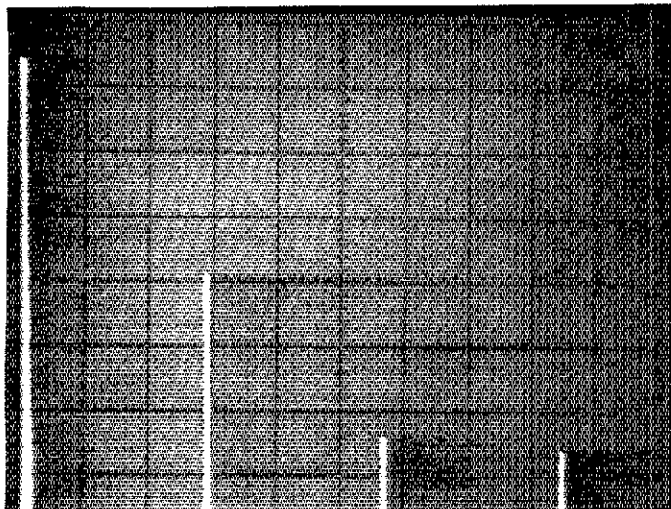
The next stage in the transmitter lineup is

the predriver. A single bipolar power transistor is used at this position. A low-pass, impedance-matching network supplies power to the driver stage — also a single bipolar power transistor. From there, the signal is amplified further by the final stage which is a stud-mounted uhf power transistor. A low-pass filter at the output of the amplifier reduces the level of harmonic energy reaching the antenna.

The transverter can be operated from a 13.8 volt dc source or from the internal 117/234-volt ac line supply. A hefty power transformer and rectifier circuit are provided for the latter. Voltage-regulator circuits assure stable operating voltages for the active devices during ac or dc operation.

The factory specifications are listed in the table. Measurements conducted in the ARRL laboratory indicate that the unit we tested met or exceeded all of the specifications. See the accompanying spectrum-analyzer photographs of the two-tone IMD and harmonic output.

The transverter is styled to match the appearance of the TS-520 and TS-820 transceivers. The unit is shipped complete with all interconnecting cables and a simple-to-follow operating manual. Available as options are the 39.0-MHz crystal and an informative service manual. Price class is \$250. The transverter and optional items are available from Trio-Kenwood, 1111 West Walnut, Compton, CA 90220. — *W1VD*



These two photographs show the spectral analysis of the TV-502. The photograph at the left shows the harmonic output. The tall pip at the left of the display is generated in the analyzer and represents zero frequency. Each horizontal division is 50 MHz so it can be seen that the next pip to the right is the fundamental 144-MHz signal. This carrier is attenuated approximately 40 dB to prevent overloading the analyzer. The second- and third-harmonic level is referenced to the top 0-dB line. Second-harmonic energy is down 64

dB with third-harmonic energy down 66 dB. The photograph at the right shows the two-tone IMD test. The third-order products are approximately 35 dB down from the PEP output level with fifth-order products down approximately 40 dB. Horizontal calibration is 2 kHz per division and the vertical calibration is 10 dB per division. The unit tested here meets or exceeds present FCC spurious-emission standards.

SOLAR POWER CORPORATION SERIES "E" SOLAR ELECTRIC GENERATOR

The handwriting has been on the wall for quite some time: New ways of producing energy are necessary if we are to survive in the years which lie ahead! Rapid progress has been made in the development of solar-powered electric cells, and with increased production the cost of solar-power panels has declined markedly. Because of this it is now practical for amateurs to purchase and use solar cells for a variety of applications — low- to medium-power portable work, powering of repeaters and operating test gear. The usefulness of the technique is realized when activity is initiated in remote areas where commercial power isn't available or gasoline generators aren't feasible.

We are at a point where we can no longer regard solar-derived electricity as a novelty. Today we are able to build or purchase solar-cell panels that will deliver (depending on the sun illumination) 16.5 volts at 1.52 amperes (peak power output), as one example. Such a panel, the Solar Power Corp. E12-01369-1.5, contains 36 "terrestrial-fallored silicon solar cells" wired in series on a fiberglass base. The cells and related wiring are sheltered from the natural destructive elements by means of a sheet of transparent, resilient, ultra-violet-stable silicone rubber. This material is self-cleaning, thereby requiring minimum maintenance.

Application Data

Solar cells are semiconductor wafer devices that convert light directly into electricity.¹ The greater the area of the cell, the higher the output current. The 3.5-inch (90-mm) cells used in the Series E array described here produce 0.5 volt at 1.52 amperes.

Solar-cell panels are normally connected

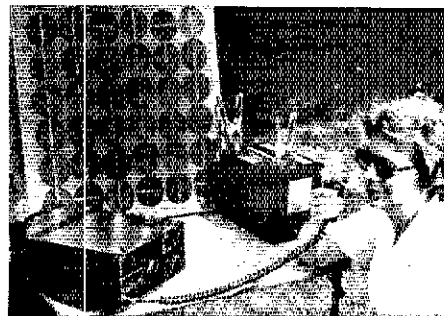
¹ See DeMaw, "Solar-Electric Power and the Amateur," in this issue of *QST*.

Trio-Kenwood TV-502 2-Meter Transverter

Frequency coverage	144-145.7 MHz == 145.0-146.0 MHz (option) 28.0-29.7 MHz ==
Input/output i-f	Ssb, cw
Type of emission	8 W (ac operation)
Rated output	50 ohms
Antenna input/output impedance	Less than -60 dB
Unwanted radiation	Less than 1 μV for a 10-dB s+n/n ratio
Receive sensitivity	Greater than 60 dB
Image ratio	Greater than 60 dB
I-f rejection	Less than ±2.5 kHz during first 60 min after power switch is turned on and within 150 Hz (per 30 min) thereafter
Frequency drift	Operation from ac line Transmit 50 W max. Receive 12 W max.
Power consumption	Operation from 13.8-V dc source Transmit 27.6 W max. Receive 5.5 W max.
Voltage requirement	Ac 117/234 V Dc 12-16 V (13.8 V nom.)
Semiconductors	FET 5 Transistor 15 Diode 19
Dimensions	6-9/16 inches wide X 5-15/16 inches high X 13-1/8 inches deep
Weight	11.5 lbs

to lead-acid or NiCad types of storage batteries. In other words, the solar generator keeps the battery charged during the daylight hours. Several batteries can be used in parallel to increase the ampere-hour rating of the system. Although it is practical to connect the solar-cell assembly directly to the storage battery, one can install a solid-state voltage regulator at the panel output. This will minimize the possibility of overcharging the battery system. In order to assure maximum utilization of the solar panel, the operator should choose a regulator which consumes the least amount of current possible.

A blocking diode is used between the solar generator and the battery to prevent the latter from discharging back into the panel during



W1CKK uses the E12-01369-1.5 solar-panel array with an automotive storage battery to operate a 100-W amateur transceiver.

the hours of darkness. The diodes can be pn junction or Schottky barrier types. Most operators prefer the Schottky type of diode because the forward voltage drop is only 0.3 — a contrast to the usual 0.7- to 0.8-volt drop of a silicon-junction diode. The latter requires the addition of an extra solar cell to compensate for the voltage drop.

An excellent amateur spot for solar-derived electrical power would be at an unmanned repeater. The cost of the panel and storage batteries would be significantly less than the long-term cost for commercial power, especially if the repeater trustee was paying commercial rates for his power! Furthermore, the reliability of the solar-power system should be much greater than when using commercial power, provided a correct maintenance schedule is kept for the batteries. In time of disaster the repeater could continue to operate, even if the power lines were out of service.

Solar power should appeal to repeater operators who have access to mountaintops where no commercial power is available. A single 1.52-ampere, 13-volt panel would be entirely adequate to handle a 10-watt repeater with accessory equipment, provided the repeater usage was not excessive at night. Of course, greater power capacity can be had by paralleling a number of solar panels.

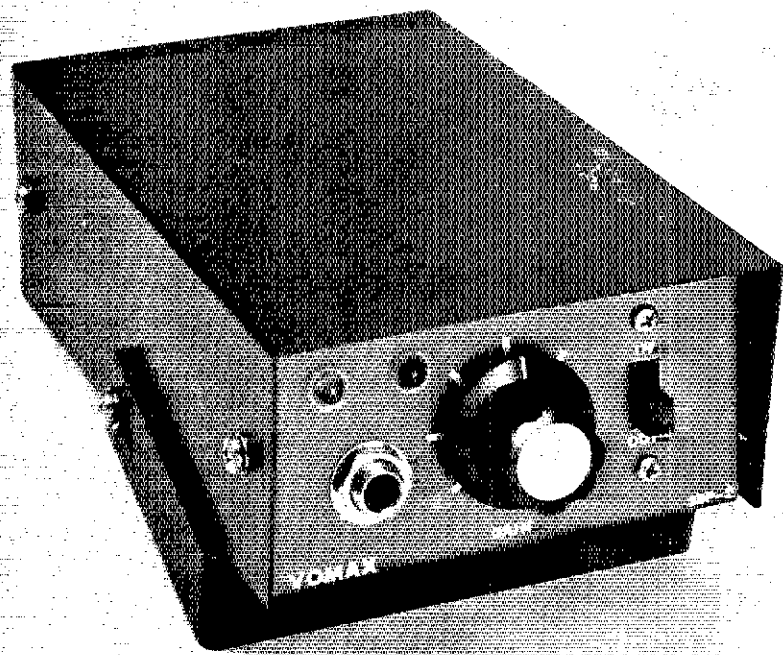
Sun-powered amateur stations are now possible during Field Day, camping trips and natural disasters. But there is also the satisfaction of "beating the system" by using power obtained from the sun! — *W1FB*

Solar Power Corp. E12-01369-1.5 Power Panel

Dimensions (HWD): 24 x 24 x 2-1/4 inches.
 Weight: 9 pounds.
 Power at peak sunlight: 25 watts (16.5 V, 1.52 A).
 Operating temperature: -55°C to +60°C.
 Humidity: 0 to 100 percent.
 Altitude: Up to 25,000 feet.
 Wind loading: Able to withstand winds in excess of 175 mph.
 Price class: \$700 (brochures and prices for various arrays available from the manufacturer on request).
 Manufacturer: Solar Power Corporation, 5 Executive Park Dr., North Billerica, MA 01862.

THE VOMAX SPEECH PROCESSOR

The Vomax SBP-3 speech processor is drawing the attention of some amateurs because of the ability of the device to increase "talk power" while maintaining a low level of distortion. A distinct feature of the unit is the split-band technique whereby the audio signals are passed through four branching pre-limiter active bandpass filters. The split-band signals are hard limited to reduce voice peaks by as much as 16 dB and then are fed through postlimiter band-pass filters to remove the distortion products produced by limiting or clipping.



This is the Vomax SBP-3.

Refer to the block diagram of the Vomax for the following discussion. Signals are recombined in the phase equalizer (signal combiner). Any possibility of out-of-phase signal relationships developing in the unit is overcome in the phase equalizer network. The low intermodulation distortion we found in the Vomax is attributable to the band-splitting method.

This speech processor is designed to give a 6- to 12-dB apparent increase in talk power while providing a sharp cutoff of audio signals below 400 Hz and above 2400 Hz. The action begins at 14 dB of peak limiting and gives enough protection to prevent compression from exceeding 17 dB. What this means is that it is almost impossible to overdrive the device with the output from a conventional microphone. Another design characteristic of the Vomax is the ability of the unit to increase the amplitude of the weaker consonants' relation to the louder vowel sounds. This is important for maximum voice intelligibility when transmitting signals over a considerable distance.

The SBP-3 weighs in at less than a pound and is a compact unit measuring 6-1/2 x 3-3/4 inches. Power is supplied either by an external battery or by means of an available ac power pack. Voltage required may range from 10 to 16 V with 13 V nominal. Current drain is rated at 35 mA.

A two-position slide switch offers the operator a choice of using or disengaging the Vomax. When disengaged, the microphone output is fed directly to the transmitting equipment. Front-panel light-emitting diodes function as level indicators for full compression and excessive voice-peak levels.

On-the-air checks seem to substantiate the manufacturer's claims of increased talk power and low distortion. Two-tone laboratory tests show the audio circuit has very good reproduction within the 400- to 2400-Hz range. While this processor does not carry an

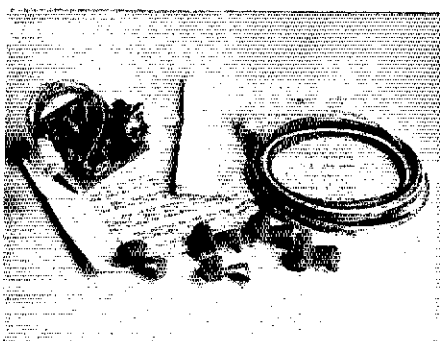
economy-sized price tag (price class is \$180) for the operator who wants a speech processor with a new design approach, this may be it!

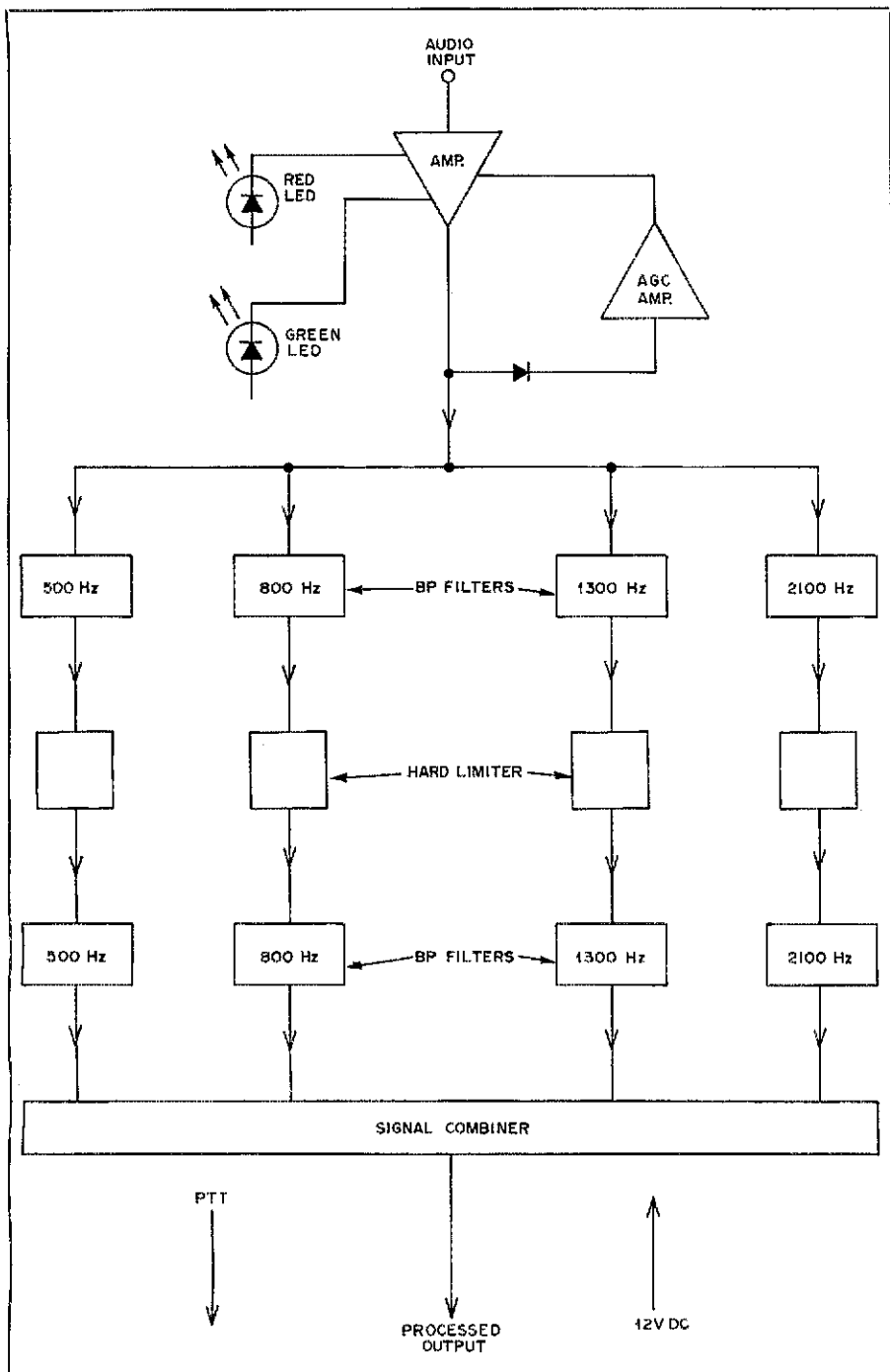
The Vomax SBP-3 is manufactured by Maxmilian Associates, and is available from Ehrhorn Technological Operations, Inc., P. O. Box 1297, Brooksville, FL 33512. — *W1JEC*

THETA LABS ENTRY SENTRY

Theta Labs Entry Sentry is an automobile intrusion alarm designed with the owner of a mobile radio in mind. The alarm sounds the horn of a protected vehicle, twice per second, a short time after any of the doors are opened, or immediately upon sensing that a wire connected to the radio chassis has been disconnected.

In normal operation, the alarm is armed when the vehicle is not in use. From the moment that the driver opens a car door he has six to ten seconds to insert the key into the ignition switch and either start the car or





The unique arrangement of the Vomax SBP-3 speech processor circuit is shown above. Audio signals are split by means of four band-pass circuits, limited and recombined in a phase equalizer at the output. Intermodulation distortion is remarkably low.

turn the key to the accessory position to disarm the alarm. The unit that was tested gave a time delay of seven seconds, which is a compromise between the time required for the driver to comfortably enter the car, be seated, close the door, and turn the ignition switch, and the time required for a thief to comfortably enter the car, remove a package from the seat, and depart before the alarm goes off.

A timing circuit in the Entry Sentry automatically rearms the unit within one to

two minutes after the ignition switch has been turned off. This allows the driver sufficient time to leave the car without setting off the alarm in the process. If the driver wishes to remain in the car longer than that amount of time, or if it is necessary to leave a car door open for a long time for loading or unloading, the ignition switch can be left in the accessory position. Alternatively, there is a disable switch on the Entry Sentry that prevents the sounding of the car horn, although the alarm itself still functions normally. The disable

switch is useful for times when the car is in the hands of someone unfamiliar with the operation of the alarm, such as a parking attendant or garage mechanic. The unit that was tested rearmed itself a minute and a half after the ignition was switched off. The disable switch does not affect normal operation of the horn.

To make use of the Entry Sentry Radio Guard feature, a sense wire can be connected from the alarm to the radio chassis via a quick-disconnect connector (a banana plug and jack are suitable). When the alarm is armed, the car horn will start sounding immediately if this connection is broken. If the radio is to be removed from the car, the sense wire can be plugged into a jack that is wired to car ground. No means of protecting more than one radio at a time is evident from the alarm's installation instructions. If an intruder sets off the alarm, the horn will sound for one minute and then stop. If the door is still open, the alarm will be retrIGGERED seven seconds later.

The Entry Sentry is designed for use with 12-volt negative-ground automobiles that have inside dome or courtesy lights which come on when a door is opened. The model designated BA-1A is intended for cars with dome-light switches that are at a +12-volt level when the doors are closed, and grounded when a door is opened (most GM, AMC and foreign cars), while the model BA-1AF is needed for recent model Fords and other cars that have a +12-volt level when a door is open and ground when the doors are closed. The alarm is built on a small printed-circuit board measuring approximately 2-1/4 inches square and comes with a 3-foot-long, color-coded, six-wire cable for connections to +12 volts, ground, the accessory +12-volt wire, the radio chassis, the car horn relay, and the door-actuated light switch. The circuit board can be mounted in a concealed location. The pressure-sensitive adhesive pad supplied with the unit can be used to affix it to a flat surface, or a hole large enough to clear the shaft of the disable toggle switch can be drilled in a suitable place underneath the dash or in the glove compartment; mounting the switch will support the board. Instructions included with the Entry Sentry detail the installation of the alarm in cars with the grounding type of horn relays as well as information on how to install such a relay in a car that is not so equipped, and ideas for hooking up air horns, seat-weight sensors and the like for those so inclined.

Installation of the Entry Sentry in a 1976 GM car took about two hours. Most of that time was spent in deciding on a place to mount the alarm and identifying the places to hook the cable wires. Included with the alarm are a handful of 3M connectors which are supposed to make it easy to tap into the existing car wiring. Depending on the accessibility of the under-dash wiring of your car, the use of such connectors may speed up the job, or they may make it a nightmare.

The alarm has been tested in the subzero (Fahrenheit) chill of several early New England winter mornings without evidence of noticeable temperature sensitivity of the alarm operation. The BA-1A and BA-1AF are both in the \$35 price class and are available from Theta Labs, Inc., 10911 Dennis Rd. No. 405, Dallas, TX 75229. The Entry Sentry is available without the Radio Guard feature (models BA-1 and BA-1F), price class \$30. —

WAJZC

QST

Hints and Kinks

RADIALS INSTALLED THE EASY WAY

Many amateurs do not provide enough radials for their vertical antennas because of the work involved. Splitting the soil with a shovel, dropping in the radial wire and closing the soil by stamping with one's foot is a tedious job. Furthermore, the wire tends to be laid unevenly and the lawn suffers badly.

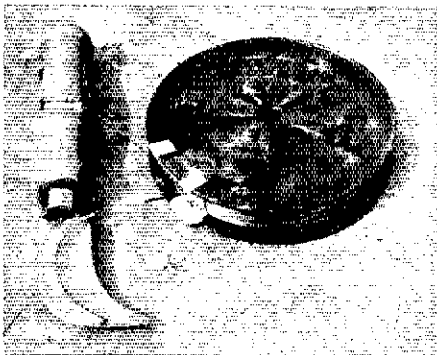
Here is a nifty gadget which in one operation splits the soil and places the wire in the ground. The split is so clean that it closes on itself as you work along. The wire is positioned one inch below the surface. Because of the shallow depth and clean cut, the lawn suffers no damage.

Items needed to fabricate the tool include a carpet knife (available at many hardware stores) and a short piece of brass tubing. The latter is available at most hobby shops. Shape and cut the tubing as shown in the photograph and secure it to the knife by means of epoxy cement. I found the so called "five-minute" epoxy did not give a proper bond to the metal knife, but regular epoxy glue held well.

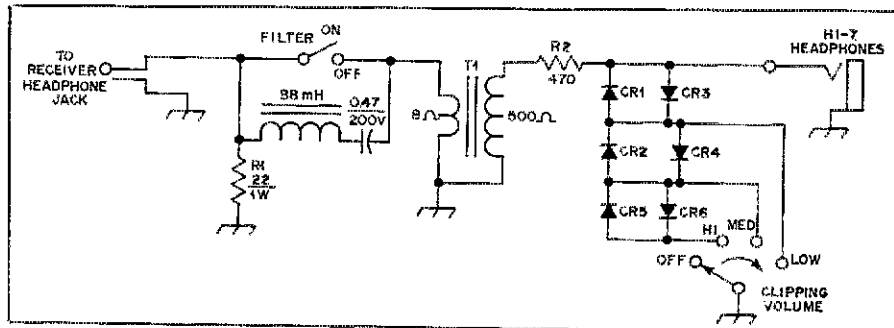
The tubing should be shaped so that the wire passing through it flows horizontally from the knife blade when the knife is held at a 45-degree angle. Spread epoxy glue over the knife blade and around the tubing so that the tubing will not catch in the soil as you work. Grind the leading edge of the knife to a razor sharpness. A drop of oil inside the tubing and over the knife blade will keep the wire moving smoothly through the tube. It also prevents the blade from dulling quickly.

Almost any thin wire will work with this tool. I use stainless-steel fishing line.* This wire resists corrosion indefinitely and costs about one cent per foot . . . a trifle expensive for some . . . but a good investment toward improving a signal. — *Harry McLean, VE3GRO*

*[Editor's Note: According to *The Electronics Engineers' Handbook*, Donald G. Fink, McGraw-Hill, First Edition, the conductivity of stainless steel is about 3 percent of that of copper.]



Installing radials is made easy with these simple devices.



The circuit for an audio clipper/filter.

AN AUDIO CLIPPER/FILTER

The results of chasing DX for several years with my Heath HW-16 have been excellent. However, the lack of avc on the set made loud-signal reception uncomfortable when using headphones. To compensate for this I devised an audio clipper/filter that also improves the selectivity of the receiver. A means of matching my 500-ohm headphones to the 8-ohm output of the HW-16 was included in the unit.

A schematic diagram of the simple circuit is shown along with a photograph of the device. The design features an 88-mH toroid and a 0.47- μ F capacitor which form a series-resonant circuit. The filter has a resonant frequency of approximately 750 Hz with a 6-dB bandwidth of 75 Hz. This is just about right for digging a signal out of the QRM, but a bit sharp for tuning around casually. For that reason a switch was included to disengage the filter.

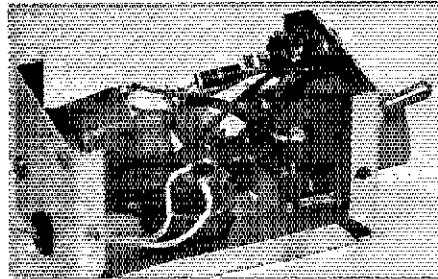
The diodes and the 470-ohm resistor (R2) form an audio clipper to keep headphone volume from exceeding a level determined by the forward-conduction voltage of the diodes. If germanium diodes are used in the top positions (CR1-CR4, inclusive) of the clipper circuit as shown in the diagram, and silicon diodes (CR5 and CR6) are used in the bottom location, there will be approximately a 6-dB increase in volume with each successive switch position.

When high-impedance phones are used, the improved impedance match provided by T1 more than compensates for losses in the filter and clipper. If low-impedance phones are desired, the transformer may be omitted and R2 should be replaced with an 8-ohm resistor. In this configuration the diodes will clip at a higher audio level.

The transformer was strictly a junk-box item. A good substitute would be an output transformer from an old transistor radio. The only other unusual item in the circuit is the 88-mH toroid, which is available from several sources advertised in *QST*.

This circuit may be used unmodified with receivers having high-impedance outputs if sufficient audio volume is provided. Other-

wise another matching transformer (500 to 8 ohms) will be needed. — *Alan R. Bloom, WA3JSU/8*



The WA3JSU audio clipper/filter.

ANTI-THEFT PRECAUTION

Amateurs wishing to protect their equipment from theft should mark it with the abbreviation of their state and driver's license number. This makes it easier to trace through police computers than using social-security numbers or an amateur radio call.

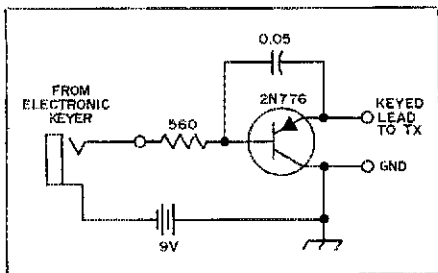
Many police departments are sponsoring a program called "Operation Identification." They lend engraving tools for marking household valuables. Stickers are also provided to indicate that the property is marked and the identification recorded. — *Paul Zander, WB6GNM (ex-WA8JGM)*

MORE ON PC BOARDS

When making circuit boards, I cover the foil side with plastic electrical tape and secure a photocopy of the template over it. Using a sharp knife, I cut the perimeter of all areas to be etched. After all areas have been cut out, I remove all of the paper and tape covering the areas to be etched. Using standard layout strips, I then fill in the detail work. I find this method to be a good way to reproduce boards from magazines without destroying the magazine. It is easier than using the photoetch or painting methods. — *Carl H. Nord, WA1KPD*

KEYING FOR A DX-100

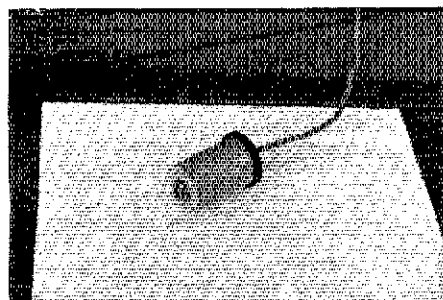
Here is a circuit which I use to key my Heath DX-100 transmitter. My electronic keyer can handle no more than 35 mA. But, with this simple transistorized circuit the problem of keying the DX-100 is solved. Battery drain is only 1 mA. — *Mike Lonneke, WQAAD*



This single transistor circuit permits an electronic keyer to be used with a DX-100.

FILM CONTAINER USEFUL FOR JACKS

Those plastic containers for 35-mm film make excellent protective covers for 1/4-inch jacks to be used on speaker extension cables. Since the plastic is flexible, it will stand abuse. — *Julian Meyer, WQYDC*



A 35-mm film container used to protect speaker-extension jack.

NOVICE STATION — ECONOMY STYLE

Many Novices are lacking in the "financial department," and cannot afford commercial equipment. Some may not realize that radios and television sets, which have been discarded, contain a large part of the components needed to build a basic Novice radio station. Such pieces of equipment may be had for the asking from friends and neighbors and even from the town dump. Many earlier-model TV sets contained one or more heavy-duty power transformers.

For the Novice who goes the "salvage route," here is some advice. When something is acquired, don't immediately attack it with wire cutters. Stripping of the chassis should be done systematically. Tubes should be removed carefully, identified and tested. Discard the weak ones. Resistors and capacitors should be unsoldered from mounting points, keeping the leads long. Tube sockets may be removed after drilling out the mounting

rivets. Identify and tag transformer leads. Avoid cutting transformer and choke leads short. Bolts, screws and miscellaneous hardware are always handy to have: These items should be sorted for keeping in marked storage trays or boxes.

CAUTION: The picture tube in a TV set can be dangerous if handled roughly. Do not carry the tube by the neck. Place it in a large carton for the sake of safety.

With a little guidance from a more experienced fellow amateur, the Novice who is willing to build his equipment from stripped components will find he can do so at minimum cost. This learning experience will go a long way toward developing self-reliance and a better understanding of one's station equipment. — *Michael Bauer, WD9ACX*

GIVE YOUR NEXT PRINTED CIRCUIT A FACE LIFT

Through my XYL's involvement in the hobby of arts and crafts, I found a very simple and easy way to make printed-circuit masks from drawings in magazines. The key to the process is a product sold in craft stores known as *Decal-It*. The cost is less than \$2 per bottle, one of which will provide enough fluid to produce many masks.

To make a mask, you must start with a black-and-white full-size print such as provided in most electronic-magazine construction articles. Cut out the pattern and tape it to a piece of wax paper. Caution! Be sure you have made a copy of the article before you cut. Then, apply six coats of fluid in alternate directions with a brush, allowing 15 minutes between each coating and a minimum of two hours after the last one. After the two-hour drying period, immerse the whole affair in warm soapy water and allow it to soak for 15 to 30 minutes. After removing it from the water, place it face down on a flat surface, such as a cutting board. With a wet finger, gently start rubbing off the paper backing. At first glance you won't believe it, but you do have a perfect etching mask.

Use the appropriate etching techniques depending on whether the original was a positive or negative. A full set of instructions appears on the bottle. — *Charles "Chip" McCoy, WB9OZX*

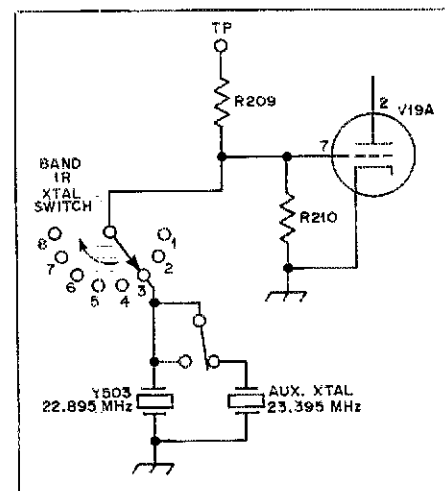
WWV ON THE HEATH HW-101

Wish you could receive the 15-MHz transmissions of WWV on your HW-101? Ever want to pipe the 14- to 15-MHz output of a vhf converter into it? Then try this modification. It involves an easy one-hour installation of an additional crystal and one small slide or toggle switch. The needed crystal, cut for 23.395 MHz, should be of the third-overtone type. A suitable crystal is available from the International Crystal Manufacturing Co., Inc., 10 North Lee St., Oklahoma City, OK 73102. Part number is 031310.

First, locate Y503, the 22.895-MHz crystal, situated on the crystal-switch board. With the use of a small Swiss file, carefully cut the foil between the crystal and the no. 3 position of the rotary switch as shown in the drawing. Mount the new crystal on a small

piece of perforated board. Solder a length of wire to each pin of the crystal. By means of an L bracket, mount the perforated board on the metal shield extending from the front to the rear of the bottom of the HW-101 chassis. Connect one lead from the new crystal to ground and the other lead to the switch as shown. The remaining connections to the new switch are then completed according to the diagram. Mounting of the switch may be done as the last step.

To adjust the HW-101, place the band switch in the 20-meter position and the new switch for WWV. With a VTVM read the negative voltage at point TP on the band-pass circuit board while carefully tuning L-603 (the 20-meter heterodyne oscillator coil). The voltage should be approximately -1.5 for either Y503 or Y503A, the new crystal. Make this adjustment with the coil cover on. With these changes, WWV should be at one's fingertips on the HW-101. — *James Calandriello, WA1UBX*



The simple modification of an HW-101 to receive WWV.

USE FOR SHAFT-BEARINGS FROM OLD POTENTIOMETERS

One Sunday I needed panel bearings for a construction project. Because the stores were closed, the only alternative seemed to be the junk box. There I found several old potentiometers equipped with good sleeve bearings which I extracted and installed in my project. I have since learned that shaft bearings are not easy to find in my area. Therefore, I'm saving all old pots, whether they're good or not. — *John N. Cox, K3WZI*

FOR RESTORING KNOBS

Secretaries and typists use a product called *Wite Out*, made by Wite Out Products, Inc., Beltsville, MD. While it is mainly for corrections on original or master copies, it is also great for restoring dots or graduations on control knobs. A touch of it also makes dimly lighted dial pointers stand out. Those who restore antique gear will find the product indispensable. It is easy to use and is water-soluble until dry. — *Victor Woodling, W9JNH*

Attention All Clubs: Have a Carrot on Us

Club meetings a bit stale these days? Beginning September 1 it'll pay off to liven them up, as all kinds of League awards and certificates can be yours — just for putting some oomph into your club's activities.

By Rosalie Cain,* WA1STO



This message booth garnered a large amount of interest at a recent Ohio State Fair.

“How'd your quad make out through last night's storm?”

“Just one little wire broke off, is all. I'll have to climb the tower Saturday and fix it.”

“Going to the club meeting Friday night?”

“I don't know. Been a rough week at work and if it's supposed to storm that night.”

“The same old people always show up anyway, and anyone I want to talk to I can always invite over to our house.”

“There's no program planned and nothing new ever happens. We'll probably stay home and watch television — ‘The Gong Show’ or something.”

Sound familiar? Your club hasn't

*Associate Manager, Club and Training Department



WA6COE (left) and WB6IKF man the emergency field setup at the 38th annual Home and Electric Show. More than 100,000 persons saw this booth during the six days.

done anything exciting for a long time except win Field Day in its class three years ago? The Christmas dinner is the most looked-forward-to event of the year? Average meeting attendance is 20 percent of the total members and this year membership went down 10 percent.

Something is needed here. Motivation? At any rate, Hq. is going to provide a carrot. Perhaps your club is known for the finest repeater system in the state. So how about also being known for running a terrific licensing class for each grade of license, too? And the best TVI sleuthers' team.

Hq. is sponsoring an all-new awards program to stimulate many different types of activity by *all* members of affiliated clubs. You keep track of the club-sponsored events and tally up the points for each, per our points-check sheet. You turn in the report sheet for the club at the end of the year and we'll have special, handsome certificates for affiliated clubs on the section, division and national level, signed by your Section Communications Manager, Division Director and ARRL president, respectively. The more that happens, the more points are earned.

Points will be awarded for all kinds of doings, such as, publishing a club bulletin, DF hunts, hamfests, club nets, upping the attendance rate, all kinds of PR, membership drives, club representation on councils, club-handled awards, the activities mentioned previously — and more. Some will be worth more points than others, depending upon the amount of effort involved. We'll have a special section on the report sheet for those events we didn't even think of that you feel are point-worthy.

These point-check sheets will be sent to all affiliated clubs with the October issue of *Radio Club News*, our quarterly bulletin. So badger your club secretary to watch for it. Points garnered after September 1, 1977, count! If your club



A local mall is an ideal place to spread the word about amateur radio, as the Wellesley ARS (MA) has discovered.

has not been getting the *RCN*, let us know. We'll find out why and get you back on the active list.

QST will carry a feature story with pictures you send us of participants and winners, after the year's time period is up. Our reporting should give your officers new ideas for special activities for the next year. This should benefit the club by creating more interest and better attendance at the meetings and events.

Need some thought on initiating events that will win points? To prod brainstorming write for past issues of *Radio Club News*, where we share clubs' creative ideas that have produced results in the past. Check your club's files and old bulletins to see what activities have been sponsored. We can send you other club bulletins to peruse. Why not get on the bandwagon and pull together a good year.

QST



Pennsylvania Electric Co. sponsors successful and well-attended Novice classes during lunch hours.



Before the snows came, a group of Lebanon County/Pine Grove (PA) amateurs provided communications for the Pine Grove Bike Hike for the Mentally Retarded. Checkpoint monitors used WR3ACI and its newly installed autopatch facility.



Portable gear is always welcome on children's wards around Christmas. WB9EUS (left) and WB9MFC bring Santa to the hospital.



Free radiograms were sent around the world from this booth at a recent Field Day in Texas.

The Beverly Hills Disaster



Not just another fire.

By Richard Johnston,* WA4KUB, Jim Weaver,** WA8COA and Robert Halprin,*** K1XA

Everyone goes down to the nightclub to party on Saturday night, so goes a popular song. May 28 was no different, especially since it was the beginning of the Memorial Day weekend. Three-thousand people were jammed into the lavish three-story Beverly Hills Supper Club in Southgate, Kentucky, near Cincinnati. In the Cabaret Room, a crowd of 600 people were enjoying the humor of two comedians when a teenage bus-boy suddenly interrupted the show.

"There's a small fire," he announced to the audience. "Everyone stay calm and please exit the building." There was no rush for the exits however. Most people just remained at their tables. Seconds later, the place was an inferno.

*3113 Brookwood Drive, Ft. Mitchell, KY 41017

**11652 Hollingsworth Way, Forest Park, OH 45240

***Asst. Communications Mgr., ARRL

The building was engulfed by flames and smoke, like a tidal wave. The panic started, then the stampede and then the dying.

Helping Hams

Within minutes after the fire was reported, the Northern Kentucky Amateur Radio Club, the emergency communications arm of the area Red Cross, went into action. Emergency nets were activated on two 2-meter repeaters by WB4FAT and WB4VOA, with WB8TYD providing liaison with the Cincinnati Repeater Association.

Hams on both sides of the Ohio River cooperated fully with NKARC as communications links were set up between the disaster scene and hospitals throughout greater Cincinnati. Approximately 60 hams were standing by on WR4ALB, waiting for assignments,

while NKARC's other repeater was used to maintain constant contact with the Red Cross and the police and fire departments.

Hams with portable 2-meter gear were dispatched to the disaster scene where a command post was set up. Stations also went on the air from the hospitals where victims were known to have been taken.

Hams coordinated the movement of medical supplies and personnel to the disaster scene. They also supplied communications relative to other crucial needs, such as the locating and transporting of oxygen, fresh water and many, many blood donors.

While those on the outside frantically made inquiries about their relatives and friends, hams at the disaster scene were busily taking messages from survivors for relay to their loved ones.

Some survivors talked directly to their relatives via autopatch, but most of the traffic was delivered by hams operating from their home stations.

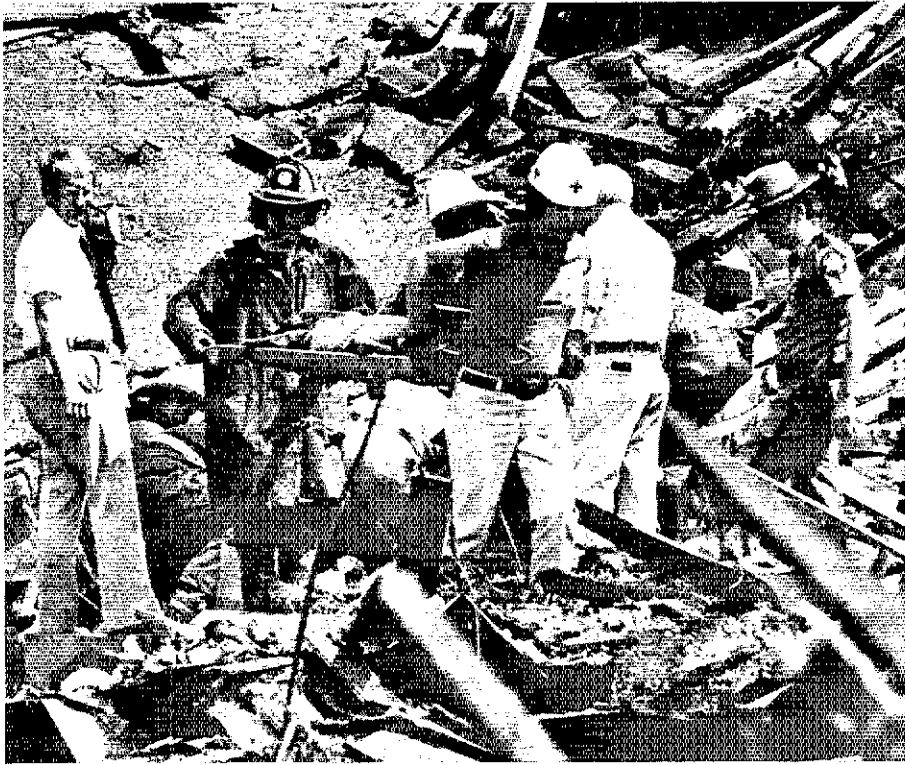
Amateurs at the hospitals had access to lists of those admitted and this was used as a basis for further health-and-welfare messages. Newsmen from WKRC-TV and WCPO worked side-by-

side with the hams at the scene, in order to get out as much information as possible. Throughout the evening, scores of calls placed by hams brought comforting words to anxious friends and relatives.

The Northern Kentucky group found that the skills they learned in practice, during the ARRL Simulated

Emergency Test, prepared them to act promptly and efficiently during this tragedy, where 161 people lost their lives and so many were injured.

Doctors, nurses, rescue squads, etc., and ham radio volunteers met as always the heavy demands placed on them during an emergency with only one failing— bringing the 161 back to life.



Twisters Take Tolls — Hams Hurry Help

Nationwide, spring tornadoes wreaked destruction. Every time, hams were on the spot immediately to provide emergency communications for relief workers and victims alike.

By Jerry Bailey,* WB8FBJ, Louis Bohorfoush,** WB4CXD,
Rick Link,*** WB0KDE and James Morris,**** KH6HQ

Swirls of dust float aimlessly in the slight breeze of a hot, humid and sunny spring day. By late afternoon shadows fade as the unsettled air brings deceptively cooling clouds from the horizon. But chickens, dogs and other animals begin to scurry about. Quickly, thunderheads form and tower to enormous heights, darkening the whole sky — lit only by erratic flashes of lightning. Rain begins to fall. Suddenly, a rush of cool air comes from the northeast accompanied by intense downpour. Then it appears — a tornado.

Like shots from a double-barreled gun, twisters hit Birmingham, AL, and Augusta, MI, during the first week of April and reloaded a month later to strike Lawrence, KS, and Sedalia, MO. While millions of newspaper readers were weighing a nationally syndicated columnist's questioning of amateur radio's many bands, hams were using them to provide professional-quality emergency communications.

Augusta, MI, April 2

Bill Sidney, WB8JZN, was enjoying coffee with his wife at a Battle Creek, MI, restaurant when the clouds began changing rapidly. Not liking the situation, they immediately started on the short distance home. Before they could complete that journey, bigger and bigger hailstones pelted their car. Once inside the house, the Calhoun County RACES Radio Officer and ARES Assistant Emergency Coordinator monitored the

Kalamazoo repeater, about 20 miles away. Already, their Emergency Operations Center had been activated by Kalamazoo Co. c.d. director WA8UKZ and EC WB8CFV.

When Bill volunteered the services of Battle Creek, he was advised that the tornado had just touched down in Augusta. Within minutes literally, hams were in the disaster area setting up

radios, antennas and a portable generator. Immediately, a command post was established at the powerless village hall and fire station. Civil-defense organizations relied on amateurs to support the relief work with traffic for needed personnel, equipment and supplies. Their messages flowed all through that Saturday night and expanded to include the relief center set up at the high school on Sunday morning.

As quickly as the storm had formed Saturday, clear weather returned on Sunday, bringing out hundreds of sightseers. Still, the hams stayed on the job by helping officials with crowd control. Much of that was provided by amateurs from nearby Jackson County. During the whole situation, at least 110 amateurs were known to have participated.

Birmingham, AL, April 4

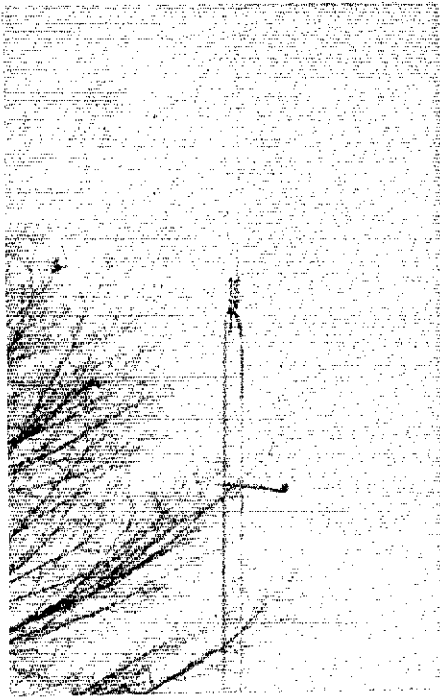
Within 48 hours after the Michigan tornado, attention on weather switched to Alabama where more than 90 lives were claimed by the violent turbulence. Members of the Birmingham ARES were already manning their club station, W4CUE, in anticipation of the severe weather front that had entered the state earlier that afternoon. Other club members were at the Jefferson County civil defense hq., WA4JLC. In a highly organized system, weather bulletins had already been dispatched statewide on 2-, 6- and 80-meter radioteletype as well as verbally. When the funnel descended in the northwest part of the city, WA4DOJ was in position, spotting for BARES. He followed the tornado to begin giving first reports for relay to the c.d. nets. In Jefferson County alone, the disaster killed 23 persons, injured at least 68 and destroyed or damaged 406 homes, affecting 547 families.

Quickly, BARES and Birmingham



At a cautious distance, mobile amateurs provide official agencies with real-time observations of a tornado. (WB0KDE photo)

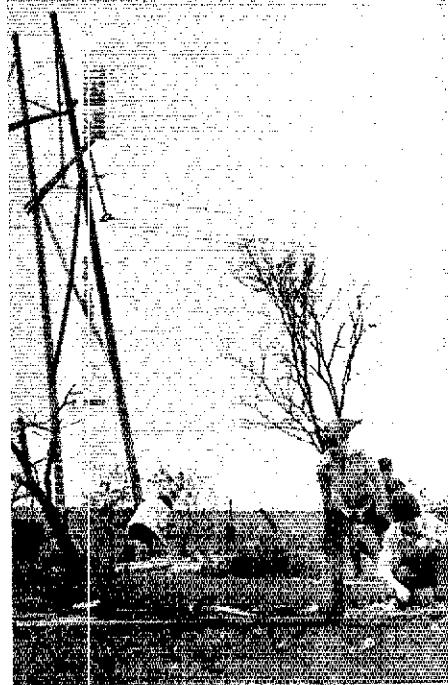
*14 James St., Battle Creek, MI 49017
**1215 S. 31st St., Birmingham, AL 35205
***522 Arizona St., Lawrence, KS 66044
****Communications Assistant, ARRL



Through all the havoc, ham gear manages to stay on the air. (WABULG photo)



While commercial crews repair downed lines, hams pass emergency traffic. (WABULG photo)



In the aftermath, victims pick through what was their home. (WB0KDE)

ARC members moved into the area, setting up a portable generator and floodlights for the communications command post. It provided a veritable umbrella for c.d., Red Cross and several law-enforcement agencies. Amateurs performed damage surveys, relayed casualty information, passed health-and-welfare traffic and provided communication links for administration and coordination. Several law officers used the vhf autopatches to call for assistance.

At the same time, operators at W4CUE continued to give weather bulletins to areas still in the severe front's path, and take reports for relay back to the National Weather Service. The turbulence caught up with a commercial jetliner that originated from Huntsville. It crashed short of an emergency landing attempt at Dobbins Air Force Base, GA, killing 71 persons. The Alabama Emergency Net M's regular session had already been extended to one and one-half hours when they went

into an emergency session. More health and welfare, weather and other messages were passed. K4LYY handled liaison between the Alabama and Georgia nets.

As the funnel cloud gets closer its color changes to a deep green. Intense turbulence tosses the rain until it becomes hail, producing stones of two inches or more in diameter. Winds of 200 miles per hour or more in the center tear everything in their path while producing a deafening roar that seems to come from everywhere.

Lawrence, KS, May 4

Early in the afternoon NWS recognized the characteristic unsettled air and issued a tornado watch. From the newly completed Douglas County Emergency Operations Center, c.d. director WA5RQU placed the ARES unit on standby. By 6 P.M., local time, the watch developed into a warning, with a "take-cover" siren sounding 40 minutes later.

Mobile spotters were dispatched. Soon K0UR saw a funnel drop from the darkest-looking cloud. He and the other spotters, of whom many were students at nearby Kansas University, tracked its eastward path as it ripped up home after home. At one point, WB0BBC got a little too close when his vehicle was lifted up and into a ditch but he was all right. Fortunately, the warnings paid off with only one injury known. A woman was trapped when her mobile home

toppled. Within minutes, aid was summoned by an amateur radio unit.

Sedalia, MO, May 4

That same storm's magnitude continued through the evening as it swept into Missouri. The town of Sedalia did not fare as well as the preceding areas. Reported were three deaths, numerous injuries and several destroyed homes and businesses. The Missouri Single Sideband Net was activated for passing health-and-welfare traffic between the Missouri Highway Patrol and the affected areas, for the benefit of relatives in the nearby Ozark Mountains.

As quickly as the immense storm had developed, it dissipates. The following day is almost too perfect — clear blue skies and mild temperatures. But, the destruction that has taken place is all apparent. Everywhere homes are leveled, silos are toppled, nothing is left. Only the dust floats about.

QST

Strays



STOLEN EQUIPMENT

- Collins KWM-2, serial no. 1070/1071, taken during break-in at home on May 15, Salt Lake County Police case no. 77-29721. Jerry Peterson, W7LEB, 1911 Southmoor Dr., Salt Lake City, UT. Tel. 801-277-1066.
- Stolen in Ormond Beach, FL, on May 17, 1977. KDK FM-144-10SXRII, serial

- no. 5096. WA4NKE and driver's license no. 8630-214-07-465 engraved on chassis. Notify Ormond Beach Police Dept.
- HRO 500, serial no. 751196; Galaxy V transceiver, serial no. 5609V1711 and RF403 transceiver. George Simon, WB6ETR, 5401 E. Sussex Way, Fresno, CA 93727. Telephone 209-291-9259.

- GTX 200, serial no. 2415, stolen from car parked in driveway. Notify Sullivan County (NY) Sheriff.
- Regency HR 212, serial no. 24-02072, stolen on May 19, 1977, in West Newton, MA. Social sec. no. 282-09-5128 engraved on rear. D. W. Stapleton, W1GJV.

The French Atlantic Affair

An ocean liner in peril of blowing to bits on the high seas; intrigue; adventure. An award-winning screenwriter puts his pen to paper and comes up with a dynamic new novel featuring his favorite hobby.

By Lenore Jensen,* W6NAZ

When the novel by Ernest Lehman, K6DXK, is published, the headlines could read, "Ham Writes First Novel." So what, you say? This is no ordinary first novel — its author is one of Hollywood's best-known screenwriters. And his new book, *The French Atlantic Affair*, may just be the first major novel whose leading character is amateur radio itself.

Having written the screenplays for such widely acclaimed films as *West*

Side Story, *the Sound of Music*, *Who's Afraid of Virginia Woolf?*, *The King and I* and *Black Sunday*, Lehman is hardly a stranger to the written word. But the award-winning writer (six Writers' Guild awards and an equal number of Academy Award nominations) is equally at home on the amateur bands — he's devoted nearly as much energy to his hobby as to his career since he first began chasing DX on the low end of 20 meters in 1958. Now, K6DXK has brought them together into a potboiling thriller that has already been chosen by the Literary Guild and Playboy Book Club. It will also be a major motion

picture, as MGM has purchased film rights.

Without giving away the entire plot, the story concerns a great ocean liner in peril of being blown apart in the Atlantic. A tiny amateur transceiver stashed in a suitcase becomes its only hope of salvation, as all other communications have been blacked out by a group of conspirators. Perilous and desperate QSOs blend with dramatic and romantic scenes that shift between Paris, New York, Washington, Southern California and the ship at sea.

In a recent interview, I asked the author some pointed questions:

Q. Why would a successful, much-in-demand writer want to take on the gigantic task of writing a long, difficult novel, three years in the making?

A. I guess I was looking for new challenges. Maybe I was acting out the Peter Principle; trying to rise to new levels of incompetence. Time will tell. That is, readers (or no readers) will tell me.

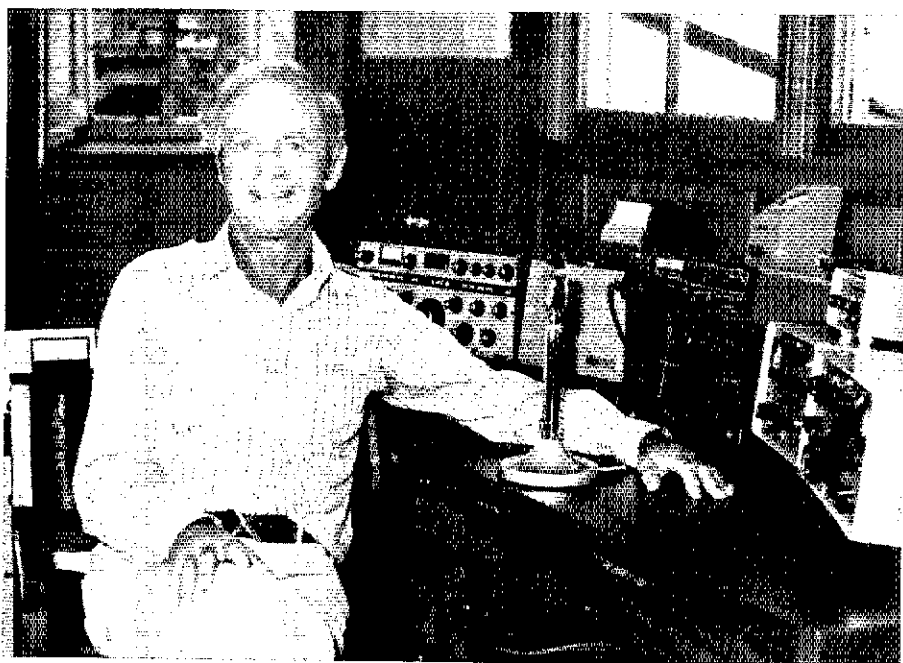
Q. Did it have something to do with your inner conflict about your addiction to your hobby?

*A. Could be. There was a time about 15 years ago when the only way a film producer or my literary agent could reach me was via ssb. Of course, it doesn't help very much that my writing study and my ham shack are one and the same! Time was when I couldn't figure out whether DXing and ragchewing were interfering with my career or my career was interfering with my hobby. So I wrote *The French Atlantic Affair*, which was like going on the air while seated at my typewriter.*

Q. Whose call letters did you use in the book?

A. At first I thought I could obtain some unassigned calls, but when I

*14867 Round Valley Drive, Sherman Oaks, CA 91403



K6DXK puts almost as much time and effort (he'd call it pleasure) into his hobby as he does his career. His new novel promises to bring the excitement of amateur radio to many thousands of readers. (Barnaby Jackson photo)

queried the FCC I learned there are none; call letters are snapped up as fast as they become available. It was suggested I use the calls of several of my close friends but I decided that might confuse readers who knew us. Certainly I didn't want people to think there was any "similarity to any person living or dead." You know what I mean.

Finally, I got lucky. A Southern California group called The Fifty Club gave me the okay to use the club call,

W6VC, for my fictional doctor-ham at sea. And the Lockheed Employees Radio Club proved equally generous in giving my TV writer-producer-ham their club call, W6LS. The actual owners of WA5JIK and K4KR graciously agreed that their calls could be those of two other fictional amateurs who make brief appearances in *The French Atlantic Affair*.

Q. Everyone's going to wonder if your characters are based on some of your

real-life amateur radio friends.

A. No single character in the novel is based on any one person I know. However, there's a little bit of me in every character and, perhaps unconsciously, a little bit of every ham I ever knew in each of the characters, too.

You can find *The French Atlantic Affair* at your favorite bookstore after August 15. It is being published by Atheneum Publishers in the U.S. and Macmillan Ltd. in Great Britain.

Strays

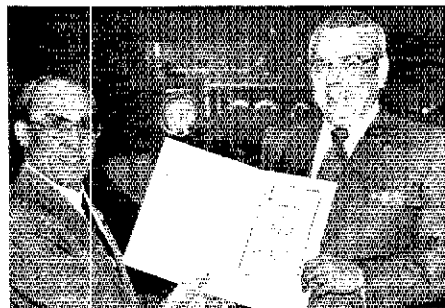
Many of the 2,500 visitors to the recent Fourth Annual Science Symposium at Sullivan County (NY) Community College managed to find the amateur radio exhibit manned by art instructor Bud Wertheim, WB2HDU, and League hq. visitor Joel Kleinman, WA1ZUY. With assistance from his son Jason, WB2HBT, Bud showed the senior and junior high students and area residents who visited his hf station how contacts are made. WA1ZUY tuned in a message from W2GN aimed at visitors on two consecutive OSCAR 7 Mode B passes. Introductory League handouts on amateur radio and OSCAR went very quickly, as the schoolchildren learned first-hand that amateur radio is indeed different from the CB they've heard so much about.

Since the day-long event, one of the

highlights of the year in the Catskill Mountain community of Loch Sheldrake, interest in amateur radio among area residents has blossomed. A new repeater club has about 20 active members, and licensing classes are turning out new and upgraded amateurs.

I would like to get in touch with . . .

amateurs who have an interest in traffic but can't keep up with the 20 wpm on the regular NTS net and who live in a 250-mile radius of Independence (Inyo County), CA. The Novice Emergency Net operates on Saturdays at 0930 local time on 3.730 MHz. For further information, contact William Baucum, Box 65, Independence, CA 93526.



After serving six years as SCM, Holland Shepherd (left), VE3DV, was presented a League Certificate of Merit by Canadian Division Director Ron Hesler, VE1SH, at a recent meeting of the Ottawa (ON) Valley Mobile Radio Club. Shep is still active on the cw nets and regularly turns in high traffic totals. VE1SH also gave the former SCM an A-1 Operators Club certificate, something the OT said he has been trying to land for 40 years. — VE3FMW (VE3FFC photo)

AMSAT-OSCAR 7

REF. ORBIT	DATE	TIME (UTC)	LONG W
12394A	1 Aug.	0009	56.1
12407B	2 Aug.	0103	69.7
12419X	3 Aug.	0002	54.5
12432B	4 Aug.	0056	68.1
12445A	5 Aug.	0151	81.7
12457B	6 Aug.	0050	66.5
12470A	7 Aug.	0144	80.1
12482B	8 Aug.	0044	65.0
12495A	9 Aug.	0138	78.6
12507X	10 Aug.	0037	63.4
12520A	11 Aug.	0132	77.0
12532B	12 Aug.	0031	61.8
12545A	13 Aug.	0125	75.4
12557B	14 Aug.	0025	60.3
12570B	15 Aug.	0119	73.8
12582B	16 Aug.	0018	58.7
12595B	17 Aug.	0113	72.3
12607B	18 Aug.	0012	57.1
12620A	19 Aug.	0106	70.7
12632B	20 Aug.	0006	55.5
12654A	21 Aug.	0100	69.1
12658B	22 Aug.	0154	82.7
12670A	23 Aug.	0053	67.5
12683X	24 Aug.	0148	81.1
12695A	25 Aug.	0047	66.0
12708B	26 Aug.	0141	79.6
12720A	27 Aug.	0041	64.4
12733B	28 Aug.	0135	78.0
12745A	29 Aug.	0034	62.8
12758B	30 Aug.	0129	76.4
12770X	31 Aug.	0028	61.3

NOTES

- 1) All time and date references are in UTC.
- 2) A-O 7 is operational on Mode A on odd days of the year, and on Mode B on even days of the year. Wednesdays are reserved for special experiments; authorized users only.
- 3) The Mode B transponder inverts signals. Upper sideband on 432 MHz becomes lower sideband on 146 MHz.
- 4) All orbits scheduled for Mondays are reserved for QRP use only. Use a *maximum* of 10 watts of erp.

The operating schedule of AMSAT-OSCAR 6 has been discontinued indefinitely. Presently operating at one-half its design voltage, it is difficult to command and is not transmitting telemetry. A-O 7, however, continues to function reliably.

To keep abreast of latest developments, tune into the regular phone and cw bulletins over W1AW (see schedule in "Operating News," page 95), AMSAT bulletins transmitted over the beacon frequencies on A-O 7 reference orbits, and AMSAT nets (East Coast at 0100 UTC Wednesdays on 3850 kHz LSB; Mid-States at 0200 UTC; West Coast 0300 UTC).

Spacecraft Frequencies

SPACECRAFT	UPLINK	DOWNLINK	BEACON
A-O 7			
Mode A	145.850 — 145.960 MHz	29.400 — 29.500 MHz	29.502 MHz
Mode B	432.125 — 432.175 MHz	145.975 — 145.925 MHz	145.972 MHz

This schedule of orbits for AMSAT-OSCAR 7 will be a regular feature of *QST*. Further information on the amateur satellite program can be obtained free of charge from ARRL hq. The ARRL OSCAR LOCATOR, a simple satellite tracking aid (see page 51, *QST* for November, 1976), is available for \$1, while the popular and informative series of

QST articles for the beginner has been reprinted in book form. *OSCAR from the Ground Up* covers OSCAR 6, OSCAR 7 and the newest satellite, A-O D, to be launched early next year. It is now available for \$3 ppd. from the ARRL.

Kentucky Flood Diary

By John Bray,* WB4WKP

The waters of the Big Sandy were rising in Pikeville. By six o'clock on the evening of Monday, April 4, they were approaching flood stage — at the rate of two and a half feet per hour. When the river inevitably overflowed its banks it became a raging torrent, sweeping away mobile homes and all else in its path.

When it looked like a major catastrophe could occur, several amateurs and others who wanted to assist hurriedly set up a communications network within the usually calm city of 4500 in southeast Kentucky. If a loss of life were to be avoided, messages had to be relayed within the city as well as between it and the outside world. All the while, the swollen river threatened to knock out telephones and electricity.

Communications were established between the civil defense and Red Cross headquarters in the local courthouse, at Pikeville College, a mobile unit, and two units which served as relays when necessary. Among those involved in this early action were WA4NOG, WB4WKP, WA4RNQ and WB4GEL.

Initially, this network worked through a repeater in Pikeville — its only link to the outside world — to a group of Prestonsburg amateurs who were still operational on the low frequencies. This worked well until the power went off at the repeater, between 2 and 4 A.M. Tuesday, Pikeville's last connection to the outside world had been severed.

Within the city, a relay was used between the mobile unit and c.d. headquarters to help avoid a potential explosion. Fifty tons of ammonium nitrate — a chemical that can explode when wet — stood in the path of the floodwaters; and a team of volunteers from Pikeville College was trying desperately to remove it. The hams passed urgent messages between them, helping to avert this added danger.

I managed to drive to the top of Peach Orchard Hill and transmit a message describing conditions in Pike-

ville during Monday night and into Tuesday morning, so that other amateurs in Prestonsburg could notify c.d. and Red Cross personnel in Frankfort and Louisville.

College Became Emergency Shelter

The next six days were a blur of 20- to 22-hour days spent glued to a rig, as we transmitted emergency messages for c.d., the Red Cross and others. One of the first things we did was arrange for cots, blankets, pillows, sheets, food and medical supplies to be brought to the Science Building at the college. It was immediately turned into an emergency shelter for townspeople as well as a food center for college employees whose homes were under water.

At one point, we radioed for insulin to be delivered to those who needed it, and arranged to transport a girl in a very isolated mountain community to the hospital. If help hadn't arrived, her life expectancy would have been only three or four hours: She had suffered a ruptured appendix. Another person in the same isolated town had a stroke; ham radio saved his life, too.

On Tuesday, an all-band operation went on-the-air from Pikeville College. WA4NOG operated the low-band sta-

tion, while I maintained 2-meter links to various emergency centers in Pike County. A nonlicensed resident, Dixie Wehrheim acted as message coordinator for the hundreds of incoming and outgoing communications.

Hams provided emergency communications almost around the clock from the station at Pikeville College until midnight the following Sunday (Easter Sunday), when fairly reliable telephone communications were reestablished. For most of Tuesday and Wednesday WB4QWE of Melvin, KY, was Pikeville's only link to commercial telephone service, however.

Many, many other hams helped — they are too numerous to mention. All worked long, hard hours during the week-long ordeal.

At the end, we were all approaching physical exhaustion. But it was a good feeling, too. In at least five cases we had provided the communications necessary to save lives in medical emergencies — we knew we had provided the vital emergency communications no one else would have been able to provide.

A Labor of Love

A large round of thanks should go to those radio amateurs who, leaving their homes and jobs for our week of greatest trial, came voluntarily to Pikeville and other locations to help us with their communications skills. Unlike military units and professional social service workers, these people do not get paid by anyone for what they do; it is truly a labor of love.

The flood of 1977 is over, but its ramifications will be felt throughout the Big Sandy Valley for years. To say I was glad to be part of it all somehow doesn't sound quite right. But I'm thankful I could help; it made me proud to be a ham and happy to be alive.

And I can remember being told on Saturday that it wasn't Wednesday



An unidentified man tries to make his way to Pikeville College, located on a hillside, where the only food, shelter and communications were to be found during the flood. WA4NOG, who served his townspeople to the point of exhaustion, lives next to the house in the foreground. He was relatively lucky; his shack got only 18 inches of water.

*Assistant Dean of Students, Pikeville College, Pikeville, KY 41501

You Like My New Call?

Why settle for a run-of-the-mill call when you can turn heads with a flashy newfangled one? Here are a few reasons.

By John G. Troster,* W6ISQ/N6IQ

“You monitoring, Charlie? This is N6IQ.”

“Yeah, I’m always monitoring. Pleased to meet ya, OM. Name is Charlie. Ain’t heard you on the channel before.”

“Naw, Charlie, this is your old buddy, W6ISQ. Just got me a new secondary call, N6IQ. Ya like it?”

“Ugh. You’re one a them fellas, huh. What was wrong with ISQ? You wasn’t wearin’ it out none workin’ DX. Sounds dumb.”

“Naw, Charlie, I just thought . . . well, everybody’s doing it, ya know. Besides it’s nice and short and snappy. Better for contests. So I asked for this one.”

“Since when did your call do you any good in a contest? Not with that signal you got . . . ha!”

“Well look, this call’s just about the same as old ‘ISQ.’ I just dropped a ‘dah’

in the first letter and dropped three ‘dits’ out of the suffix. Saves all that keyin’ time.”

“Hmmm . . . amazing.”

“And hear how fast I can talk it . . . ‘N6IQ N6IQ’ . . . that’s twice as fast on fone as I could say ‘W6ISQ.’”

“More fast talkin’ is just what we need on the fone bands.”

“And look, that ‘N’ prefix will pull in all sorts a calls . . . everybody will want to QSO an ‘N.’ Lotsa fun in the contests.”

“And lotsa fun after the contests makin’ out all them QSLs.”

“Another thing, ‘IQ’ means, ahhhh . . . ‘Intelligence Quotient’ which is the ‘IQ’ test for how smart ya are. Pretty clever, eh? The ‘IQ’ call, I mean.”

“Well ‘Nothin’ Six IQ’ don’t sound so smart to me. By the way, if you wanta try out that smart new call, I’m hearin’ Venkat, VU2KV, on the low end here workin’ a pileup.”

“Yeah, yeah . . . good. He used to have a lot of trouble copying my ‘ISQ’ call through the pile. I’ll make him the first ‘IQ’ QSO.”

“Stand by, Charlie . . . ahhhh . . . ‘Venkat, this is N6IQ N6IQ.’”

“K6AQ, this is VU2KV. Good morning, Jim . . .”

“N6IQ N6IQ.”

“K6RU, this is VU2KV. Good morning, Cam . . .”

“N6IQ N6IQ.”

“K6PU, this is VU2KV. Good morning, Ken . . .”

“Ahhhh, Venkat, this is ahhh . . . N6IQ? Ya think he came back to me, Charlie?”

“Naw, just like old times. That ‘Nothin’ Six’ call ain’t boring no bigger hole over there than the ‘ISQ’ did. And you say you actually asked for that call?”

“Eh . . . ahhhh . . . Venkat, this is W6ISQ.”

“Oh, good morning, Jack. Been looking for you. I think I heard someone signing ‘N6,’ but it didn’t sound right. Never heard one before. Must be a phoney. But I can spot the old ‘Italian String Quartet’ in any pileup . . .”

“Ahhh . . . yeeeah, thanks Venkat. I . . . ah . . . I once heard one a them ‘N’ calls . . . they say it’s a new kind of Novice call for fellas as can pass the code but flunk the theory . . . Maybe it’s the other way. Eeeyeah . . . well, see you in Fresno again sometime . . . 73.”

“W6ISQ this is VU2KV . . . 73 . . . QRZed?”

“What I tell ya? That number ‘6’ is about right for your ‘IQ.’ It’s a dumb call.”

“Yeah, Charlie . . . but maybe on cw . . . ahhhh . . . say, ya think I could send the N6IQ call back to the FCC?”

“Naw, don’t think so. I’d say the FCC was glad to get rid of that one.”

“I Quit.”

Q57

* 82 Bellbrook Way, Atherton, CA 94025



Contests and Emergencies

The Guatemalan quake brought a perennial dispute to a head: Should emergencies take precedence over contests? Perhaps it need not be a dispute at all. Here's one man's opinion.

By Chip Margelli,* K7JA/K7VPF

Amateur radio: Is it a hobby or an emergency service? Surely, the answer is, "Both, and much more." There are times, though, when the several goals of the Amateur Radio Service appear to conflict.

A recent example was the devastating earthquake in Guatemala which required and received an immediate and thorough response from amateurs. As fate would have it, though, just as the hams were getting into high gear, along came the ARRL Phone DX Contest with its attendant QRM. Much unintentional disruption of emergency circuits took place, despite remarkable cooperation among all concerned.

Out of this episode came, as never before, soul-searching as to whether the "fun and games" of contests should be allowed to endanger life-and-death communications. This article has been prepared by one who is an enthusiastic contesteer — perhaps even a diehard — but at the same time dedicated to the long tradition of the Amateur Radio Service of assistance to the public in time of need. My intent is to foster rational discussion of the matter rather than the all-too-frequent responses that pit one side against the other, such as: "Phone patchers should know better than to sit on 14.225" or "I couldn't work Homer in Tulsa because of that %#@ contest!"*

tenance of alternative frequencies to be utilized under adverse conditions of any kind, whether QRM or less-than-ideal propagation.

I do not for a moment minimize the scope of the problem, but for the purposes of this article, interference to random net operation is considerably less critical than the problem posed by QRM to communications during a serious, unexpected natural disaster.

Alternatives

What can be done should a contest and a serious emergency fall in the same period of time? Here are several possible courses of action.

1) *Cancel the contest.* This alternative has in its favor the elimination, by removing it from the airwaves, of a major portion of the interference to persons passing emergency traffic. Furthermore, it would increase the number of amateurs available to assist in

Whenver a major operating event takes place, such as a DX contest which attracts thousands of participants, interference to nonparticipants will occur. While routine schedules and other random activities can usually be moved to a less crowded band or mode, some urgent situations, such as international relief traffic, require utilization of the best band available. In the case of the Guatemalan earthquake, propagation conditions demanded that 20 meters be employed, and for most operations the use of ssb was indicated. Both contesters and the emergency crew were seeking the best band at the best times

for maintaining international communications. Conflict was therefore inevitable.

Interference to Nets

After every contest ARRL headquarters receives complaints about interference to scheduled net operations and weekly or daily schedules of a personal nature. That the number of complaints is tiny compared to the number of logs received is irrelevant; the problem does exist. However, this aspect of the contests versus public-service debate will not be addressed here. There are a number of solutions available to net operators facing a serious problem, not the least among them being the main-

Even if all the participants in a contest were swept from the band, QRM would still exist.

passing traffic. To be sure, many of the participants in a contest are supremely capable of putting a booming signal into the disaster zone. It seems a shame that many of those best suited to help out are engaged in what is basically a form of entertainment.

The arguments against this alternative seem compelling. First, even if all the participants in a contest were swept

*2806 N. Union Ave., Tacoma, WA 98407

from the band, QRM would still exist. We have all listened to the QRM that prevails on the low end of 20 meters on a non-contest Saturday morning. Further, it would be logistically impossible to call off a contest. WIAW bulletins would be about the only way to attempt this, and, while the bulletin service is handy for tens of thousands of listeners daily, there are many more thousands of potential contest participants who do not know how, where or when to find such bulletins; thousands more, especially the overseas chaps, simply *cannot* hear the bulletins because of adverse propagation and other reasons.

Disqualification of violators from the contest results could be one approach, but who would be the policeman?

One further argument that can be made is that there is, in general, no shortage of help when a real emergency comes along, although it certainly would be nice if the "big guns" could be pressed into traffic service when the going gets tough. With a number of surveys showing that many people do not know the name of their state governor or that men have walked on the moon, it can be seen that even getting the word across that an emergency exists is an almost impossible task. Thus, canceling a contest is not a satisfactory solution nor a realistic possibility.

2) *Set aside specific contest frequencies within the U.S.* This proposal has been made often in recent years and is not totally without merit; after all, if the majority of the contest QRM could be confined within certain boundaries, it might be possible to carry on emergency traffic with much less difficulty than if the contest gang were allowed

The idea would be to set aside a segment of the band, possibly 14.150 to 14.180 MHz, for emergency communications only.

unlimited operation across the bands, as is the case now. A voluntary program of this sort exists in the ARRL November Sweepstakes, but it is only marginally adhered to; however, in domestic contests, the Extra Class subbands are almost deserted, as the higher class licensees seek exposure to the mainstream of hamdom.

This alternative is deficient in several

areas, though. First, a mandatory system of frequency allocation would have to be enforced. Disqualification of violators from the contest results could be one approach, but who would be the policeman? Would it be Class I and II Official Observers?

Further, any system of frequency allocation would have to be set up very carefully to avoid discrimination toward any group. For example, if 100 kHz were to be set aside in the 20-meter phone band for contest participants, where would it fall? If the lower 100 kHz of the band were so allocated, the General class participants would be hopelessly jammed into a narrow segment between 14.275 and 14.300 MHz. If 14.250 to 14.350 were set aside, better balance would exist for the U.S. hams, but many foreign operators who cannot operate above 14.300 would be given a raw deal, and still little relief would be provided in the lower 50 kHz of the band, which are always busy. Contest or no, the declaration by Guatemalan authorities of 14.205 MHz as the emergency frequency during that country's crisis was bound for failure!

Under this proposal, many contest activities which pose no QRM potential, such as calling a new country in the cw band and moving him to ssb, would be prohibited. Moreover, it would be impossible to determine if a contest QSO were taking place out of the allocated segment. How many QSOs take place daily in which signal report, QTH and equipment information are discussed? These are the essential elements of the contest exchange in the ARRL DX Contest!

3) *Set aside segments outside of regular U.S. suballocations in which emergency communications could take place.* This proposal has several highly favorable aspects. A number of the present U.S. phone allocations are considerably more restrictive than are the international allocations. On 20 meters, for example, most of the rest of the world works upward on phone from 14.100 MHz, while U.S. hams are not allowed below 14.200. In part, this situation is left over from an earlier day in which such segregation was desirable so as to make it possible to hear DX stations away from the stateside QRM.

Several things have changed, however. One has been the advent of ssb. When these allocations were drawn up, there was severe heterodyning from U.S. a-m stations covering up the DX. The second change has been the development of the transceiver as almost standard equipment for phone operating. The result has been that *very* few stations are now working split-channel except on 40 meters; the foreign segments are now largely a haven for overseas hams away from the U.S.

QRM. It is this feature — very slight QRM as compared to the U.S. bands — which makes this proposal attractive.

The idea would be to set aside a segment of a band, possibly 14.150 to 14.180 MHz for *emergency communications only*. Because of possible delays and because of the difficulties in getting the word out, no FCC or ARRL declaration of a state of emergency would be required. Therefore, if one were in the jungle of Venezuela and needed an airlift of medical supplies for a village swept by a flash flood, one could be

With a number of surveys showing that many people do not know that men have walked on the moon, it can be seen that even getting the word across that an emergency exists is an almost impossible task.

sure of having a clear channel on which to work — even in the middle of the Sweepstakes or a DX contest. Those operating in these segments in the absence of an emergency situation would be subject to the same sanctions as any other out-of-band violator.

The most obvious disadvantages of this proposal are of a legal nature. FCC action would be necessary for U.S. hams to use these frequencies under the law (putting aside the longstanding concept of "Do what is necessary in an emergency, and worry about the regulations later"). Furthermore, the FCC is under considerable pressure from foreign governments to keep the hordes of U.S. hams out of these sanctuaries. With the World Administrative Radio Conference

... interference to random net operation is considerably less critical than the problem posed by QRM to communications during a serious, unexpected natural disaster.

coming up in 1979, at which the future of our allocations will be decided, this is no time to make enemies!

The other problem would be enforcement. In a matter such as this, it seems logical that the amateur tradition of self-regulation would assert itself. A bona fide emergency is not difficult to define: any situation in which property or life and limb are endangered.

A Reasonable Compromise

It should be clear that this writer favors the last alternative as a reasonable compromise in the debate over contests

versus emergencies. The problems associated with canceling or confining a contest are, in my view, unworkable, however desirable they might be. The goal is to provide reliable, clear, working segments in which emergency traffic can be passed. The impact of the last alternative on foreign hams would be minimal, since these segments would be used by U.S. hams only under true emergency conditions; as such, this would not constitute a day-to-day inroad on the

preferred allocations of foreign operators.

The total U.S. utilization of such a segment would be small, even in an emergency; it has always been a cardinal rule that if you are passing important traffic, do so, and if you aren't, shut up! Under this alternative no QRM from contest or casual U.S. operating would endanger communications with the disaster zone. Most of the present potential for inefficient spectrum utilization

would be eliminated.

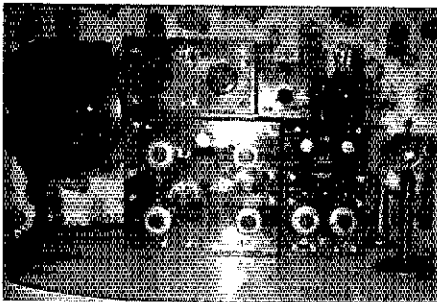
We, as hams, should not force ourselves to ask whether saving lives is more important than working a new country in a contest. Rather, we should concern ourselves with finding a way in which to provide the best chance of maintaining emergency communications in the face of a number of adversities. When the right questions are asked, we stand a better chance of finding the right answer. QST

Strays



Just a few pieces of Hardin McCauley's collection of pre-1928 radio equipment are shown here: a Morning Glory speaker (left), one-tube 1921 Kennedy receiver with two-stage amplifier (bottom), one-tube 1922 Tuska (upper left), one-tube Bristol amp (upper middle) and 1923 Crosley Pup (upper right). One of Mr. Bell's early models is at far right. McCauley, WB9NVE, has more than 60 such antiques at his QTH in St. John, IN.

Old-time radio enthusiasts will be able to once again ogle Hq.'s fine collection of antique gear when the Museum re-opens sometime in late summer.



Al Smith, WA2TAQ, left, is shown presenting a \$2200 check to the ARRL Foundation. Accepting is Stan Zak, K2SJO, Hudson Division Director and a member of the Foundation Board. Presented at the Hall of Science Hamfest in Flushing, NY, the donation was given on behalf of the former Federation of Long Island Radio Clubs. The money "will be used for a scholarship for a radio amateur residing in the counties of either Brooklyn, Queens, Nassau or Suffolk. This scholarship shall be to an electronics oriented school."



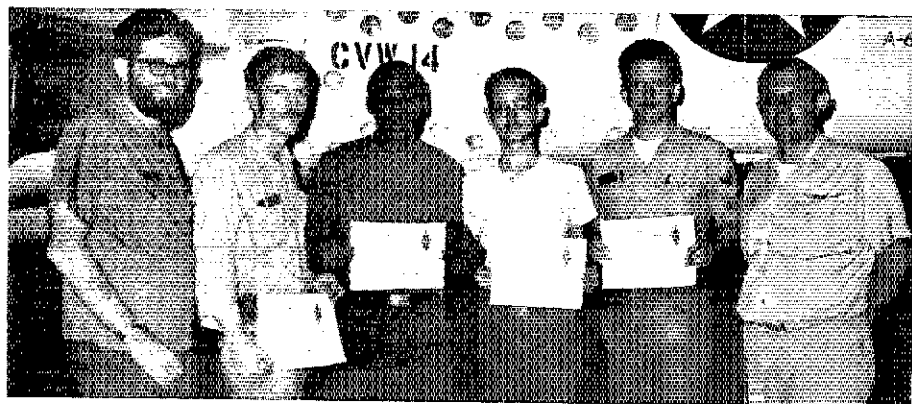
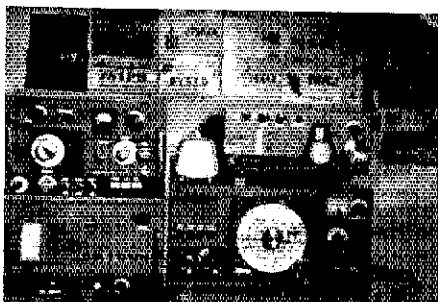
QST Congratulates . . .

□ Paul Schmitz, W8DQR, who received a framed citation from the U.S. Department of Commerce for his exemplary performance as Skywarn NCS on June 10, 1975, and his prompt action in July, 1976, when large areas of the western shore of Lake Erie were threatened with severe flooding. The commendation was signed by George P. Cressman, director, The National Weather Service.

□ Donald G. Fink, W2AFX, on his retirement from the Institute of Electrical and Electronics Engineers, where he has been serving as Executive Consultant and is Director Emeritus.

□ Al Wentworth, W1BSX, who recently retired from the GenRad Corporation, Concord, MA, after 36 years. He received several frequency-standard components, which have been encapsulated for posterity, from Bob Barrett, WA1ZJG.

This orderly amateur station consists entirely of homemade equipment. The various pieces were built by Andy, DM2DWN. At the lower right is his 7-band receiver which covers 160 through 2 meters, inclusive. Above the receiver is a phasing type of ssb exciter. It is flanked on the left by a 5-band 300-watt amplifier. The amplifier power supply is at the lower left in the picture. Our thanks to Al, W1BL, for sending the information to Hq. — W1FB



Some of the crew members of the USS *Enterprise*, the world's largest aircraft carrier, while conducting routine operations in the Indian Ocean last winter, WB6CYA, "Skip" Prinsen, and WA6LCU, Jerrie Rosecrans, took advantage of their captive audience to teach Novice class regs and theory, while WB3HAP, Bob Larue (not pictured) sent code. Seven men were graduated, with four taking their Novice exams before returning to the States. From left: Prinsen, Charles Day, Malachi Tolar, Michael Dupuis, George Overbeck II and Rosecrans. Not pictured: Castle Phelps, George Johnson, Jonathan Wort.

Moved and Seconded...

MINUTES OF EXECUTIVE
COMMITTEE MEETING
No. 363
June 4, 1977

Pursuant to due notice, the Executive Committee of the American Radio Relay League, Inc., met at the Sheraton Centre, Toronto, Canada at 10:58 A.M. on June 4, 1977. Present: President Harry J. Dannals, W2HD, in the Chair; First Vice President Victor C. Clark, W4KFC; Directors Max Arnold, W4WHN; Richard A. Egbert, W8ETU; Ron Hesler, VE1SH; and Robert B. Thurston, W7PGY; and General Manager Richard L. Baldwin, W1RU. A number of other officers, directors, and vice directors of the League were also present, together with General Counsel Robert M. Booth, Jr., W3PS.

The General Manager presented the names of 658 Life Members who had been elected since the March meeting of the Executive Committee, and on motion of Mr. Thurston, seconded by Mr. Hesler, these were acknowledged by the Committee and will be published in *QST*.

On motion of Mr. Clark, seconded by Mr. Arnold, unanimously VOTED to grant approval of the following conventions: South-eastern Division, January 21-22, 1978, Miami, FL; Florida State, February 17-18-19, 1978, Orlando, FL; South Florida Section, November 18-19, 1978, Clearwater, FL.

The Committee was in receipt of correspondence from Director Grauer requesting approval of a change in the date of the Midwest Division Convention from October 6-7-8, 1977 to October 13-14-15, 1977 and on motion of Mr. Egbert, seconded by Mr. Thurston, this approval was unanimously GRANTED.

On motion of Mr. Hesler, seconded by Mr. Arnold, affiliation was unanimously GRANTED to the following societies: Amateur Radio Club of California, Claremont, CA; Amateur Radio Club of Wally Byam Caravan Club International Inc., Mio, MI; Big Rapids Area Amateur Radio Club, Big Rapids, MI; Boone Area Repeater, Inc., Dayton, IA; Bullitt Amateur Radio Society, Shepherdsville, KY; California State University Northridge ARC, Northridge, CA; Crater Amateur Radio Society, Colonial Heights, VA; Deep East Texas Amateur Radio Club, Lufkin, TX; Elmwood Park Amateur Radio Club, Inc., Elmwood Park, IL; Empire Amateur Radio Service, Brooklyn, NY; Far West Repeater Association, Eureka, CA; F. M. League, Emmitsburg, MD; Geauga Radio Amateur Association, Middlefield, OH; Hockanum Valley Amateur Radio Society, East Hartford, CT; Independence FM ARC, Inc., Independence, MO; Jacksonville Range Association, Jacksonville, FL; Lake & Kenosha County Amateur Radio Society, Ltd., Antioch, IL; Leisure World Amateur Radio Club, Laguna Hills, CA; Monroe County Community College ARC, Monroe, MI; Nassau Amateur Radio Society, Fernandina Beach, FL; North Dade Repeater, N. Miami, FL; North Fulton Amateur Radio League, Roswell, GA; Pennyroyal Amateur Radio Society, Hopkinsville, KY; Peter Rouget School Amateur Radio Society, Brooklyn, NY; Pittsburg Repeater Organization, Inc., Pittsburg, KS; QRP Club of Greater St. Louis, St. Ann, MO; Rockingham County Amateur Radio Club, Wentworth, NC; Sandy Valley Amateur Radio Association, Paintsville, KY; Sheboygan County Amateur Radio Club, Inc., Sheboygan, WI; Silverado Amateur Radio Society, Inc., Napa, CA; Silvis Amateur Radio Explorer Post 9120, Silvis, IL; Skyview Radio Society, New Kensington, PA; South Pasadena Amateur Radio Council, South Pasadena, CA;

Southern Chester County Amateur Radio Club, Rosemont, PA; U. W. Stout Amateur Radio Club, Menomonie, WI; Ward Melville High School Amateur Radio Club, Setauket, NY; Williamsburg Area Amateur Radio Club, Williamsburg, VA.

On motion of Mr. Arnold, seconded by Mr. Egbert, mail vote granting affiliation to the following clubs was unanimously ratified: Academy Amateur Radio Club, South Auburn, WA; Affton High School Amateur Radio Club, St. Louis, MO; Algonquin Amateur Radio Club, Marlboro, MA; Americus Amateur Radio Association, Americus, GA; Arlington Amateur Radio Club, Arlington, VA; Ashland Middle School ARC, Ashland, MA; Bath Junior High School Amateur Radio Club, Bath, ME; Bellbrook Amateur Radio Club, Xenia, OH; Brazoport Amateur Radio Club, Inc., Lake Jackson, TX; Cape Ann ARA, Gloucester, MA; Central Arizona DX Association, Scottsdale, AZ; Central Valley Radio Club, Inc., Delano, CA; Chippewa Hills High School Amateur Radio Club, Weidman, MI; Clarks Fork Valley Amateur Wireless Association, Bridger, MT; Coconino County Amateur Radio Club, Flagstaff, AZ; Culpeper Amateur Radio Association, Culpeper, VA; Eastern Michigan University Amateur Radio Club, Ann Arbor, MI; Emmett Amateur Radio Society, Emmett, ID; Fauquier Amateur Radio Club, Warrenton, VA; Foothill High School ARC, Santa Ana, CA; Gahanna Lincoln High School ARC, Gahanna, OH; Golden Eagle Amateur Radio Club, Bayville, NJ; Gulf Science and Technology ARC, Pittsburgh, PA; Hams Amateur Mobile Service Club, Inc., Marysville, WA; Harris Jr. Academy ARC, Pendleton, OR; Heartland ARC, Staples, MN; Henry County Amateur Radio Club, New Castle, IN; Hillsborough ARS, Inc., Tampa, FL; Holmdel Amateur Radio Club, Middletown, NJ; Hot Springs Amateur Radio Club, Inc., Hot Springs, AR; HTC South Campus Amateur Radio Society, Eden Prairie, MN; Iowa-Illinois Amateur Radio Club, Burlington, IA; Iroquois Ford Amateur Radio Society, Loda, IL; Jackson County ARC, Sandville, WV; Jr. Amateur Radio Operators of Virginia, Richmond, VA; KFC Amateur Radio Society, Pratt, WV; Knox County Amateur Radio Club, Galesburg, IL; Lakeland Radio Club, Heinsburg School, Heinsburg, Alberta, Canada; LaSalle-Peru Area Vocational Center Radio Club, LaSalle, IL; Liberty Bible College Amateur Radio Club, Pensacola, FL; Memphis Pioneer Amateur Radio Association, Memphis, TN; Middle Country Amateur Radio Club, Selden, NY; Montclair-Kimberly Academy ARC, Montclair, NJ; Norristown ARC, Fairview Village, PA; Oidfield ARC, Gaffney, SC; Ozark ARC, Mountain Home, AR; Palo Verde High School Amateur Radio Club, Tucson, AZ; Public Service Terminal Athletic Assn. ARC, Newark, NJ; Redwood School Amateur Radio Association, Saratoga, CA; River Rats Amateur Radio Club, Fort Thomas, KY; Roseburg High School Amateur Radio Club, Roseburg, OR; Sabine Valley Amateur Radio Association, Greenville, TX; St. John's University Radio Club, Jamaica, NY; Sandra, Inc., San Diego, CA; Scotland County ARS, Inc., Laurinburg, NC; Sharon High Amateur Radio Club, Sharon, PA; Shore Points Amateur Radio Club, Atlantic City, NJ; Sierra Pacific Amateur Radio Klub, Citrus Heights, CA; Southern Counties Amateur Printers Society, Buena Park, CA; Starke Co. Amateur Radio Club, Knox, IN; Sunset Empire Radio Club, Astoria, OR; The Sea Girt Elementary Educational ARC, Sea Girt, NJ; South Bay Amateur Radio Association, Fremont, CA; The South Queens Boys Club ARA, Ozone Park, NY; Tenefly High School Amateur Radio Club, Tenefly, NJ; Tioga

Amateur Repeater, Inc., Owego, NY; Tri-City Radio Assn., Millville, NJ; Tupper Lake High School Radio Club, Tupper Lake, NY; Twin Lakes High School ARC, Monticello, IN; University of Missouri ARC, Columbia, MO; Valley VHF Club, Inc., Hanover Park, IL; Western Arizona Radio Club, Riviera, AZ.

After extended discussion moved by Mr. Clark, seconded by Mr. Thurston, and unanimously VOTED, that the General Manager seek further quotations, particularly from University Electrical Engineering Research Facilities of the matter of the antenna height vs. interference research project that was the subject of Minute 64 at the July 1976 Board meeting.

After extended discussion and a presentation by General Counsel Booth on proposed League responses to Dockets 21116, 21117 and 21135, and after further extended discussion on FCC's present budget problems, moved by Mr. Clark, seconded by Mr. Arnold, and unanimously VOTED that the President obtain all pertinent facts concerning the present budgetary problems of FCC and possible responses thereto, and that he prepare a position paper addressed to the directors with his recommendations for action, at the earliest opportunity.

After discussion, and upon the recommendation of General Counsel Booth, moved by Mr. Arnold, seconded by Mr. Hesler, unanimously VOTED to reimburse Attorney Frederick J. Lawson in the amount of \$1233.75 for printing costs of Appellant's Opening Brief in the case of *People vs. Schroeder*. In addition, the General Manager was instructed to reproduce this brief for use in the ARRL Legal Kit in an economical fashion.

During the course of the meeting the Committee discussed, without formal action, *QST* advertising policy, the Personal Communications Foundation, the General Manager's decision concerning a training program for Space Center employees, the League's response to a NAB petition concerning a rebroadcast of amateur and CB transmissions, the status of the YL Column, the status of the listing of the overseas QSL Bureaus, a *QST* readership survey, problems attendant to two clubs in a single division having the same name, the problems of conflicts in convention dates, and the Jack Anderson column.

During the course of the above the Committee was in recess for luncheon from 11:40 A.M. until 1:15 P.M.

There being no further business, the Committee adjourned at 5:10 P.M.

Respectfully submitted,
Richard L. Baldwin, W1RU
Secretary

The Executive Committee acknowledges the following Life Members who have been elected between January 19, 1977 and June 4, 1977.

List No. 1

A. D. Abercrombie, W2GJS; Wayne M. Abernethy, WB3AEQ; Rodney V. Adams, WA4AGN; Terry V. Adams, WB8WMM; Michael D. Ahlberg, K9OBF; Charles S. Ahlgren, WB6IYM; Sybil Allbright, W6GIC; James H. Allen, W6IQH; Carl M. Anderson, WB6PHM; G. R. Andrews, VE3RA; Roger A. Baim, WB9BDP; Robert C. Baker, WA6MCT; Harvey F. Ball, W8FYX; M. Bardfield, W1UQ; Claire M. Bardfield, WA1USW; Dave J. Barnes, WB4KDI; Dennis R. Barth, K7DYH;

Dewey M. Bassett, W8GE; Kenneth R. Bauer, W9WGO; Walter J. Beatty, Jr., K7DNN/WB7CAR; Leola M. Beatty, K7GAT/WB7CAQ; Jeffrey S. Beauprez, WB0UFP; Floyd E. Becker, W6RJY; Harold Beebe, W9RY; Darrell R. Bell, K4LIV; Phillip N. Bennett, Jr., WA4BNV; Kenneth A. Berg, VE7DMV; Richard N. Berg, WB5OCP; Carl Bergman, W3HBK; Bernard A. Best, VE3SH; Alan Bieber, Jr., WA2EPW; Richard S. Bird, W1VGY; Wilfred W. Bisson, WB6COT; Bernhard M. Bloom, K3KZB; Ronnie A. Bolton, WB4PIQ; Virginia E. Bonnough, WB5TPH; Jimmy A. Bonnough, WB5TPG; Michael F. Born, W9JXT; Caleb O. Bost; M. C. Bowers, Jr., K4VQ; William C. Boyer, WA3YOX; Lawrence J. Boyler, WA0KWK; Arthur Bradley, K4YZV; George N. Braidich, WA8VFA; Timothy L. Bratton, K5RA; Joshua J. Brehm, WA2CAJ; Martin Breski, WA1WES; Charles W. J. Brown, W1DDC; William G. Brown, WB9TCQ; Thomas M. Browning, WA1ELQ; Emmett F. Burke, W0FB; James Burkholder, WSUXA; Jeremy R. Burnham, WA6FEQ; Ronald H. Butcher; McKinley Byrge, W4HPG; Cecil R. Calhoun, W5ZGZ; Charles P. Calhoun, W2EG; Martha J. Carmichael, WB4AOR; John J. Carter, WB5JLB; David Cassiere, WA2EZG; Michael J. Castellano, WA1CUN; Harry Chaffee, Jr., W6QMT; Donald S. Chamberlain, W9JQD/K8YCM; Gregory Chambers, WB9UHR; Burr T. Chambless, Sr., WA6VYD; Everett Chapman, W1OCY; Steven C. Chastain, WA7SJV; William B. Cheney, WN4JKL; A. Duncan Chiquoine, WB2KMC; Gregory W. Chong, W6BUR; Dale P. Clement, WA1ESZ; Edgar A. Cliborne, WB4NIY; Craig E. Cobb, WA2ZVN; Howard A. Cochran, K9IUG; William G. Coe, W6SV; Thomas W. Comstock, WB5NUM; Jack R. Cook, K0AQO; Gregory D. Copeland, WB0QET; John C. Cottage, WA2BAT; Charles R. Cox, W5SQW; Gary Crane, WB2FGZ; Forest M. Cummings, W5LQU; R. Cunningham II, WD8DZF; Albert J. Cyr, W4SRH; Jim Dailey, WA7WET; Carleton M. Dane, W1FXK; John E. Davies; William C. Davis, WB7BRA; Ivan C. Davison, K0STP; John S. DeGood; Ginny Densmore, WA4WJA; Hal E. Dietz, W4SZYH; Loren A. Disper, K6DD; Donald C. Dickinson, W4EGQ; John L. Dolnack, WB81YR; Andrew E. Donovan, WA1GEP; John D. Donald, W7OIQ; John F. Doyle, WA2NOH; Donald R. Drury, WL7ICX; John F. Duze, WB6CHW; John L. Duerdath, VE3RKB; George S. Dundon, W2TOH; Hallowell Dunlap, WA1RJG; David C. Eastman; Jurgen C. Eckhoff, WB0AJL; Romilos Efratrin, WD8AFP; Andrew R. Ehrlicher, W9MC; William L. Engstrom, K2DPK; Dennis Erickson, WA9FBC; Andrew Evancho, Jr., WA7JGO; Carl B. Evans, W1BFT; Dorothy W. Evans, W1FTI; Philip Ewald, W4EWR; Ken A. Fath, WB8NDX; William C. Ferguson, Jr., W3DPU/WB4AJC; Paul C. Ferris, K2UME; Robert B. Finch, WA71PX; Allyn H. Fisher, W1CQN; Edward C. Fladt, WA8JBG; R. J. Flansburg, W6GFF; Steve Flatt, WB9LQH; John T. Fleming, W3GQJ; James M. Forzono, K2CXX; Bill G. Fowler, WB8NMP; James G. Franklin, WB5NHM; Michael J. Freedman, K8GTO; Richard Freitag, W2CXX; Franz J. Friedrich, DJ2MM; Harry F. Frieichen, WB8VDJ; Alfred I. Fromm, K5WMX/KL71FD; Russell W. Frum, WB4LLO; Robert J. Fulton, WB6HGI; Robert R. Funck, WB5MUL; Fred M. Gamer, K0DIX; Jack E. Garrison, WA0DKG; T. Garritano, WA9JGX; Ernest L. Garside, WA2TDI; Robert E. Gates, Jr., K7INE; Ronald D. Gates, W0GKE; Milan Gecelovsky, VE3BJP; M. C. Gilliland, WB9NHG; Henry E. Goldman, WA2OVG; Stanley D. Goldstein; James Gore, WA2HGH; Dillard L. Graham, WA4NZI; Patricia A. Graham, WB4UQI; Gordon R. Greer, K1SXS; Tommy J. Grier, WA4AYA; Earl J. Gross, K9PYM; Maurice E. Hale, Jr., W1WBM; Robert J. Halprin, WB2NOM; Gordon A. Hammers, W6BYY; Ralph Hanna, W8QR; Gary E. Hans, WA2SMI; Ronald F. Harburg, WB5KTY; David W. Hardesty, WB8FFY; Henry L. Harding, W6KBU; R. Booth Hartley, K6KVC; Lewis E. Hartzler, WB5IUC; William E. Hawes, W9ERG; William T. Hawkins, Jr., KH6HDA; George C. Hays, WA5IQU; George M. Hemmeter, WA7ZZH; John L. Henley, W1EOR; Cecil W. Herman, WA4IFC; Michael G. Herndon, WB7ONS; William E. Higgins, W3VNE; Alan M. Hoffberg, W2CBU; James R. Holt, W4MLL/3; Maurice E. Hope, W8EMD; Raymond N. Hoppins, W7IVX;

Frank E. Horton, WA4HGQ; Allan F. Houston, W9WJH; Harry R. Houston, WA7MZV; Joseph D. Hoyt, WB9QEB; Paul Hudak, WA2ZDQ; Ed B. Hudgens, Jr., WB4RHQ; Robert L. Huffman, WA1KID; Ronald P. Huffman, W7JZH; Philip K. Hunsberger, K9PNT; Alan N. Iverson, W7PVE; Vernon C. Jackson, WA0RCR; Wendell F. Jackson, W3WW; Boyce W. Jarrett, K5FOG; Dorothy H. Johnson, WB9RCY; Wayne S. Johnson, WB9QGW; Robert E. Johnson, WB0KTR; Ross Johnson, WB9SEK; Edward P. Jones, K5ZPC; Fred H. Jones, K3CYM; Pete Juul, K6UBH; Paul Kalkstein, WA1NKE; Edward Karagozian, Jr., K6JGN; Maurice C. Karriger, W8FF; Norman Katz, W3VIN; Edward Keenan, WB0NIP; Ted G. Keller, WB9SNK; Randall C. Kelly, WB4MJF; Craig B. Kendall, WA3RGH; Graham G. Kent, W7CZL; Eugene D. Kidd, WA0ICG; Evelyn M. Kidd, WB0CDQ; Sewhan Kim, WB6WQB; George Kimmeldorf, K5LL; Nicholas J. Kirk; Edward Knobloch, K4PF; Joseph A. Kolb, W2NL; William F. Kucera, W0RTB; Georg A. M. Kralik; Donald W. Lambrecht, W7MKH; Edgar J. Lambert III, WA4LVB; Paul J. Lanzoni, WA3WPR; Earl C. Larsen, W9CGF; Charles L. Latimer, Jr., K25CLN; Gordon Lauder, W9PVD; Benoit W. Laurents, WSJAH; Edwin P. Lea, W5OWM; Thomas E. Lenon, WD8IBW; Julius L. Levy, Jr., W5CQC; Arthur R. Lewis, WA8VSI; J. Curtis Lewis, Jr., W4LHS; James C. Liston II, WA1SVT; James G. Little, VE5KG; Thomas C. Lloyd, Jr., W9LNB; Robert A. Lockshire; G. B. Lowther, W0FCI; Carrie C. Lynch, WA4BVD; Ernest E. Launer, WA9UQC; John M. Mabey, W7CWK; Dale R. Machallick, WD9AXT; William G. Maerle, WA8HBQ; Richard Magerl, WA9ZXM; Charles E. Maguire, WA2NIC; William Mark, VE3HIQ; Charles E. Marshburn, W6AZ; Daniel B. Martin; John Mason, K6MLU; W. J. Martin, WB6SUL; Mariano E. Maticampo, WB6ZYS; Beryl H. Masters, WB9EJ; Ray F. Mathis, WA5SOC; H. E. Matson; Lawrence D. Matson, WB0BGO; Douglas McClare, W6JLF; Roger A. McConnell, W6VE; Jim McCook, W6YA; James A. McCoy, W7LCE; Richard P. McCoy, WB4RLD; Dugaid S. McDougall, W9IV; John E. McQuade, WA3WV; Alfred H. Mebane III, WA4CEC; Alfred H. Mebane IV, WB4DNB; Julia M. Meers, KL7HMH; Russell Meese, Jr., W8RQ; Richard W. Mencil, K9T9Y; Arlena M. Michael, WA9VYS; Thomas M. Middleton, Jr., WB4CKY; Don C. Miller, W9NTP; Sue Miller, W9CNW; Homer W. Miller, K7CQA; Joel R. Miller, WA7JWC; Samuel C. Miller, WB8TXG; Bruce Miliken, WA5TKA; F. Eugene Mitchell, K3DSM; Stan Moistad, K0HGP; John A. Moninger, WA3VKC; Irad B. Moore, WA4RGX; William S. Moore, W9WNB/W9WM; Frank L. Morgan, WB3EIN; Louis W. Morgan, WB3EIO; William C. Morgan, K0DEQ; Garry Mosebach, WB9TED; Milo Moucha, W4TIJ; David L. Movius, W7KZO; Donald P. Musgrave, W6MIG; Edward L. Muhleisen; Florence V. Muhleisen, WB5NIS; Albert F. Muller, W2QXM; David B. Murray; WA1QGR; G. W. Murphy, K7YRU; Robert Murray, WA9VZC; Tom D. Needham, WB2CHE; William R. Newsom III, WA5BFB; Charles R. Newton, WITNS; Joseph C. Nibel, Jr., WB6TUW; Gene J. Nicholson, W6YJO; William W. Nugent, WB9OUD; Richard S. O'Brien, WB2JEZ; Richard K. Olsen, WA7CNP/6; Gordon L. Olsen, WA0GLI; David A. Orienti, W8LTF; William J. Ova, Jr., W1HFB; Shirley D. Owens, WA6QUP; James L. Parish, WA4ADK; Alan L. Parsons, K7UYJ; Mark A. Pereira, WA1JYV; Randy L. Perkins, WB5KCM; Laurence K. Perron, WA7VIB; Kevin G. Perrot, K3NTD; Dennis E. Persyk, WB9USW; Hans D. Peters, VE3CRU; James F. Petrey, WA4QHJ; Henry L. Pfizenmayer, K7HP; Esther Pierce; Wayne Pierce; John A. Pitkin, WA2EVL; Matthew L. Pimentel, W6KXO; John S. Pixley, W4YKA; James L. Plack, W9NWE; Randy L. Pleasance, W7PWK/WA6BJZ; Duane A. Poling, W8DHG; James C. Poppenhouse, WA1RJE; Francis R. Prah; Richard E. Pratt, K4XF; Faustin Prinz, WA9GDA; Richard L. Rampton, W6SJM; James S. Ramsey, WB1AHA; Newell E. Raxter, WB6FVN; James E. Ray, Jr., WB5PRG; Timothy J. Reed, WA2JYJ; Jack D. Reeder, W6NGZ; Michael L. Reik, WB9YJF; Ernest B. Renswick, Jr., WA2AWX; Samuel N. Riggs, W4POM; John F. Rice, W9MMB; William H. Roadstrum, W1FJ; James

P. Robertson, K2FA; William H. Robertson, W4NZP; W. S. Robertson; David M. Robinson, WB4IRP; William A. Robison, Jr., W4GIV; James M. Roden, WA5UQB; Fred W. Rollyson, WB6CNO; Norman Z. Rosow, W1EJJ; Delbert D. Roy, WB8DKM; Michael Y. Roy, WB9HWQ; William A. Ruddick, WB9RWK; John Sanborn; Leonardo Santamarina; Tom L. Sawyer, K0THI; Kermit K. Schauer, WA0DLB; William A. Schlosser, K3GHS; Duane Schnur, WB8EEJ; William Schrempp, K7YJO; Brent F. Schroeder, WB4QLK; Philip F. Schultze, K6ROR; Louis H. Schwitzer III; Jack E. Scott, WB5WPN; John W. Semene, VE6CAB; J. D. Shamburger, WB5NXJ; Shirley A. Sharan, K2OYG; Virginia Shaver, WA4QWC; Lacy P. Shawer, WB8FMW; James F. Shepherd, W4JCC; Robert P. Shimkus, W5TWP; Kent D. Shipley, WA3LEM; James B. Sims, W5RYA; J. S. Skaptason, WA0WOB; Timothy J. Slattery, WB5FTA; Robert A. Sloate, W7BMI; Arthur R. Smith, WB3DWB; Donald L. Smith, WA4MUW; Earl B. Smith, K2YLM; Edward Smith, WA6GKH; James Q. Smith, WB7OF; S. H. Smith; Talbot F. Smith, Sr., W7FRR; W. Edwin Smith, VE1AP; Keith E. Snavelly, WD4AFD; Clarence Snyder, W3PYF; Anton J. Sokol, W9JXN; Barry M. Sommers, W2BS; Paul M. Sorokes, WA3ZZR; Ronnie J. Stailey, WB5NXH; Keith J. Stanger; Daniel J. Stanks, W31PE; Dorothea K. Stirn, WA3WDM; Byron L. Stoerer, W7SWC; Raymond E. Stone, W5RBO; Tracy E. Strevey, Jr., WB6MAS/K25VS; Minekazu Sugiyama, JH1LKH; Len W. Sumner, VE3DOR; David E. Suuronen; William C. Swanner, K3HKN; Scott N. Swisher, WB9UCB; F. J. Swift, Jr., K4IP; Ronald G. Tate, WA5OQZ; Larry W. Taylor; William W. Taylor, WD5BGA; John H. Templeton, K1MBA; Jon D. Teske, W3DRV; James E. Thayer, W1FZ; Richard T. Tiek, WA4LMF; Erwin D. Toeber, W9MSL; Ronald E. Tomchin, WA2ARO; Ward F. Trammell, WA5NRT; William O. Troetschel, K6UQH; Bill E. Tuck, K5EA; John A. Tyburski, K2VPR; Mike Vaia, WB8VBW; David Valiton, WB4FZU; J. Clark Van Bloom, WB8BFY; Clifford Vance, W6LRC; Jack L. Walker, W3YW; Herman C. Wall, K5FM; Ralph J. Walsh; Charles R. Waters, WB5NCM; Ronald E. Watkins, K0ETD; Kenneth J. Watson, K6AYX; Robert E. Weaver, W4TYE; Lloyd C. Wells, WB4EYW; Daniel P. Welch, W7WL; Steven L. Welton, WB0IUN; Thomas P. Wember, W9DWC; Don G. Whitaker, WB5ROT; Gary J. White, WB9BUU; Terry A. White, KL7IAK; Harold J. Wilkinson, WB6JGS; Edward E. Wille, W9PWG; Robert W. Willis, K2GLS; Charles A. Wilson, WB8SYE; Lowell W. Wilson, W9NUC; Phillip A. Wilson, Jr., WA6CRA; Michael A. Wolford, WB3BOK; John K. Wood, Jr., K61IS; W. Mike Wood, WA4UKU; Victor A. Wooding, W9JNH; Paul H. Wray, WD8BOZ; Leonidas R. Wright, K4MG; Stanley F. Wucher, Jr., K5DSH; James E. Younce, K4LXU/K4ZM; David D. Young, W0GEI; Kenneth L. Young, W3RUR; David R. Zimmerman, W3ZD; Douglas N. Zuckerman, WA2QJU; Samuel Zuidema, K7HR;

List No. 2

Masanobu Abe, WB6OGK; James W. Abraham, WB6QGO; Chester T. Alderman, W4BQF; Anselm Allen, WB5JLD; Robert J. Almeida, WA3HBT; Vick Applegate, WA7DEO; Lawrence F. Applet; Donald R. Austin, WA3KXC; Larry R. Baine, W8GBR; Thomas W. Barefoot, WA4YQT; George M. Barnes, W8RH; Lynwood R. Barnes, W6PMT/WA6UVX; Thomas F. Barrett, W1KUE; Gene N. Barry, WB5BBS; William K. Batchelor, W5UZO; David T. Baxter, WA4JH; Wallace S. Bell, KL7IPP; William J. Bennett, K3TNM; Edward J. Berbari, WB4BVP/WA8PXP; David A. Bergeson, WB4ISC; Michael Berlin, WB2FIG; James E. Bevancon, K8SIA; Edward L. Bever, WB0SYT; Roger R. Bisby, WB0DRJ; Edwin E. Blalack, WA4DPU; Lynn A. Blesh, WA0ODH; Robert A. Blum, W3TNR; George Bond; Gustav C. Bonow, W9HW; Benjamin S. Booth, W4LBS; Wayne A. Bortner, WA8RTQ; H. Warren Brainard, WB4DAR; George C. Brandenburg, WA7MZI; Travis L. Brann, WA5RGU; John D. Brannon, WA4RBO; W. A. Breining, WD9AUM; Richard L. Brock, W6LXC; Harold E. Brown, VE3DMB; James A. Brown, Jr., W5DRP; William B. Brown,

K4NJ; William P. Brown, W6ZUM; Edward Buckmaster, WB7FFW; Frank G. Burford, W7ELH; Jack P. Burke, W6BK; Donald W. Butler, W9TTJ; Edmund J. Buxton, VE8AP; Henry E. Byers, WA2EHG; Reginald R. Cain, Jr., W4CYC; Lys J. Carey, K0PGM; Joseph J. Caronita, WB4ZBT; Richard T. Carpentier, WB9CAH; Robert G. Carter, WA5UNR; Bruce N. Cavanaugh, W9GOI; Kenneth S. Ching, KH6JAZ; Lawrence K. C. Ching, KH6ZD; Thomas B. Christopher, WA2LQL; Neuman F. Church, WB8VRL; William D. Clark, W8TXM; Chester L. Coderre, W6VYV; Salvatore Cogliandro, VE2EGW; Michael F. Collins, WB0LET; J. Russell Comer, W0NKO; Joseph W. Corbett, W9BEU; Brian B. Covell, WB7DXQ; William A. Crabbe, VE3CUK; William H. Craft, WB4MUS; Doralie M. Crisp, K7OXL; George A. Cunningham, Jr., K6LZ; Bruce A. Curl, WB6DGH; Rankin A. Curtis, Jr., KH6HML; Frank C. Dahm; William F. Daley, K6BO; D. R. Dashney, VE2SH/VE3RM; Calvin Davidson, K8QGC; Charles A. Davis, WA3UTC; Neal W. De Loye, WA6ENV; Robert G. Dent, W4VJU; Wayne Derosssett, WA6BSQ; Ellen C. Deutsch, WA1WOA; Ronald D. Dillon, WB8DHQ; Paul D. Doocley, WB5ZIP; Wayne A. Downer, WB8TFM; Irvin C. Dumas; Lawrence E. Durham, WB8EQC; Peter W. Dwyer, WB3QCQ; Wells M. Ebers, W5MIG; Willard D. Epperson, WB9CFE; Kent Evans; Sharrol T. Felt, W7OSI; Ray E. Felt, Jr., WA4GOS; James L. Fenton, WA1LNF/K1JH; John V. Fieldly, WB2ZQZ; Paul T. Fisk, WB6U1X; Charles M. Flesher, WA6GKW; Jerry L. Foland, WA4TTL; Thomas G. Ford, WA4GJS; George W. Fort, WA4TNO; Guy Fournier, VE2EJO; Brian S. Fox, VE3EBF; John W. Frank; Walter W. Frank, WA3RWP/KA2WF; Henry W. Fulwider, WA4AL; Eugene A. Gaffney, W7FOS; Clarence F. Galli, W5VFN; Gene Garrage, WB8UCF; James M. Garrett, WB4VVF; Curt George, W4SSU; Michael K. George, K9ORU; Roy Gerlach, WA6THJ; Walter R. Gesell; Kent H. Gibb, VE6BAF; Marvin Gilkeson, W9ERQ; Sanford Glanz, WB5RNC; Stuart V. Glenn, K1PNS; Hugo Goodman, VE7CLG; David Gordon, WB5QOI; Dale C. Gorsuch, K5AKW; Bill Gosney, WB7BFK; W. C. Gould, V5PWG; Frank F. Grabenhofer, WB9VRV; Stephen J. Gradjan, WB5KIA; Arthur Grant, WA1RVZ; Robert W. Green, K4UF; Stephen Green, WB5KUT; Norman Greenberg, WB9TOT; Sylvia Greenberg, WB9TOV; Charles F. Grey, WA7WOU; Robert S. Grossman, K1GJP; David E. Hall, W9AOK; Jack D. Hammett, Jr., K4VV; Robert H. Harder, WB8LLI; Laetitia C. Hardie, VE3HIR; Allan B. Harris, WA7JWC; William H. Harrison, K6ZI; Peter C. Hartman, WB2VQQ; John S. Harvey, WB4KIT; Scott M. Harwood, K4VWK; Herb H. Hawken, WA7ESX; E. J. Heatley, VE3FRU; William M. Henderson, K6ZHA; Russell S. Henry, W5HRS/WB9PVT; William J. Herbert, WB5MVR; Jeffrey R. Herhold, WB7ABM; Robert D. Herman, W4NC; Michael J. Heslin, VE3FOY; Roger M. Higley, W8CRK; Dwight B. Hill, K2KWK; Edward T. Hilliard, W6SHZ; Walter W. Hoffman, WA6KGS; William C. Hoffmeyer, WB4ASL; William F. Hogan, WB4WQU; Gregory J. Holch, WA1FAX; Curtis R. Holsopple, WB9CAF; Fred Hopengarten, W1NJJ; Tamar R. Hornik, WB9LAA; Jim Howe, WA6INI; Chester F. Howes, WD8CZV; Edward L. Hoyt, K8JJK; Joachim Immelnkemper, DK2BI; Mike Irwin, K7CPC; A. Frank Isele, WA4BDD; Fay Isele, WA4BDE; Henry S. Jacobs, WA3QVP; Bruce D. Jones, WA6STA; Marjorie M. Jones, W5ZPD; Michael L. Jones, WB5BJH; Paul M. Jurewicz, W8LZM; V. Dee Justensen, K7DEQ; David Kazdan, WB8QYM; George R. Keller, W2DM; Richard C. Keller, WB2UFG; John J. Ketterlinus, Jr., K3JLF; Charles G. Ketterman, K6EN; James A. Kew, WB9WZF; Maxwell C. Kimball, K4JVN; Joe King, WB5NUD; John W. King, III, WB4NHX; D. Paul Klein, WB0DHF; Edward D. Knight, Jr., WA8PFB; Philip J. Kopczyk, WB3FKK; Kei Kosaka, J11TA; Ken Kreton; Kenneth F. Kugler, WA7TEG; Harold D. Kunke, K9KTZ; Harry A. Lafferty, Jr., WB6LZA; Bruce R. Landis, WA7YFJ; Larry Langevin, K1GXU; Lester R. Larson, W0UP; Howard C. La Tourneau, WA8ILQ; Charles A. Leach, III, K4OMZ; Fredric A. Le Beau, WA8EPM; Louis Lecheneger, W5HLH; Albert F. Lee, KH6HDM; John H. Lehman, WA8MHO; Barry Leibha, WA4GAJ; W. L. William Letovsky, VE2QL; J.

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Strays

I would like to get in touch with . . .

- hams who also collect postage stamps to set up a duplicate exchange net. Dave Miller, KP4BPH, Box 6113, Hilton Head Is., SC 29928.
- any real-estate organizations or individual agents who belong to amateur radio clubs or who operate local or national ragchew nets. W. W. (Bill) Smith, KH6IRL, 145 Ridgfield Ct., Orange Park, FL 32073.
- amateurs who are members of Charismatic Christian communities and prayer groups who would be interested in forming a weekly fellowship net. Francis R. White, WA4ZYN, 5059 Hampshire, Memphis, TN 38117.
- any foreign amateur who needs a QSL manager in the U.S. Jim Ray, WB8VYI, 20 S. Oensmore, Muskegon, MI 49442.
- amateurs who served in the 136th Signal Radio Intelligence Company, Army Air Force (WWII), that was headquartered at Bolling Field, Washington, DC, and later at Ft. Meade, Silver Springs, MD. Willard J. Zahalka, K4HOE, 204 Westover Rd., Frankfort, KY.
- hams who are born-again Christians to start a round-table DX net. Wallace D. Christensen, Jr., Box 13, CINCUSNAVEUR London, FPO New York, NY 09510.
- anyone knowing the whereabouts of Tom Moyer, formerly K7HHI, Bill Moore, K7IOO, 405 Roosevelt Rte. 1, Grand Coulee, WA 99166.
- old-timers who have knowledge of the history or design of the Hallicrafters Dual Diversity receiver Model DD1 circa 1939. Also any present or previous owners of the receiver. John J. Nagle, K4KJ, 12330 Lawyers Road, Herndon, VA 22070.
- amateurs who are members of the Photographic Society of America to form a PSA net and make up a list of PSA/hams. Gene Santoski, K9UTQ, 1220 18th Street S., Wisconsin Rapids, WI 54494.
- anyone with a Hammarlund HX-50A experiencing difficulty with power transformer buzz or transmit relays. Jerry Martin, WB2ZOC, 7 Keenon Pl., Caledonia, NY 14423.

□ hams involved in the "Right-to-Life" movement who are interested in starting a net. Pete Stillson, WA9BAB, 57181 Poppy Rd., South Bend, IN 46619.

□ amateurs in the field of law-enforcement who would like to form a 40-meter net in the five-state area of TX, OK, LA, AR and NM. Wayne Brandon, WB5HMB, 834 Brookshire Circle, Garland, TX 75043.

□ anyone who can help me obtain information about the design and construction of antique car radio antennas. John Carr,

WA1WTO; 244 Corey St., W. Roxbury, MA 02132.

□ 2nd Class Radiotelegraph license holders who would like to go to sea as a radio operator. E. R. Adams, K2YEF, 718 Graisbury Ave., Haddonfield, NJ 08033.

□ air-traffic controllers, active or retired, including FSS, Center and Tower, for a net on 7.240 MHz on Tuesdays at 2400 UTC. Star Ketcham, WB0RBH, 3345 S. Lexington Ave. Eagan, MN 55121.



This family could sway the vote of the Richmond (IN) Amateur Radio Association — all five are hams! Kiffin Gilbert (r), WB9AND, found that his son was interested in the hobby. So he helped Skip become WB9ZNN. Soon his daughters Suzy and Kathy wanted to join the Richmond ARA's Novice class. Mother Marieta went along. They are WD9AHU, WD9AHV and WD9AHW, respectively. The club had better keep the family happy, or their votes might carry a motion the other members don't want! — WA1STO

ARRL to FCC: Killing Special Calls Won't Solve Workload Problem

In March, reacting to a substantial increase in the workload at its Gettysburg, PA, licensing unit, the Federal Communications Commission proposed to eliminate virtually all types of amateur station licenses other than primary. In other words, club, RACES, military recreation, special-event and secondary station licenses would no longer be issued to new applicants, and existing licenses would not be renewed upon expiration. Specific call signs, for which certain applicants are now eligible, would also be eliminated under the Commission's Notice of Proposed Rulemaking in Docket 21135 (May 1977 *QST*, page 58). The Commission argued that the processing of these types of applications consumed a disproportionate amount of its resources and that its most important task was the issuance of primary station licenses.

On June 6, the ARRL submitted an exhaustive, 60-page response to the Commission's proposal, taking exception to each and every facet of it. In short, the League's position is that the elimination of any of the presently available types of amateur station licenses would have a severe impact upon amateur radio, and that, moreover, the effect on the Commission's workload would be insignificant. The League's comments suggested a number of alternatives which would be far more effective and would have far fewer undesirable side effects.

In brief, the following points are made in the League's filing:

The Commission's most important task is not the processing of license applications, but the encouraging and support of the wider use of radio in the public interest. Drastic changes in the licensing structure cannot be made merely for the sake of administrative convenience if there is any harmful impact upon the public-interest use of radio.

Separate club station licenses are essential to the very existence of many club stations, especially those which rely on funding from nonamateur sources. Club stations are frequently used for training new operators and for emergency communications, and are often the only means by which some operators can get on the air.

Distinctive call signs for repeaters serve an

important function. If repeaters were required to identify by the call sign of the control operator on duty, massive confusion and unnecessary technical complexity would result.

The availability of secondary station licenses actually aids in reducing the Commission's workload, because otherwise a licensee with more than one permanent location (such as a summer cottage or winter home in the south) would have to notify the Commission *each time* he moved from one to the other. This could result in several exchanges of correspondence with the Commission each year. Furthermore, abuses of the present system are rare and do not justify the elimination of a useful type of license.

Military recreation stations serve a useful purpose. Those with distinctive call signs such as K4AF, K4CG, W4USN, etc., use the extra recognition afforded by these calls to good advantage in meeting their public-service objectives. The workload created by the tiny number of military recreation station licenses is completely insignificant.

Many special-event stations would be severely hampered in demonstrating amateur radio to the general public if distinctive call signs were not available for temporary use. Besides, these applications have always been processed in Washington, not Gettysburg, so their elimination would have no effect upon the Gettysburg workload.

RACES station licenses cannot be eliminated without adversely affecting the nation's emergency communications capabilities.

Preferred call signs have encouraged upgrading to the Extra Class and should be continued for that reason.

Even if the Commission's proposal is adopted *in toto*, less than 1,000 applications per month will be eliminated. By contrast, more than 20,000 applications per month, including more than 5,000 renewals, 7,000 new Novices, and 7,000 for "upgrades" are unavoidable. (Subsequent research at Hq. has revealed that the Commission was able to process more than 10,000 applications per month as long ago as 1962. This was the year *before* the Commission began using a computer for license processing. This writer re-

ceived his first amateur license in 1962 — eleven *days* after taking the Novice exam.)

In spite of all of the comments made above, it is apparent that the Commission has a very real problem which *must* be addressed. Some of the League's suggestions are

1) Place a temporary freeze on applications for new secondary station licenses and for specific call signs.

2) Process renewal applications only as personnel are available (because amateurs who file renewal applications in a timely manner may continue to operate beyond the expiration date until the renewal application is acted upon).

3) Return nonroutine applications to Washington for processing, thereby relieving the Gettysburg staff.

4) Seriously consider the feasibility of acceptance of assistance from individual amateurs and established clubs (not limited to ARRL affiliated clubs) in processing new Novice applications.

5) Employ an outside contractor to process amateur applications. (An outside contractor could do the job more efficiently, since modern data processing facilities could be used in place of the Commission's out-moded facilities.)

6) Seek funds for additional staff, and for the modernization of data processing facilities.

7) Reduce the number of unnecessary or frivolous CB applications by emphasizing the need for only one CB license per family.

The Commission's hard-working staff at Gettysburg is not to blame, in the League's opinion. The responsibility must rest with the upper levels of the Commission, with the people who are responsible for obtaining adequate funding for efficient operation. The proposal is an unjustifiable reaction to a short-term, temporary situation which is largely of the Commission's own making. In its filing, the League argues strongly that the Amateur Radio Service should not be made to suffer as a result. Copies of the complete filing can be obtained by writing to Hq., mentioning Response, Docket 21135, and enclosing a large (9 × 12, or so) envelope with 35-cents postage. — *K1ZZ*

"REPRIEVE" ON PURITY RULE

In the May issue we reported on new Section 97.73, *Purity of emissions*, in the FCC Amateur Rules. Basically, it requires that the mean power of all spurious emissions be at least 40

*Manager, Membership Services, ARRL

dB below the mean power of the fundamental without exceeding the power of 50 mW when the transmitter is operating below 30 MHz. On frequencies between 30 and 235 MHz, the limits are 60 dB or 40 dB without exceeding 25 microwatts, whichever is the less stringent.

Requirements for very low-powered equipment are somewhat less severe. The rule became effective April 15.

In the June issue, we reported the efforts of ARRL to lessen the impact of the rule insofar as existing equipment is concerned.

The R. L. Drake Company and the Amateur Radio Manufacturer's Assn. also filed comments requesting modifications of the order.

In partial fulfillment of these requests, FCC has changed section 97.73 again, so it now reads

97.73 Purity of emissions.

a) Except for a transmitter or transceiver built before April 15, 1977 or first marketed before January 1, 1978, the mean power of any spurious emission or radiation from an amateur transmitter, transceiver, or external radio frequency power amplifier being operated with a carrier frequency below 30 MHz shall be at least 40 decibels below the mean power of the fundamental without exceeding the power of 50 milliwatts. For equipment of mean power less than five watts, the attenuation shall be at least 30 decibels.

b) Except for a transmitter or transceiver built before April 15, 1977 or first marketed before January 1, 1978, the mean power of any spurious emission or radiation from an amateur transmitter, transceiver, or external radio frequency power amplifier being operated with a carrier frequency above 30 MHz but below 235 MHz shall be at least 60 decibels below the mean power of the fundamental. For a transmitter having a mean power of 25 watts or less, the mean power of any spurious radiation supplied to the antenna transmission line shall be at least 40 decibels below the mean power of the fundamental without exceeding the power of 25 microwatts, but need not be reduced below the power of 10 microwatts.

c) Paragraphs (a) and (b) of this section notwithstanding, all spurious emissions or radiation from an amateur transmitter, transceiver, or external radio frequency power amplifier shall be reduced or eliminated in accordance with good engineering practice.

d) If any spurious radiation, including chassis or power line radiation, causes harmful interference to the reception of another radio station, the licensee may be required to take steps to eliminate the interference in accordance with good engineering practice. Note: For the purposes of this section, a spurious emission or radiation means any emission or radiation from a transmitter, transceiver, or external radio frequency power amplifier which is outside of the authorized Amateur Radio Service frequency band being used.

ELECTION NOTICE

It is time for ARRL Full Members in the Atlantic, Canadian, Dakota, Delta, Great Lakes, Midwest, Pacific and Southeastern Divisions to begin picking a director and a vice director in each division for the two-year term which will begin January 1, 1978. From now until September 10, at noon, nominations will be accepted at League headquarters bearing the signatures of 10 (or preferably more) Full Members of a division naming a Full Member of the division as a candidate for director or vice director. The nominee must be the holder of at least a General class amateur license, or a Canadian Advanced Amateur Certificate, must be at least 21 years of age, and must have been licensed and a Full Member of the League for a continuous term

of at least four years at the time of the election. No person is eligible who is commercially engaged in the manufacture, sale or rental of radio apparatus capable of being used in radio communication. Neither is a person eligible who is commercially or governmentally engaged in frequency-allocation planning or implementation. Finally, no one can run who is commercially engaged in the publication of radio literature intended in whole or in part for consumption by radio amateurs. The idea behind these rules is to insure lasting interest in amateur radio and the League, legal capacity to make decisions for ARRL, and freedom from conflicts of interest.

Balloting Later

Wherever there is more than one candidate for either office, ballots will be sent to all Full Members of the League in that division who were in good standing on September 10. The ballots will be mailed not later than October 1 and, to be valid, must be returned to Headquarters by noon, November 21. A group of nominators can name a candidate for director, for vice director, or both, but there are no "slates" as such — each candidate appears on the ballot in alphabetical order. If a person is nominated for both director and vice director, the nomination for director will stand and that for vice director will be void. A person nominated for both offices does have the option, however, of declining the higher nomination and running for vice director if he wishes.

Since all the powers of the director are transferred to the vice director in the event of the director's death, resignation, removal outside the division, or inability to serve, careful selection of candidates for vice director is just as important as for director.

Nominating Form

The following form for nomination is suggested; it may be copied onto any paper, or a blank following this form can be obtained from Headquarters on request:

*Executive Committee,
The American Radio Relay League,
Newington, CT 06111*

*We, the undersigned Full Members of the ARRL residing in the . . . Division, hereby nominate . . . of . . . as a candidate for director; and we also nominate . . . of . . . as a candidate for vice director from this division for the 1978-1979 term.
(Signature . . . Call . . . City . . . Zip . . . Date)*

Nominees or, indeed, any member, may obtain a copy of the Articles of Association and Bylaws, along with a pamphlet outlining the duties and responsibilities of elected League officials.

"Absentee Ballots"

All ARRL members who are licensed by FCC or DOC but are temporarily residing outside the U.S. or Canada are now eligible for Full Membership. These members overseas who arrange to be listed as Full Members in an appropriate division prior to September 10 will be able to vote this year where elections are being held.

Even within the U.S., Full Members temporarily residing outside the ARRL division they consider home may now notify the secretary prior to September 10, giving the

current QST address and the reason why another division is considered home (as for instance, holding an amateur call appropriate to the division). So if your home division is the Atlantic, Canadian, Dakota, Delta, Great Lakes, Midwest, Pacific or Southeastern Division, but your QST goes elsewhere, please let the ARRL secretary know, as soon as possible but no later than September 10, so you'll receive a ballot for your home division

The Incumbents

Presently these persons hold the office of director and vice director in the division conducting elections this year: *Atlantic* — Harry A. McConaghy, W3SW and Jess Bieberman, W3KT; *Canadian* — Ronald H. Hessler, VE1SH and William W. Loucks, VE3AR; *Dakota* — Garfield A. Anderson, K0GA and Tod A. Olson, W0IYP; *Delta* — Max Arnold, W4WHN and Malcolm P. Keown, W5RUB; *Great Lakes* — Richard A. Egbert, W8ETU and William E. Clausen, W8IM; *Midwest* — Paul Grauer, W0FIR and Claire Richard Dyas, W0JCP; *Pacific* — J. A. "Doc" Gmelin, W6ZRJ and William W. Eitel, WA7LRU; *Southeastern* — Larry E. Price, W4RA and Bev. B. Cavender, W4ZD.

In summary: Petitions need 10 or more signatures of Full Members and are due at Headquarters by noon, September 10. If there is only one candidate for an office, he'll be declared elected by the Executive Committee; otherwise, ballots will be mailed not later than October 1 to Full Members of record. September 10. To be valid, ballots must reach Headquarters before noon, November 20. The new term will begin at noon, January 1, 1978.

For the Board of Directors:
June 1, 1977

*R. L. Baldwin, W1RU
Secretary*

REQUEST FOR RULEMAKING

The Ohio Council of Amateur Radio Clubs has asked FCC, in RM-2872, to provide for interim licensing for those successful applicants for Technician or higher license who do not already hold some class of FCC license (and thus are not eligible for the current interim licensing system). They propose allocating calls with a distinctive prefix, such as W1, and with a two-letter identifier at the end for a six-month period. Thus, W12AAA/NY might be issued to the first applicant at the New York City office and W12AAA/BF to the first one at Buffalo. Those wishing to support this concept should write FCC Personal Radio Division, Washington, DC 20554, mentioning RM-2872.

EXAMINERS FOR NOVICE AT 18

The Federal Communications Commission has reduced the minimum age of volunteer examiners from 21 to 18. Effective on June 13, the action responded to a petition filed by Gordon H. Piper, WB4EKC. The text of the introduction to Section 97.28(b) now reads:

(b) The examination for a Novice class operator license shall be conducted and supervised by a volunteer examiner selected by the

applicant, unless otherwise prescribed by the Commission. The volunteer examiner shall be at least 18 years of age, shall be unrelated to the applicant, and shall be the holder of an Amateur Extra, Advanced or General class operator license. The written portion of the Novice class operator examination shall be obtained, administered and submitted in accordance with the following procedure: [remainder of section unchanged.]

BEHIND THE DIAMOND

If you call or write Hq. with a question about fm, who does your question go to? Well, I can tell you who it does *not* go to: It does not go to *Tony Dorbuck*, assistant technical editor for *QST* and the new holder of the distinctive call K1FM. Tony's major field of expertise is antennas, and why he would request K1FM is as mystifying as why someone would request K1ET.

Tony started at Hq. way back in 1955 on a part-time basis. Between sessions at school, he worked in the production department and as operator for WIAW. After a break of some years he came to the League full time in 1971, again as WIAW operator. He went to the technical department in 1972 as editorial assistant, and became assistant technical editor in 1973. In 1976 he assumed the additional title of ARRL *Handbook* editor. He has also served at various times as "Hints and Kinks" editor and "Recent Equipment" editor.



Tony Dorbuck, W1YNC/K1FM

Tony has a sound educational background for the job. In 1959 he earned his BSEE degree from the University of Connecticut, and in 1963 earned his MSEE from the same. During his post-graduate years he also served as an instructor of mathematics and electrical engineering. He has also had experience in industry: He was an engineer for Singer Company from 1966 to 1970, working in the instrumentation division.

Tony also holds the call W1YNC. He is past president of the Singer Amateur Radio Club, and present member of the Connecticut Wireless Association. He has gone out for Field Day with the CWA for 20 years straight, serving as cook (no comment)! On the public service side, he is the emergency coordinator for New Britain, CT, a major industrial center southwest of Hartford.

Tony's hobbies, other than amateur radio, are fishing, boating and photography; in fact, he owns a small boat of his own. But when asked about his hobbies, he always mentions the *Handbook*, which he includes on the list. He says he spends much of his spare time

working on the *Handbook*, not because he has to, but because he enjoys it. His dedication to the *Handbook* is evidenced by the quality of the product.

One sad note which we are obliged to pass along to you: Shortly after Tony purchased his HP-25 programmable calculator, the price dropped by \$75. Tony hasn't been the same since. — *K1FHN/K1ET*

AGENCY COORDINATION DROPPED

In response to requests from the Office of Telecommunications Policy, the Department of the Interior and the Department of Agriculture, FCC has deleted from its rules coordination procedures between the Commission and the U.S. Forest Service and the Bureau of Land Management for handling applications for transmitting facilities to be located on lands or reservations of these Federal departments. Thus, section 97.41(f) of the Amateur Rules is canceled and marked "Reserved" (until the number is needed for a new rule at some future date).

FCC EXAM SCHEDULES READY

A new edition of Bulletin FO-28 has been issued by FCC, covering the amateur and commercial radio operator examination schedules for the period July 1, 1977 through June 30, 1978. Copies are available from any office of FCC; a limited supply is also at Hq. — ask for FO-28 and enclose a stamped, self-addressed envelope for fastest service.

EVERETT L. BATTEY, W4IA

It is our grievous duty to record the passing, in June of Everett L. Battey, W4IA — outstanding amateur, former Assistant Communications Manager on the ARRL staff, and later a director from the Roanoke Division. Most of his 68 years were deeply involved with radio, not only as an amateur but also professionally in various government/military areas.

First licensed as IUE in 1925, Ev made that a well-known call in the Eastern Massachusetts section, distinguishing himself as ORS and RM and, before long, SCM. A natural result was an invitation in 1929 to move to Hartford as WIBDI's right-hand man: ACM at League hq. The 30s were a time of heavy amateur and League growth, paralleled by expanding activities of the Communications Department, and W1UE had admirable qualifications to meet the challenge. While first and foremost a traffic man, Ev was nevertheless a well-rounded operating amateur, with DXCC, WAS and the like, a penchant for contests (possessing one of the most excellent fists ever heard on the bands), and an especially deep involvement in club organizational affairs.

One of the early members of the Naval Communications Reserve when it was created in the mid-20s, he was called to active duty as Ensign Battey in 1940, as the war clouds thickened. A first post was as instructor at the Noroton (CT) Navy radio school, where he helped polish the military communications

skills of other newly called ham-reservists. Later, he was moved to Washington as field liaison officer for the entire Navy radio operator program — some 40 schools in all.

Postwar, Ev rejoined the ARRL staff, but apparently found it less exciting than Washington; in 1947 he returned to active Navy duty, acquiring W4IA for his new Arlington, VA, home. Local amateurs soon convinced him to run for the Roanoke Division directorship, a post he won handily as of January, 1949 — right in the midst of an earlier incentive-licensing hassle (Docket 9295) between FCC and the League. Unfortunately, a new Navy duty assignment later that same year was judged by him as a potential conflict of interest, and he felt obliged to resign the ARRL office.

Commander Battey left active duty in 1953, after a hitch in Japan, but remained with the government as a civilian "communications specialist," the intentionally undistinguished title for those on "cloak-and-dagger" assignments. He retired in 1966 and shortly moved to Orlando, FL. He died with his wife in a double tragedy.

Ev Battey was a warm and personal friend of many amateurs. He was universally respected for his integrity, ability and undiminished enthusiasm for ham affairs over a career of more than 52 years. Our avocation is the better for his having been not only a practitioner, but an outstanding leader. Our deep sympathies are extended to sons Phil (W3FZV) and Bruce. — *W1RW*

STAFF NOTES

Basic Radio Editor Jim Bartlett, WB9VAV, comes to the technical staff at ARRL hq. from Indiana. He grew up in Indianapolis, where, as a result of exposure to the hobby of ham radio through his grandfather (W9MC), he developed an early interest in electronics.



Jim Bartlett, WB9VAV

Jim attended Northern Arizona University and was graduated in 1975 with a B.S. in journalism — radio and TV. He worked briefly for WLFI-TV before joining Lafayette Radio Electronics at an associate store in Kokomo, IN, as audio manager. Re-exposure to ham radio at this point revived Jim's fascination with the hobby, and he soon received his license.

When Jim came to the technical department, another husband and wife team joined those working at Headquarters. Michele, Jim's wife, is employed in the production department, doing final layouts for *QST* articles. — *K1TD*

Correspondence

The publishers of QST assume no responsibility for statements made herein by correspondents.

PUT DETRACTORS ON DESKIDS

□ The FCC issued almost one-million CB licenses in the month of January alone. CB owners today may be likened to the first people to get telephones. To have or operate one does not automatically signify that the person is a freak or criminal. From among the many new amateurs who still own CB radios, we have had a resurgence of healthy, law-abiding, enthusiastic amateur participation the likes of which have not been seen in our town ever! They're upgrading so fast we had trouble fielding a Novice station for Field Day!

Here's a suggestion for the detractors (WB8KFD included). Get out of the "feet propped up at meetings/entertain me/I ain't helpin' nobody 'cause nobody helped me/all us hams are better'n all them Cbers" attitude, hie down to the club training classes and start teaching good amateur practices by being an "Elmer" to a budding new ham who never heard of amateur radio before he (she) became a Cber — and remember how we never got off our fat tails to tell anybody about ham radio? If growth is titled "empire building," I am all for it. Without the CB phenomenon we'd still be declining in total number of licensed hams and on our way to extinction.

For every "notoriously lawless Cber" identified by WB8KFD as also lawless on amateur radio, I'll supply the name of one lawless, long-term non-CB ham. Such individuals are in the distinct minority and should not be credited, as typifying the average operator in either radio service. — Robert N. Dyruff, W6POU, Santa Barbara, CA

THANK YOU

I received my Novice ticket December, 1975, and passed the General test the following March, so I was a Novice for less than three months. As a Novice I got on the air with my shaky fist and was so nervous for the first month I almost gave it up. When a ham with a two-letter call would answer my CQ, I would almost fall apart from nerves. Whenever I didn't understand something they sent, I would ask what they meant and they always explained it to me. I remember K7DEJ who told me the only dumb question was the one that wasn't asked. These higher class licensees gave me encouragement and even said I had a nice fist when they knew my cw was awful.

Without the help of these higher class licensees, I would still be a Cber! — Tracy Sheehan, WB0RNA, Sioux Falls, SD

LOBBYING?

□ I do not consider my membership dues an endorsement of your policies either. I support the League because having ARRL is better than no representation at all. I can do without such nice extras as unnecessary membership services, new buildings, QST, etc. What I can not do without is frequency allocations. What I worked hard for is those frequencies. Take my money, put it and a concerned effort forth where it will benefit all of ham radio — in quest for frequency space. Do it, even if it means nonprofit lobbying. — Richard Miller, WA4OET, Ft. Belvoir, VA

CQ SPACE CADETS

□ Most hams are probably not aware that in

March of 1976 the FCC activated a new toy walkie-talkie band on 49.82 to 49.90 MHz. In March of 1978 the sale of the present toy walkie-talkies (CB) must cease, so the new ones will probably appear on the market at that time. It should be a simple matter to change them to operate on 6 meters. This could provide a lot of ham activity at low cost. — "Chick" Grimes, W4JBW, Ludlow, KY

WAS THAT 803 OR 827?

□ Thanks for converting UTC to EDST in the revised W1AW Operating Schedule. That's a big help to us poor souls who have been struggling for years converting to our local time. So, now I can listen to the cw bulletins at 0300 which is 11 P.M. here and then the phone bulletins at 0430 which is 12:30 P.M. . . . What? You too, QST? Oh NO! — Harry Bloechle, K4WP, St. Petersburg, FL

STUCK IN THE TRASH

I have just finished reading Dockets 20777, 21116, 21117 and 21135. If passed, these dockets would (a) set for the first time limitations on transmitters and linears, (b) ban linears capable of operation in the 24- to 35-MHz range, (c) abolish all additional station licenses, beyond primary, and (d) doom all special calls. I hope that all hams will write their senators and congressmen to get these dockets stuck in the trash. If every ham would write his senator and congressman, over 900,000 letters would go to our representatives. — John Clark, WB3ERU, Hagerstown, MD

□ I would support any logical way of alleviating the immediate crisis at the FCC short of losing (before I get to enjoy them) some of the privileges of ham radio. How about a list of "likes and dislikes" or "wants and don't wants" published in QST along with mailing addresses for the senators and congressmen. I would like to see the amateurs totally administer the Novice test as this would remove some of the FCC's work load, ensure the level of control and prevent the demise of this class of license. — Erick L. Walters, WB1DHZ, Quaker Hill, CT

QSL? QSL? QSL??? ????

□ Believe it or not, the last QSL was received only a few days ago for my Bicentennial WAS from the state of Washington after sending s.a.s.e.s, letters and requests to over 10 stations worked. The QSL from Utah had to be requested by registered air mail, return receipt requested, at a cost of \$2.68! You will also notice that ND and WY QSLs are made out to KP4CM, my new call since August 1976. I had to work them over and over again to get a QSL! It is shameful! Why the poor cooperation even when a letter asking for a QSL from their particular state, with s.a.s.e. included? — Miguel J. Enciso, KP4CM, Coral Gables, FL

□ Just a quick note to express my feelings regarding the ARRL outgoing QSL Bureau. It's great! I've used the facility several times since it was launched, and the results have been most satisfactory. At last, I am spared the drudgery of looking up QSL bureau addresses for a few dozen foreign radio

societies a year. The outgoing bureau has helped me formulate a new QSL policy: 100 percent for all DX QSOs right away. — Phil Goetz, N6ZZ, Los Angeles, CA

BOMB THE BUMS

□ While I write this letter I am monitoring a station using the call 29W871 operating 27.610 MHz with a spur on 28.650 MHz. When will the hams in this country have enough of this? Monitor these bums, get their names, addresses, tell the FCC. When the mail starts coming in, the FCC will think maybe it is time to take some real action. — James D. Pickard, WA1PSI, Derry, NH

OUT OF THIS WORLD

□ I would certainly like to see more articles about OSCAR. Why, six months ago I thought satellite communications was so above my head (?) technically speaking that I would have no chance of hearing it, let alone working it. — Daniel A. Rozek, WA2ZRL, Cheektowaga, NY

PIE ARE ROUND?

Wow! You've finally done it. "Design Your Own Active Audio Filters" is really a quantum leap into much higher quality. I am particularly happy to see the detailed explanation of mathematics in your pages. You are finally beginning to realize that some of us understand algebra. How great it was to be able to brush up on a couple of "toughy" problems. I certainly hope that you continue with your mathematical discussions in QST. Make them more sophisticated if you like, but continue them. — Richard Peterson, WA6HCC, Santa Ana, CA

WHERE IS MY RADIO???

□ After waiting a DOZEN weeks for a popular transceiver, I just canceled the order. My ARC-5 gets out fine anyway. Maybe QST should refuse to accept advertising until the manufacturer can fill his backlog. . . . and what about all the newcomers who will give up for lack of good rigs? — J. Nelson, WB0JKZ, Cass Lake, MN

UGLY DUCKLING

□ Just received my License Manual (1977 edition). It is a nice job except for that awful cover — musta been picked out in the dark. It's SIMPLY AWFUL. Nice to change the League's publication's appearance maybe, but NOT this way. Looks like the old electrical experimenter of Gernsback days. Please don't modernize (???) another of the publications, I mean coverwise. — Charles E. Gardiner, W2TB, Bayside, NY

□ You are to be complimented on the enlarged edition of the License Manual. I will miss the traditional League cover format on the publication covers. — James J. Kohter, KL7IDY, Anchorage, AK

□ I don't like the new License Manual. I like the old style with questions and answers and a page reference to the Handbook. I hope that others will also complain and the ARRL will bring back the original License Manual. — W. C. Neumann, K6ZHK, National City, CA

Think ... Before You Run That Patch

Is the ARRL against phone patches? Well, aren't *you* the ARRL? Here at ARRL headquarters, we certainly haven't filed any petitions with the FCC regarding patching. Well, then what's all the furor about? Simply this: We have confronting us the most crucial World Administrative Radio Conference ever. And the indiscriminate phone patching one can hear any afternoon on 20 meters is beginning to cause radio amateurs the world over a lot of unneeded grief and concern. (We're talking about phone patches between the amateurs of different countries, of course, and not discussing in this column the domestic phone patch.)

Are international phone patches illegal? Yes — *unless* a third-party agreement has been signed between the countries involved. We print the list below; and we'll be printing it more often in the pages of *QST*. We can't use the patch to substitute for a landline call, either. Listen to what the international radio regulations have to say about that: "When transmissions between amateur stations of different countries are permitted, they shall be made in plain language, and shall be limited to messages of a technical nature relating to tests and to remarks of a personal character for which, by reason of their unimportance, recourse to the public telecom-

munications service is not justified." (Article 41, ITU Radio Regulations)

So what you can talk about under the third-party agreements is rather limited. You *can* say "hello" to Aunt Min, but you can't say, "Sell Aunt Min's stock in Consolidated Ball and Chain!" You can say, "YA1XX will listen for you Friday at 1900Z," but not, "YA1XX is asking fellow amateurs to contribute pesos for a new tower." You can say, "We're praying for Father Jones and his mission"; you *can't* say, "Father Jones needs three gross more of hymnals in Swahili!"

If the third party for whom you are running a patch speaks in a language you don't happen to understand, you are still responsible for what that party says. So you should brief him before the patch as to what he can and can't talk about. We need hardly point out that all business communications are strictly prohibited.

On occasion, someone will write or call ARRL headquarters and say that we're making a mountain out of a molehill. Nothing could be further from the truth. Amateur radio has been stamped out in several countries already because of violations of this regulation, and its second part: "It is absolutely forbidden for amateur stations to be used for transmitting international communications on behalf of third parties" — *unless* third-party agreements exist between those countries.

We all know that WARC-79 will shape the future of amateur radio for the rest of this century. But are you aware that of the 153 member-countries of the International Telecommunication Union (which hosts the WARC and determines international telecommunications regulations), almost half (67) are not members of the International Amateur Radio Union — and that almost the same number have no organized amateur radio service? These countries comprise what is popularly referred to as the Third World. And at the present time, they hold nearly a majority of the votes at ITU. You can be sure that they are watching us closely, to see if what the ARRL/IARU WARC team has been saying about the need for amateur radio in developing countries is true. (We've been stressing, of course, that amateurs are law-abiding, professional communicators who provide vital technological expertise, emergency communications, and wide exposure to a developing nation's image.)

While we may not always agree with the severe restrictions imposed by international law (and the laws of other countries) concerning third-party communications, we had better adhere to them — or risk losing vitally needed frequencies at WARC-79 and, of course, the hope of signing future third-party agreements with other countries.

So, all we ask is that you think before you run that patch.

*International Services Assistant, ARRL

U.S. Third-Party Agreements

COUNTRY	CONDITION	COUNTRY	CONDITION
Argentina	1, 3b	Haiti	1, 3b
Bolivia	1, 3b	Honduras	1, 3b
Brazil	1, 3b	Israel	1, 3b
Canada	1, 2, 3b	Jamaica	1, 2, 3b
Chile	1	Jordan	1, 3b
Colombia	1, 3b	Liberia	1, 3b
Costa Rica	1, 3b	Mexico	1, 3b
Cuba	1, 3b	Nicaragua	1, 3b
Dominican Republic	1, 3b	Panama	1, 3b
Ecuador	1, 3b	Paraguay	1, 3b
El Salvador	1, 3b	Peru	1
Guatemala	1, 3b	Trinidad & Tobago	1, 3b
Guyana	1, 3b	Uruguay	1, 3b
		Venezuela	1, 3b

Stations in Greenland with XP calls; stations using calls like W1LVQ/8P6 from Barbados; station 7Z1AB *only* (in Saudi Arabia); 4U11TU and W7JXE/SU may handle traffic with the U.S.

Conditions: (1) We may handle messages on behalf of third parties provided that they are of the character that would not normally be sent by any existing means of electrical communication or except for the availability of the amateur station. (2) We may handle messages from radio stations in isolated points not connected into the regular electrical communication network, such messages to be handed to the local office of the commercial telegraph company for transmission to final destination. (3a) In cases of emergency, where the regular communication system is interrupted, amateurs may handle messages of any importance, same to be handed to the nearest point on the commercial telegraph system remaining in operation. (3b) Amateurs may handle, in emergencies, traffic relating directly to the safety of life or property.

CANADIAN AMATEURS!

Radio amateurs in Canada may now exchange international messages on behalf of third parties with Colombian amateurs, and Colombian amateurs may freely exchange with Canada. In addition, Canada has announced that a reciprocal operating agreement has been signed with the government of Colombia.



More than 190 of your fellow amateurs in the Republic of Panama turned out for the National Seminar for Radio Amateurs May 1st. Presided over by the Minister of Government and Justice of Panama, the amateurs and government representatives met and discussed all aspects of amateur communications, including future legislation which would affect the amateur and CB services in Panama. (HPIJC photo)

YL News and Views

Conducted By Louise Moreau,* W3WRE



ARRL National Convention, YL Activities

CLARA celebrated its 10th anniversary with a special luncheon as a part of the ARRL National Convention in Toronto in June. Cathy Hrischenko, VE3GJH, planned the theme of the YL program to cover international friendship through amateur radio with a special emphasis on getting to know each other on a YL to YL level rather than as just another contact in the log.

Guest speakers were Clara Reger, W2RUF, who originated the YL signature "33" in the early 1930s; VE3AYL, Gwen Burnett, tracing the early history of CLARA; Ethel Williamson, VE3DTW, on QSOs and YLs, and W3WRE of QST's "YL News and Views," on the growth of international YL friendship.

Over 80 YL operators attended the forum and luncheon representing six of the Canadian districts and six of the call areas of the United States. They included gals from the Maritime Sparkettes, Ontario Trilliums, CLARA, WAY-LARC, PJ-YL, WRONE, TASYL, Buckeye

Belles, NYCYLRL, Chix-on-Six, Laurel Lassies, YL Repeater Assn. and YLRL represented by two past presidents WA8EBS and K4LMB. These women, in turn represented QCWA, OOTC, Radio Club of America, SOWP, Morse Telegraph Club, and de Forest Pioneers.

At the forum we learned about plans for a history of Canadian YLs from the author VE3GJH plus the work of women amateurs of YLRL and TOT/CLARA who assist blind and handicapped amateurs through the taped reproduction of the club news with the addition of "YL News and Views" of QST as a part of the tapes.

As always, the hospitality and very special warmth of the VE gals were prominent at the CLARA booth. Their careful planning of the YL activities allowed us to attend the technical sessions, yet still meet and, in many cases, put faces on the voices and fists of our net and QSO contacts.

THE YL SUFFIX

Of the 29 countries that have granted the YL suffix to women amateur radio operators, Ellen White, W1YL, Deputy Communications Manager ARRL, has been the only YL to hold that call in this country until this year. In 1977 two more YLs were granted that distinctive suffix: Sandy Rutiser, W3YL, formerly K3SQX and Rosetta Reed, W8YL, formerly WA8USU. All three have passed the Extra Class examination. These two latest additions to the YL suffix gals bring the total to 63 women on all continents with that call.

FRENCH YL CERTIFICATE INTRODUCED

The DLG Award (Diplome du Lot-et-Garonne) has been recently introduced by French YLs for proof of contact with three YL stations located within the Lot-et-Garonne (post code beginning with 47). Logs with calls, dates, time, mode, band should be sent to Renee Chassard, Boite Postale 195 F 47707 Agen, France. Renee is the Diplome Manager for this award and requests eight IRCs be included with the log.

For those who speak French, there is a French YL Net on 3705 or 3710 MHz at 0900 UTC.

CLARA AC-DC CONTEST

The annual CLARA AC-DC Contest will be held September 10 and 11, 1977. All logs should be sent to the contest custodian Ann Nutter, VE3HAL, 135 Weston Place, Waterloo, Ontario, Canada N2J 3W2 and not to QST "YL News and Views." Rerouting to the custodians of the YL contests may involve a time delay that could disqualify the logs. Full contest details may be found in the QST "Operating Events" column.

Both CLARA AC-DC and the YLRL "Howdy Days" open the YL activities calendar for the fall-winter season leading to the YLAP in October.

1977 DX YL TO NORTH AMERICAN YL CONTEST RESULTS

The winners were DX phone: DJ0EK 714; DJ1TE 552.50*; F5RC 488.75*. NA phone: W2GLB 1108; VE3MRS 726; WA8EBS 432. DX phone scores: DL3LS 123.75; EA3AR1 234; G4EZI 304; G8LY 16; HB9ARC 221; I3MQ 143; JA1AEQ 20; JF1WMY 5; OA4JN 187; OE1YHA 332.50; OZ1AVV 192; PA0HIL 1.25; PY8IO 121; VK3YL 61.25; ZS6GH 36. NA phone: W2EEO 170; WA2NFY 143; WA2VIE 70; WA3ZAK 110; WB4PXN 308; K6DLL 330; WA8EKQ 61.25; WB9TDR 48; WA9TVM 154. DX cw: I3MQ 143; DJ0EK 70; DF2SL 9; DK5TT 4; VK3YL 5. NA cw: WA2DMK 11.25; K6DLL 7.5; W3CDQ 4; W2HFR 4; WA3ZAK 1.25. Highest combined score (phone and cw) DJ0EK 784; K6DLL 337.50.

*Indicates low-power multiplier.



5Z4PG Philomena Greenwood, only YL in Kenya, can be found on 10, 15 and 20 meters operating in the YLISB System. Phil and OM Ron will soon be working with an EA8 call from Lanzarote. They also hold VO-Seychelles calls. (WB9MFC photo)



Marie, W3MDJ, very active Delaware YL, has given many contacts for the WAS-YL Award. Marie is often found working on the YLISB daily frequencies. (WB9MFC photo)

DF2SL Anni Schwager, now visiting in the U.S., is looking for high-speed code contacts on 20 meters. At her home station near Munich, Anni enjoys contests and certificate hunting. (WA2NFY photo)

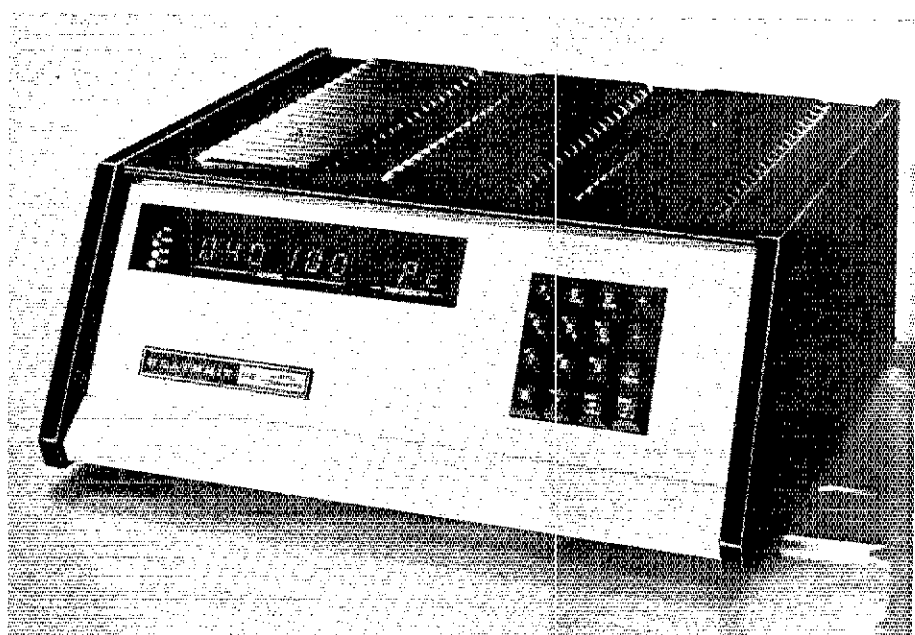


*YL Editor, QST. Please send all news notes to W3WRE's home address: 305 N. Llanwellyn Ave., Glenolden, PA 19036.

Microcomputers and Repeaters

We are hearing more and more about repeaters that are being controlled via microprocessors (or microcomputers). It is just a little mind-boggling to consider some of the things a minicomputer can do for a repeater system. Let's say that we encounter a state-wide emergency with several repeaters that can be linked together to provide vital communications. The microprocessor can be programmed to perform many timesaving and important functions. We could have information stored that would tell us which individual amateur stations were best equipped to provide coverage for particular areas, including band and emission capabilities. What's more, the computer could be programmed to contact automatically such amateurs and alert them to the emergency status. How? Believe it or not, we have seen demonstrations of "talking" computers — and they work. The linking of repeaters and whole systems can be automated (including logging third-party traffic, a necessary chore).

For the individual repeater, the computer can be set up to take care of membership rosters, vital statistics on each member, all dues and expenditure bookkeeping, and so on. Automated autopatch? Real simple to arrange. Automatic dialing can be installed that will handle fuzz buzzing at all levels. Once members get the know-how they could easily program autopatch interconnects to suit their individual needs from the car or portable!



Talking about computers and repeater control, here is a shot of the new Heath Co. H8 digital computer which has just been announced. We'll be doing a product review on this and other Heath Co. computer items later on. (Photo courtesy of Heath Co.)

Topic A on repeaters (no, it isn't sex) is usually FCC rules. It wouldn't be too difficult to set up the computer so that you could get

a reading at any time on any rule. That should be a good way to settle arguments (or start them). —

HOW TO REPORT SEVERE WEATHER — SKYWARN

"After reading in the 'FM Repeater News' section in May *QST* on how to report an emergency I would like to add my public service thoughts too on Skywarn, severe weather and how to report it. Being in charge of Skywarn since 1965 in northwest Ohio and southwest Michigan and a weather forecaster at Toledo, I find many amateurs are not aware of how to report severe weather — and where to report it. In my teachings to weather spotters I use what is called the four-by-four method. The National Weather Service is only interested in four kinds of weather:

- 1) Tornadoes
- 2) Funnel clouds
- 3) Hailstorms
- 4) Damaging winds

It makes no difference if you are mobile or fixed, if you see a severe-weather happening, report it. To report severe weather give the following information:

- 1) Location of the severe storm and/or tornadoes (nearest city)
- 2) Time it is happening
- 3) Direction of movement and speed, if possible
- 4) Call it into your nearest National Weather Service office, civil defense or law-enforcement agency.

Never give interstate routes or county roads. Always give location to nearest city or town. It is easier to locate on a map. As an example, assume W8XYZ saw a tornado 15 miles south of Podunck moving at about 30 miles an hour towards the northeast, at 4:15 P.M. The procedure would be for W8XYZ (if mobile) to call into the nearest repeater or simplex frequency. If the repeater had autopatch, then the autopatch would be used. Reporting procedure is simple: 'This is amateur radio station W8XYZ. I would like to report a tornado 15 miles south of Podunck moving northeast at about 30 miles an hour.' In northwest Ohio and the Toledo area we have two priority repeaters and one simplex frequency to handle all severe-weather traffic, plus several more options within 80 miles of Toledo. Needless to say, the amateurs are doing a darn fine job. If you haven't got a

Skywarn operation going in your area, it would help amateur radio to get one going. I suggest you get the repeater groups together and coordinate with the National Weather Service, c.d. or local law-enforcement agencies." — Merle G. Kuchenmeister, W8EWW

THE INTERNATIONAL VHF-FM GUIDE

We have just received a copy of the 1977 edition of the *International VHF-FM Guide* and are impressed by the excellent work of its compilers. The guide lists repeaters in Europe, Australia, New Zealand, South Africa and many other areas, including information on reciprocal licensing (including USSR). If you are planning on going abroad, we recommend that you obtain a copy of the manual. The price is \$3, postfree to U.S. and Canada. The address is Julian Baldwin, G3UHK, 41 Castle Drive, Maidenhead, Berks., SL6 6DB England.

*VRAC Liaison, ARRL hq.

Coming Conventions

July 30-31
Northwestern Division, Seattle, WA
September 16-18
Virginia State, Falls Church, VA
September 23-25
New England Division, Hartford, CT
September 24-25*
Delta Division, New Orleans, LA
October 7-9
Midwest Division, Wichita, KS
October 7-9
Southwestern Division, Santa Maria, CA
October 8-9*
West Gulf Division, Austin, TX
October 15-16
Pacific Division, San Mateo, CA
November 19-20
South Florida Section, Clearwater, FL

*Date Change

VIRGINIA STATE CONVENTION

September 16-18, 1977, Falls Church, VA

The third weekend of September, for hams of

the Mid-Eastern Seaboard, marks the 1977 ARRL Virginia State Convention sponsored by the Northern Virginia Amateur Radio Council. This event occurs during September 16-18 and offers a bag of goodies for everyone, including the CBers. Location is the Tysons Corner Ramada Inn in Falls Church, VA, a suburb of Washington, DC, at the intersection of Route 7 and Interstate 495.

A technical symposium is featured on Friday evening. Papers include "Microprocessor Control of Satellites" by Randy Smith, VE3SAT, and "The Windham Antenna: Fact and Fiction" by John J. Nagle, K4KJ. Also, Hal Richman, W3CIZ, will offer an update on "A General Review of TVI Causes - Effects and Solutions." Other papers are in the offing.

Saturday morning's session concentrates on *The Emergency Preparedness Structure in Virginia* in cooperation with the Red Cross and CAP, and includes the operational interface with CB. In the afternoon, the theme *Amateur Radio - A Public Service* will continue. This will include an ARPSC Forum monitored by George Hart, W1NJM, of the ARRL headquarters staff. In addition, Col. Margaret Williams, WA4FTJ, president of the Virginia State REACT and James B. Southworth, president of the Washington Metropolitan Area REACT, will speak on their organizations' public services. Phil Sager, WB4FDT, of the FCC will reminisce on Virginia nets and personalities. Saturday afternoon will be wrapped up by John E. Miller of NASA's Communications and Navigation

Division when he speaks on the use of satellites for land, mobile communications, and potentially enhancing air to emergency operations.

For the ladies, meanwhile, on Saturday, a special luncheon has been arranged at a popular restaurant with an authentic colonial setting. This will be followed by a shopping tour nearby at one of the largest malls in the world.

Featured speaker at the Saturday evening banquet will be Gordon Barnes, Washington, DC, television and radio weather forecaster at WTOP and one-time AP2GB and 9G1GB. Gordon will discuss weather with emphasis on sunspots and recite tales of frenetic ham operations while in Pakistan and Ghana.

On Sunday, there will be a traffic session and a League Officials Forum, including a presentation on WARC by Samuel E. Probst of the Office of Telecommunications Policy. A MARS program and seminar on ham insurance are also scheduled.

Between 10 A.M. and 4 P.M. on Sunday an open house will spotlight *Getting Started in Amateur Radio*, at no cost for registration with a hearty welcome to CBers. Experienced hams will speak on club training programs, learning the Morse code, the niceties of FCC examinations, DXing, radiotelephone, satellite communications, and the economics of getting started, all supplemented by League films on amateur activities.

Full details and paperwork are available from NOVARC, P. O. Box 682, McLean, VA 22101.

OST

Hamfest Calendar

Alabama: The North Alabama Hamfest is Sunday, August 21, at Calhoun Community College in Decatur. For info write North Alabama Hamfest Assoc., P. O. Box 9, Decatur, AL 35602.

Delaware: The 1977 Delmarva Hamfest is August 21 from 8 A.M. to 4 P.M., rain or shine, at the Delaware Technical College in Stanton. (Take the Stanton, Delaware Park Exit off I-95.) Tickets \$2 advance; \$2.50 at gate. Tailgating and tables \$2.50. Refreshments. Talk-in on 13/73, 146.52 and 3905. Contact John Low, K3YHR, 11 Scotsfield Dr., Newark, DE 19713.

Illinois: The SARA Hamfest is August 22 in Desoto. Prizes, food, auction; no charge for flea-market merchants. For info contact Nick Koenigstein, 2009 Gray Dr., Carbondale, IL 62901.

Indiana: The seventh annual Lafayette Hamfest is Sunday, August 21, at beautiful Tippecanoe County Fairgrounds located at 18th St. and Teal Rd. (IN-Hwy. 25) in Lafayette. Lafayette is 55 mi. northwest of Indianapolis, just off I-65. Camping on the grounds with limited electricity; modern restroom facilities. Tickets are \$2. Send check or money order to WA9ZDI, Bill Bayley, 1021 Beck Ln., Lafayette, IN 47905.

Indiana: The LaPorte County Summer Electronic Swapfest is Sunday, August 28, at the County Fairgrounds in LaPorte, 50 mi. southeast of Chicago. Paved midway and indoor booths available at no charge. Good food and cold drink available. Talk-in on 37/97, 91/61, or \$2 simplex. Tickets \$2 at gate. Info: P. O. Box 30, LaPorte, IN 46350.

Iowa: The 1977 Hawkeye Ham and Computerfest on August 20-21, is sponsored by the Des Moines Amateur Radio Assoc. in Des Moines. The site is Camp Dodge (in the suburb of Johnston on Des Moines' north border). Four buildings and a theatre for presentation by manufacturers of radio and computer equipment. Open to the public from 8:30 A.M. to 4:30 P.M. Technical talks, equipment and parts displays and a massive flea market. Donation for attendees \$2. Talk-in on 75 meters and 2 meters 34/94, 22/82 and 07/67.

Iowa: The Iowa 75 Meter Phone Net's annual hamfest is Sunday, August 28, in Riverside Park in Marshalltown. All are welcome to a pot-luck meal at noon with a short program.

Kansas: The 26th annual Kansas-Nebraska Amateur Radio Club's hamfest and flea market is at the Cloud County Community College, Concordia, August 13 and 14. FCC exams Saturday morning; form 610 to W0EIR. Free cocktail party at 5:30 P.M. Dinner follows; reservations required. Outstanding amateur-of-the-year award presented at dinner. W0DSY emcee. Sunday unofficial hamfest breakfast at 7:30 A.M. Technical talks, ARRL meeting, QCWA meeting, pot-luck luncheon, satellite display in operation, free power, flea market and manufacturers' displays \$10 per table, hams with less than 3 items free, club displays free, free passes to Concordia swimming pool, radio-controlled model-airplane demonstration in college parking lot; basketball and tennis on the grounds. Talk-in on 34/94 and 3920 kHz. For info and motel reservations contact W0ZIT, P. O. Box 462, Concordia, KS 66901.

Kansas: The Boothill Amateur Radio Club's hamfest is Sunday, August 21, in Dodge City at the Hoover Pavilion at Wright Park. For info contact BARC President Albert Vogel, 1802 Sixth, Dodge City, KS 67801.

Kentucky: The Bluegrass Amateur Radio Club's (Lexington, Kentucky) annual Central Kentucky Hamfest is August 14 at the Lexington National Guard located adjacent to the Bluegrass Field on Airport Rd., Lexington,

KY. Write Edward B. Bono, WA4ONE, Ass'n Chairman, Bluegrass Hamfest, 2077 Dogwood Dr., Lexington, KY 40504.

Massachusetts: The Northeast VHF Association's annual picnic is Sunday, August 28, at Mt. Tom State Park, Holyoke, MA. For more details send an s.a.s.e. to KIHTY at 36 Sweet Birch Dr., Meriden, CT 06450.

Michigan: The Straits Area Radio Club Swap n' Shop is August 13 at Petoskey, MI, on the Emmet County Fairgrounds, in the 4-H Bldg. Free parking, lunch counter. Talk-in 146.52 MHz and 3920 kHz; club call W8GQN. Donation \$1.50 at door; table donation \$1. For more info phone 347-4734.

Michigan: The Jewish Community Center of Metropolitan Detroit's Amateur Radio Club's fifth annual Swap n' Shop is August 21 at 6600 W. Maple Rd., West Bloomfield, CA. Bob Aronson, W8DGR, at 838-3534. Free parking. All welcome.

Michigan: The Marinette (Wisconsin) Menominee (Michigan) Amateur Radio Club annual picnic is Sunday, August 21, at Hene Park in Menominee. The celebration begins with a pot-luck dinner at noon. Fellowship and a continuing program in the afternoon with refreshments.

Minnesota: The Saint Cloud Radio Club annual hamfest is August 14, Sunday, from 10 A.M. 'til closing, at the Sauk Rapids Municipal Park. Free parking and overnight parking; hot dogs, pop and chili available. Swapfest and ham gear sale. Talk-in on 34/94 and 3925. For info contact Bill Zim, WA0GTO, R.R. No. 4, St. Cloud, MN 56301.

Mississippi: The Delta Amateur Radio Assoc. is sponsoring a hamfest in Greenville in the Washington County Expo Bldg. on August 13 and 14, \$1 per ticket.

Missouri: The second annual St. Charles Hamfest is August 28 at Diermanns Lake, 5 miles south of Ofallon on Hwy. K. Bigger and better; improved facilities. Tickets still \$1. Flea market, dealers, refreshments and plenty of parking. For advance info or tickets write (s.a.s.e.) to Dan Corbin, 1512 Sundowner, St. Charles, MO 63301.

Missouri: The Southwest Amateur Radio Club's annual hamfest is at Lake Springfield, just south of Springfield on August 28.

Montana: The Western Montana Amateurs are sponsoring the 30th annual Mini-Hamfest on Flathead Lake near Polson on August 13.

Nevada: The 1977 Sierra Hamfest is Saturday, August 13, in Reno at the California Bldg. Opens at 8 A.M. Appetizing luncheon buffet at 1 P.M. Swap tables, QSL design contest, new equipment displays, WCARS station, swimming pool, kids' playground, ragchewing, oldest and youngest ham. Call-in on 7255 or 146.94 simplex. Children 6 and under are free. Ages 7-16, \$4; 17 and over \$11 before Aug. 1. Make your own hotel/motel reservations early as August is a busy time. Make check available to Nevada Amateur Radio Assoc., Inc. and mail to P. O. Box 2534, Reno, NV 89505.

New Brunswick: The All Saints Amateur Group invites you to St. Andrews-by-the-Sea for a maritime hamfest. St. Andrews in NB is a picturesque town located just across the historic St. Croix River from Maine. Technical forum, flea market, antique radio show, outstanding speakers, exhibit of leading ham equipment, transmitter hunt, amateur group forums and meetings; family program, a home show tour, golf, swimming, tennis, shopping, luncheon, banquet and dance — all held September 3-5 at the Algonquin Hotel. For info write Hamfest '77, R.R. 325-8, Rothesay, NB, Canada E0G 2W0.

New Jersey: The 550 Amateur Radio Club flea market is Sunday, August 28, from 9 A.M. to 5 P.M. at the Oakland American Legion Hall, Oak St., Oakland. Rain or shine. Admission \$1; tables \$3, tailgate \$2. Talk-in WR2AHD, 146.49/147.49, 146.52. Dealers invited. Beverages available. For info write 550 A.R.C., P. O. Box 364, Oakland, NJ 07436 or call Rick Anderson, WB2QOQ, at 201-684-8569.

North Carolina: The Shelby Radio Club's 21st annual hamfest is September 3 and 4 at Cedar Park, 12 mi. north of Shelby on Hwy. 10. Camping facilities with hookups. Southern-cooked barbecue. For info write Bill G. Bridges, N4WH, 904 E. Main St., Shelby, NC

28150. 704-482-1239.

***Ohio:** The Union County Amateur Radio Club's Hamfest '77 is at the Plain City Fairgrounds, Plain City, Union County. Hours 7 A.M. to 5 P.M. EST. Admission is \$1.50 advance or \$2 at the gate.

***Ohio:** The Warren Amateur Radio Assoc.'s 20th annual hamfest is August 21 in the main bldg. of Kent State Univ. in Warren. Write for info to Gary L. Finmet, 7102 Kinsman Nickerson Rd., Kinsman, OH 44428.

Pennsylvania: The Mt. Airy VHF Radio Club (the Packrats) annual family picnic in the Flourtown area of the Fort Washington State Park on Sunday, August 14 (rain date, August 21). Talk-in via W3CCX on 52.525, 146.52 and 222.98/224.58 MHz.

Pennsylvania: The Erie Hamfest is Saturday, August 27, at the Erie County Fieldhouse at jct. of I-90 and Rte. 8.

Pennsylvania: The 22nd annual York County Hamfest is September 4, rain or shine, from 9 A.M. to 4:30 P.M. Registration \$3, KYLs and children free. No charge for tailgaters. New location (U.S. 30 Drag-o-Way at York Airport, Thomasville; 10 mi. west of York on U.S. 30.) Talk-ins 37/97, 52, 147.93/33. Fly into site. Saturday night campers welcome. Full service cafeteria, clean restrooms, electricity on grounds. Display tables under roof \$2 charge. By advance reservation only. Contact LeRoy Frey, K3POR, 170 S. Albermarle St., York, PA 17403, 717-854-1203.

South Dakota: The Signal Hill Amateur Radio Club of the Northern Black Hills area's Ham-Flea Market is August 20, 10 A.M. to 6 P.M. at the South Sturgis Church of Christ in Sturgis. Talk-in on 52/52. For more info contact Dennis Painter, WB0FYG, Box 759, Sturgis, SD 57785 or phone 605-347-3087.

***Tennessee:** The Bristol Amateur Radio Club, Inc. hamfest is in the Beacon Drive-In Theatre lot in Bristol, Aug. 13 and 14. Admission \$1; \$2 additional for flea market. Paul E. Booher, 1221 Jonesboro Rd., Bristol, VA 24201.

Tennessee: The Annual Cedars of Lebanon

hamfest is August 28 at the Cedars of Lebanon State Park (10 miles south of Lebanon on Rte. 231). Talk-ins mobile 3.980 and 2 meters. Bring food, drinks available. Bring gear to swap, sell or trade. Three campgrounds available. Thirty minutes from Opryland, USA. For info contact W4VJW or W4GVC on Tenn. phone net 3.980 weekdays 0645 CDT or write 203 West Main St., Gallatin, TN 37066.

Texas: The El Paso hamfest and swapmeet at Mesa Inn Motel is Saturday, August 20 and Sunday, August 21. Take I-10 to Executive Center Exit. Saturday: registration, seminars, ladies activities and banquet with a guest speaker. Sunday: an all-day swapmeet. Registration fees are swapmeet \$2; hamfest/swapmeet \$8/head, \$14/couple; total package (hamfest, banquet, swapmeet) \$15/head, \$25/couple. No registration for children under 15. For further info write El Paso Hamfest, P. O. Box 4573, El Paso, TX 79914.

Vermont: The Burlington Amateur Radio Club's hamfest is August 13-14 in Old Lantern, Charlotte, dedicated to, and in memory of, K1URQ. Flea market both days. Camping available at site. Doors open 7 A.M. Saturday and close 5 P.M. Talk-in on 01/61. Info: Burlington ARC, P. O. Box 312, Burlington, VT 05401. Early bird \$3, at door \$3.50.

West Virginia: The Jackson County Amateur Radio Club's Cedar Lakes Hamfest is August 14. A flea market as well as food and recreational facilities are available at the site. Talk-in on 146.52 as well as 31/91. The call is WD8JNU. Space for commercial displays is available inside. Location is 3 mi. off I-77 at Ripley, WV, at the site of the Arts and Crafts Fair. For info write WB8TJA, P. O. Box 631, Ravenswood, WV 26164 or call 304-273-3190.

***West Virginia:** The first annual "Mon-hamgala" is Sunday, September 4, from 10 A.M. to 5 P.M. at Westover Park, 300 yards off I-79 near Morgantown, WV. Sponsored by the Monongalia Wireless Assoc. Talk-in on 16/76. For info write George Armstrong, WB8YFC, 1491 Andmore St., Morgantown, WV 26505.

*ARRL Hamfest

Strays

AMSAT AREA COORDINATORS, USA

AMSAT Area Coordinators supply information about the amateur satellites to anyone who needs it. If you have specific questions about OSCAR or need printed material for a local demonstration, contact the Area Coordinator nearest you. He's a volunteer working to further the satellite program in your state, and will be glad to help.

AL Robert H. Killian, K4GTQ, 316 Nevada St., Birmingham 35224
AK Frank G. Pratt, KL7FSE, 7446 E. 20th Ave., Anchorage 99504
AZ Hank Sampler, WB7AWA, 6525 N. 15th Ave., Phoenix 85015
CA Bud Schultz, W6CG, 3050 Ball Rd., No. 154, Anaheim 92804
CT Dennis Grindrod, WA1EHF, 564 Stillman St., Bridgeport 06608
DE A. Earl Henson, W3ZNF, RD2, Box 208, Camden 19934
FL Mark Calderazzo, WB4UOK, 6257 Luzon Dr., Orlando 32809
FL Walt Dixon, W4DWN, 820 NE 123 St., Miami 33161
GA William Latimer, WA4DDH, Box 994, Marietta 30061
HI Katashi Nose, KH6JJ, 4207 Huanui St., Honolulu 96816
IL Joe Schroeder, W9JUV, Box 406, Glenview 60025
IN K. O. Learner, K9PVW, 4012 S. Haidebeck Rd., Kokomo 46901

KS Jim McKim, W0CY, 1414 So. 10th, Salina 67401
KY F. C. (Bo) Lowrey, WB4GZK, 3805 Hill Creek Rd., Louisville 40220
LA Steve Gradijan, WB5KIA, 616 Oakwood Dr., Gretna 70053
MA Larry Langevin, K1GXU, 42 Prospect St., Ludlow 01056
MD Joe Kasser, G3CZC/W3, 11532 Stewart Ln., Apt. C-1, Silver Spring 20904
ME Jon Neary, W1UA, Starr Acres, Maplewood 04052
MI Richard Coffon, W8DX, 5526 Buckingham Rd., Detroit 48224
MN Ben J. Layton, W0UTT, Rte. 2, Box 8C, Glyndon 56549
MO Roy D. Welch, W0SL, 908 Dutch Mill Dr., Manchester 63011
MS William Appleby, WB5DCY, 28 Linda Ln., Longbeach 39560
MT Harry A. Roylance, W7RZY, 113 North-west View, Harlowton 59036
NC Jim Stewart, WA4MVI, Rte. 8, Box 92, Hendersonville 28739
ND Rev. Douglas Millar, WB0NST, Box 275, Rutland 58067
NE Doyle Kernes, WB0IUT, 7040 Seward St., Lincoln 68507
NH Don Brown, W1JSM, 638 Post Rd., Greenland 03840
NJ Ed Bizub, WA2CBB, 1579 Franklin St., Clark 07066
NM Bob Meilke, WB5QPG, 6801 Leander Ave., NE, Albuquerque 87109
NY Jay Buscemi, K2OVS, 8 Wexford Court, St. James 11780
NY Fred Merry, W2GN, 35 Highland Dr., E.

Greenbush 12061
NY Kaz Deskur, K2ZRO, Box 11, Endicott 13760
NY Bob Crumrine, WB2DNN, 24 Parkmere Rd., Rochester 14617
OH Richard Drain, WA8YFW, 6730 Alter, Dayton 45424
OK Bob McArthur, WB5MSU, Box 694, Grove 74344
OR Dave Leonard, WA7VKC, 1980 Hillcrest, W. Linn 97068
PA Dr. Stephen Cruse, K3WHC, 1018 N. George St., York 17404
PR Pedro J. Piza, KP4AST, Box 2001, Ponce 00731
RI George Simmons, WA1POJ, 46 Broad St., Warren 02885
SD Stan Burghardt, W0IT, Box 73, Watertown 57201
TN Roy Hill, W4PID, 4051 Skyland Dr., Kingsport 37664
TX Steve Hay, K5RZU, 11010 Strait Ln., Dallas 75229
UT David Middleton, W7ZC, Box 303, Springdale 84767
VA Ted Mathewson, W4FJ, 1525 Sunset Ln., Richmond 23221
VT Stephen Warley, K1LJL, 63 Moore Dr., Burlington 05401
WI Keith Mason, W9OIL, 232 Nelson St., Sharon 35385
WV Clark Stewart, WA8UUY, 1 Bryson Ave., Morgantown 26505
WY Paul Humberson, WA7DKZ, 508 Clark, Laramie 82070
West Indies Bert Fageol, KV4AD, Box 2126, St. Thomas, Virgin Islands 00801

Washington Mailbox

FCC EXAM PROCEDURE

Q. Could you fill me in on the procedure that the FCC follows in conducting amateur exams at an FCC examination site?

A. First of all, there are four classes of license for which the applicant must appear at an FCC examination site to be tested. These are the Technician, General, Advanced and Amateur Extra. In cases of protracted, physical disability, making it unable for you to travel, tests may be conducted in your own home.

When you appear at an FCC office to take an amateur exam, the telegraphy test will usually be conducted first.

Q. What is the telegraphy test like?

A. The new "comprehension" style test, discussed in this column in May, 1977, is now in use at all FCC offices.

You will be sent approximately five minutes of telegraphy, during which time you may take whatever notes you wish, copy solid if you wish, or simply "copy" in your head. The content of the telegraphy test will be an ordinary QSO. At the end of the five minutes, you will be given a 10-question multiple-choice test based on the content of the QSO. You must score at least 80 percent to pass.

Q. If I took notes while the telegraphy was being sent... can I refer to the notes when answering the 10 multiple-choice questions?

A. Yes.

Q. Do I have the option of taking the telegraphy test the old way, that is, copying one minute solid out of five, if I wish?

A. No, you must take the comprehension style test.

Q. What's the sending test like?

A. If you pass the receiving portion of the telegraphy test, you will be asked to send code for a period of time up to five minutes.

Q. Do I actually have to send code for a full five minutes?

A. Probably not. The examiner is only interested in determining if you have the ability to send proper, intelligible code. If you do a good job, he may ask you to stop after a minute or thereabouts, so he can move on to the next candidate. However, he *could* ask you to continue sending for the full five minutes.

Q. What if I make a mistake while sending the code?

A. Simply correct it by sending eight dits. As long as you recognize your mistakes and correct them, you will not be penalized. If

you do not recognize and correct your mistakes, the examiner will conclude that you do not know how to send code.

Q. What sort of key may I use?

A. The examiner will provide a straight key, which you may adjust to suit your preference. Or you may bring a key of your own, straight, semiautomatic or electronic. If you bring your own key and it needs power from the commercial lines, it's recommended that you bring along an extension cord. No keyboard keyers are allowed, though.

Q. What about the written test?

A. No keyboard keyers are allowed on the written test, either - sorry! If you successfully complete both parts of the telegraphy test, the written test is next. It is also of the multiple-choice format. The written test for the Technician and General licenses consists of 50 questions (element 3); the test for the Advanced consists of 50 questions (element 4A); and the Amateur Extra test also contains 50 questions (element 4B).

Which elements you will have to take depends on what type of license you have when you start. For example, if you have a General license, and wish to qualify for the Advanced, you need only take element 4A. But if you have a Novice and wish to qualify for the Advanced, you must take elements 3 and 4A.

In other words, you will receive credit for all examination elements that you have previously taken and passed. This applies to the telegraphy test, too. And you will receive credit for those elements that you passed by mail, also. This means that if you hold a Technician license that was obtained by the mail procedure some time ago, and you seek the General license, you need only take the 13-word-per minute telegraphy test. You have credit for the written test (element 3).

Q. Is there a time limit for taking the written test?

A. No, except that you can't continue beyond the time the FCC office closes. In reality, each written examination element shouldn't take more than one or two hours to complete at the outside.

Oh yes, there's one more thing we should mention. If you don't already possess some class of amateur radio license when you go to the FCC office, you must also pass element 2, the Novice class written element. Of course, if you already have a Novice or higher license, you will not have to retake that element since you will receive credit for it.

Q. Do you mean that if I don't already possess a license of some class, I actually have to take the Novice written test at the FCC office?

A. Yes, and it is given last in the sequence of events. The Novice written test is now a requirement for all classes of license, so if you don't already have some class of amateur license, you have to take element 2 at the FCC office.

Q. In other words, I had better make sure to study the material required for the Novice license as well as for whatever higher class license I'm applying for.

A. That's right. Some people have been disappointed to find that they were required to take element 2 at the FCC office. A few people even passed the Amateur Extra written test, but failed the Novice written test. A few moments spent perusing Novice study material is highly recommended.

Q. I don't see how someone can pass the General, Advanced or Extra written test and then fail the Novice. Isn't the Novice test easier than the other tests?

A. Much of the material covered on the Novice written test is not covered on the higher class tests. The Novice test may be "easier" than the other tests, but it's also "different."

Q. Can the Novice class license be obtained at an FCC examination point?

A. No, the Novice license is available only through the mail examination procedure. The only time the Novice exam element is administered at an FCC examination point is when the applicant is applying for a higher class of license. In no case can an applicant obtain a Novice license by taking an examination before the FCC. It must be taken through the mail and administered by a volunteer examiner.

Q. And if I pass all the required elements for the class of license I'm applying for, what then?

A. If you already hold some class of amateur radio license, you will receive an interim permit authorizing you to use your new privileges immediately. However, if you don't hold some class of amateur license at the time, you must wait for your new license to arrive in the mail.

Q. Since there's no fee for the exam, doesn't cost me anything to take it even if I'm not prepared, right?

A. That's true, but going in unprepared means you're unnecessarily adding to the tremendous burden of amateur applicants the FCC is trying to process. Their facilities are tremendously overloaded right now because of the surge of interest in amateur radio. Courtesy to your fellow hams dictates that you wait until you're prepared before going in to take the exam.

How's DX?



Conducted By Rod Newkirk,* W9BRD

Party Line

"I'm slightly agog at some of the implications," writes Columbus Amateur Radio Association *CARAscope* editor K8HRR concerning OSCAR Phase III. "A satellite with an offset elliptical orbit that will give us literally hours of full hemisphere (half the world!) coverage at 435 MHz seems almost incredible. Since over 90 percent of all the world's amateurs live in the Northern Hemisphere, this would mean that a major portion of the 300-plus countries of the world are also in that same relationship — a clear channel with no propagation problems that will cover half the world on 'DXing' as we know it today."

The OM puts it into a tempting nutshell, and it's much more than mere futuristic

musings. If all goes according to plan you'll be participating the year after next in solid six-hour round tables with Europeans and Asians on 435 MHz. And you'll do it without all the light-dimming QRO and monstrous skyhooks required for the old ionospheric world below 30 MHz.

Oh, no need for QSY panic. Don't junk your weird towers and clumsy quads just yet. You'll still need old-fashioned lower frequencies for geography not visible to AMSAT-OSCAR Phase III. But it's becoming clear that such new-mode uhf ham bands eventually will be capable of total global range. Perhaps it's fortunate that the change-

over will be gradual. We've accumulated some awful 20-meter-type habits over the years, manners that have no place in OSCAR work. The brute-force DX approach is one.

Hmmm — no propagation problems? That could be a problem. We're curious just how the no-skip feature of a well-used satellite spectrum will impact DXing techniques. Skip eliminates a tremendous amount of in-close QRM on our present hf bands. Usually one hears but a fraction of all stations in any given pileup, the tip of a roaring iceberg. On 14 MHz you can hear some stations all the time (ground-wave locals) and all stations some of the time. How will things go when everybody hears everybody all of the time?

FROM QST'S DX MAILBAG

EUROPE: Last year's 18th Scandinavian Activity Contest single-op radiotelegraphy outcome finds our side scoring in this order: W9SZR/3, K2SIL/1, WA1STN, Ws 2EQK 4WSF 0BMM, Ks 9ECE 11IK, WA7TMM, W6DGH, K4BAI, WAs 0TAS 3DMH, W7OK, WB3AOP, Ws 10PI 3ARK, KH6IJ, WSSOD and WB6PZW with VE3s GCO and BR the Canadian one-two punch. Other leaders by country include D2AAL, DL1TH, DM2CMF, EA4BV, EI5F, EP2SV, F6CRT, G3SXW, GM3CFS, HA4XK, HB9EQ, I5RHZ, JA6BSM, KG6JFY, LU8ADK, LZ2RF, DL1YA/OE, OK1MMW, ON4XG, PA0LVB, PY1ZBJ, SP5FLA, UA4HAL, UB5WF, UC2ABT, UG6GAF, UH8HBR, UI8ACC, UJ8JAS, UL7QH, UM8NND, UO5AP, UP2PBM, UQ2GDW, UR2GDW, UR2QD, YB0ACH, YO4HW, YU3TGB, ZS5UP, 4Z4TA, 5Z4LW, 6W8EX and 9M2FK. Scandinavian highs were recorded by OH6DX, SM6DHU, OZ7HT and LA6HL. In the voice division our side's scoring sequence goes WA2JJO, K9ECE, Ws 9DDL 4AQL 2JGR, WA3DMH, LU1BAR/W3, Ws 2FCR 9LKI, WA0TAS, WB6PZW, W6DGH and WA1ORP with VE3s GCO 3BR and 1A1H finishing 1-2-3 for Canada. Top talkers per country are CT1EU, DJ3HJ, DM5YJL, EA3VM, EL80, EP2SV, F6BDN, G4CVZ, GM4DZX, GW3SLA, HA5GF, HB9AGC, I4WZA, JA6BSM, KG6JFY, LU3HAK, LX1GG, LZ1QR, OE6WIG, OK1MJI, ON4XG, PA0TMM, PY1ZBJ, SP8ECV, UA4PW, UA9CBO, UB5WE, UC2ABT, UF6DZ, UL7QH, UO5GS, UP2BAS, UQ2GCN, UR2QA, YB0ACH, YO7VJ, YU3TJA, LZ2AC, 4Z4OM, 5Z4LW, 9H1EL and 9L1BH. OH2BX, SM5CSS, OZ5KF and LA6HL led Scandinavia's vocalists. See you in the '77 SAC next month! (SM0DJZ) . . . Nice visit to Mallorca this spring where the Palma EA6 gang were most hospitable. (W0WIT) . . . OSCAR activity was an added DXpeditionary feature on our group's visit to



EL2ET's quad-raising tableau in Monrovia involved EL2s EE EK EO ET EU, some helpful SWLs and the host's junior operator. Only avid DX hounds could possibly appreciate such mushy high-conductivity terrain. Traditional "antenna parties" like this will hardly be necessary in AMSAT-OSCAR days ahead. (W3HNK photo)

Andorra in June as C31s NK NL NM NN and NO. (PA0s ERA GIN) . . . Limerick Radio Club's June jaunt to the Aran isles as EJ0A was the first amateur use of that prefix. (EI4BK) . . . I'm mainly on 20 cw's low edge for ragchews and occasional new WAS states with a TS515 and longwire. Hard to compete with the linears and arrays of Finland's DX hounds but I do catch some of the rare ones that come my way. (OH2BN) . . . Fine visit to the hamshacks of OT PA0s HR and HU recently. Veteran DXers will recall the former

as VERON's QSL manager in the early '30s. (K2JFJ) . . . Our 1B0CBM trip to Ventotene isle resulted in 2250 QSOs with 81 countries. (I2CBM) . . . LA8WT/p operates from Fugloy Island, about 70°N, where summer snow isn't unusual. Knut sometimes hits 14,075 kHz at 2000 UTC. (W8JQ) . . . I was behind the mic at C31NQ on 14-MHz sideband in early July. (F6CWB) . . . After an enjoyable HB0 trip this spring DF4GV & Co. are thinking of early LX C31 3A and/or 9A possibilities. (W4RHZ)

AFRICA: Ham radio at French outposts in the far south this season is in the able hands of FB8s XQ and XR on Kerguelen isle, ZK and ZL on Amsterdam, and WE on Crozet. (F6CRT) . . . Glad to be C5AAM's second QSO when Ellis fired up at Banjul in mid-April. (W1BWS) . . . Check with 5N2NAS if interested in qualifying for the First All-Africa Boy Scout Jamboree Award. 5N2 contacts with Jos and Apapa during April are prerequisite. (WB9MFC) . . . 5Z4s LW and RT are among the most DX-minded of Kenya's 40 amateurs. Also visited OT 5Z4ERR who is somewhat inactive due to current high interest in "rockology." In Egypt I found business affairs limiting SU1MA's activity but SU1IM, recovering from a major operation, may soon have his loaned Swan 500 on the air. (Uganda's only active ham, 5X5NK, is intermittently workable but may soon QRT. ET3FF, formerly ET3AH, tries to keep Ethiopia available with a low-profile layout but is not sure of license renewal at year's end. (W6YY) . . . EL2ET's impressive 80-meter signal is radiated by three phased ground-plane verticals. (W6LFB) . . . WA6ICQ/9Q5 may air Zaire for a year or so on 20. 9Q5BG likes 3798 kHz at 2130 UTC. 9Q5QR gets into Europe well on 10 and 15, and 9Q5GR is heard on 20. (VERON, DXNS) . . . ZS5PG says ZS6AGV is the new proprietor of ZS2MI on Marion Island, much DXing anticipated. (CARA) . . . 5H3JR's KWM2 and two-element quad near 14,280 kHz currently offer your cleanest crack at Tanzania. DK5EC is reported signing 5H3KS. (WCDXB, VERON)

*c/o ARRL, 225 Main St., Newington, CT 06111

OCEANIA: Managed about a thousand QSOs in Manila as W9MR/DU1 but propagation never was really good. Great bunch of hams in the Philippine Amateur Radio Association. I was privileged to meet DU1s BOS CH LM OR and others at a luncheon meeting. DU1OR, KA1OR of long ago, is the author of an interesting history of P. I. amateur radio. (W9MR) . . . I also had a fine visit to the Philippines where I found conditions quite good on 20 and 40, fair on 15. Repeaterless 2-meter DX is going strong in the Islands. PARA members plan a DXpedition to Leyte in October. (W7HPI) . . . The XYL, myself and another couple will fulfill a lifelong dream this year by visiting Australia and New Zealand. Ham radio will flavor the itinerary. (WSAMK) . . . VK9ZM shut down on Willis Island last month, ham replacement in doubt. VK0s AC and KH should be heard from Macquarie until November. My own station is quite active so far this year with 4700 contacts logged by June 1st. (VK3AH) . . . ZL1s AIC AJL AVR BKL and BKX continue planning their DXpedition to the Kermadec Islands, target date unclear. 5W1AT may encore from the Tokelaus at any time. (WCDXB)

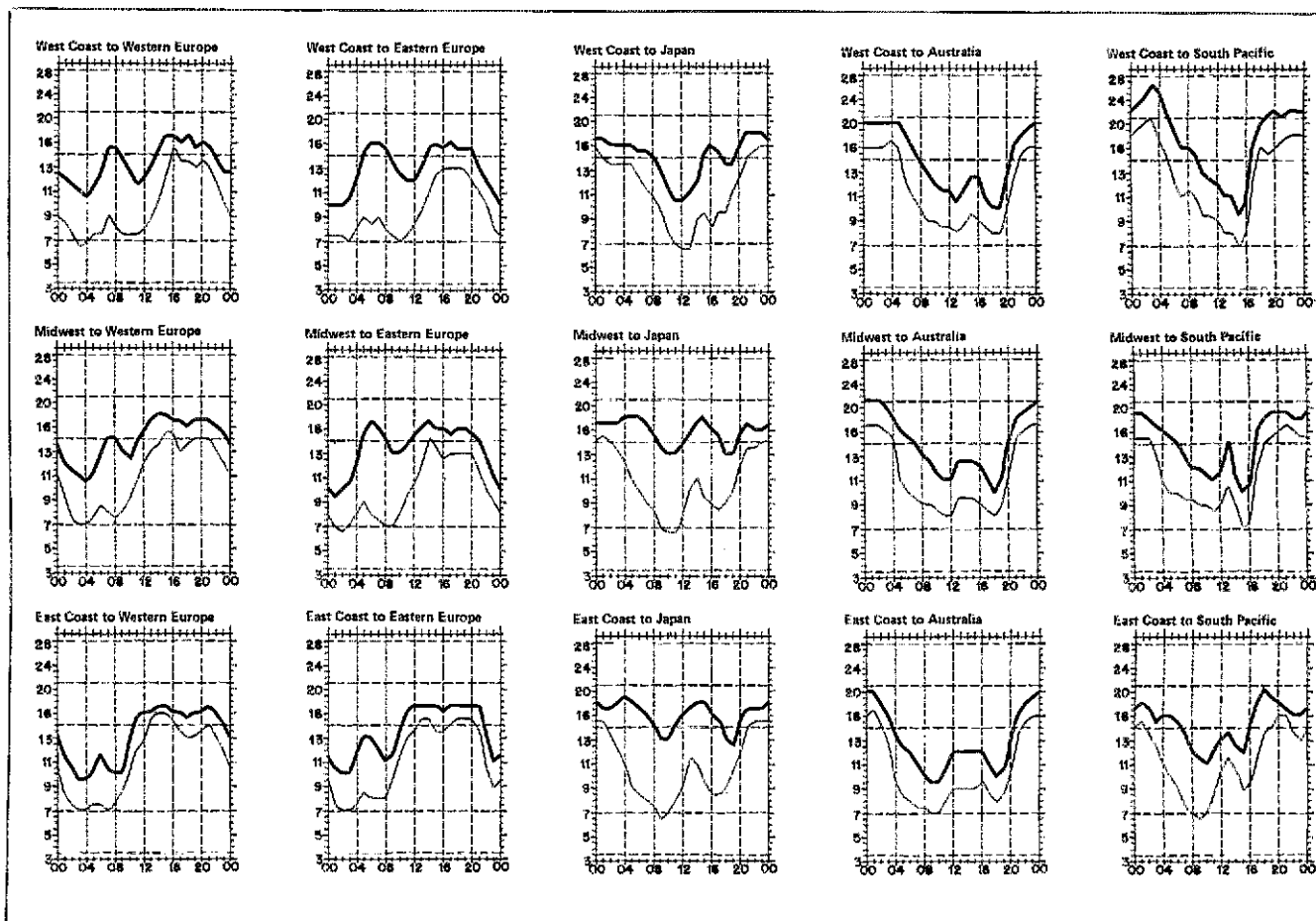
ASIA: W6YO, heading southwestward aboard *Yankee Trader*, could show from 9N1 FHS D6 and other interesting areas. (W6BVM) . . . HKARTS secretary VS6GG expects to QRT for return to Australia next month. Meanwhile John can be found near 14,225 kHz most evenings at 2300 UTC. (WB4FJO) . . . Very exciting visit to Taiwan in April. I've heard huge pileups before but the mob scenes inspired by BV2A top them all. (WA6VNR) . . . Via WCDXB: KA6RI often is net control of a 14,285-kHz group of KAs at 0200 UTC Sundays . . . EP2SV reports



HS1YL shares this Bangkok DX corner with OM HS1WR, Mayuree and Kamchai like side-band on 20 or 15 and are prominent in South-east Asia Net doings. (W2AO photo)

20-kilo QSOs in less than a year's Tehran activity . . . Next month may produce a YU2 contingent in the Laccadives. . . K8CSG, stationed in Saudi Arabia, sees improving conditions to the USA from HZ1AB. The station's multioperator staff hooked a new CL33 to the Dharan KWM2 and SB220. . . Hamless Iraq, once the hangout of easily worked YIs, has risen to most-needed-country status in recent polls. The Saudi-Iraq Neutral Zone, mainland China, Burma and South Yemen are also widely sought.

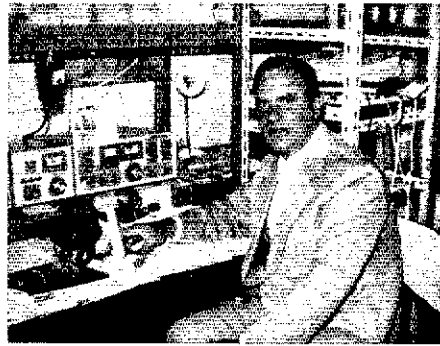
THE AMERICAS: After a five-year absence I'm back in Greenland with my previous call sign for a tour of 18 months or more. I have an FT101E working mostly 20 cw and voice with a vertical. A quad, 4BTV and FL2100B are on the way. Three other active 1hule locals are OXs JAE 5AC and 5AD with more newcomers due. A 12-hour working day complicates my on-the-air plans but 5BDXCC sked inquiries are welcomed. At present 160, 15 and 10 meters appear dormant here. Forty is pretty well wiped out by SWBC above 7070 kHz but 80 is good for W/Ks between 0100 and 0900 UTC. (OX5AP-WA5ZYF) . . . As secretary-treasurer of SMIRK, Six-Meter International Radio Klub, I'd like to be contacted by members of imminent hf DXpeditions for the purpose of possible inclusion and coordination of 50-MHz activity. Transporting modest six-meter accommodations is no problem in this miniaturized era. Plenty of DX is worked on the band with mere two- or three-watt hand-held portables. (K5ZMS) . . . Two more countries will qualify me for DXCC application with 35 watts and a vertical despite a QTH overhung with huge trees, a steep hill and 138-kV power lines. (W4RHZ) . . . I eagerly tried 40, 15 and 10 meters when Techs were given Novice privileges a year ago. (WA1TZK) . . . Borrowed a large log-periodic array for this year's Bermuda Contest and received fantastic reports on a barefoot FT101B. By next April I hope to have licked severe local QRN for equally excellent reception. (K4BR/VP9) . . . March and April supplied good DX on 10-meter ssb: FOs 8DF 0RS, HP1MU, JA8UI/PZ, KH6JHC, TI2CF, TJ1BB, VKs 2FU 4JP 4LG, VP2DD, VRs 3AK 8N, ZLs 1BI 1KD 2AX 2BGV 2HE 2LI 2NF 2RP and 4IJ. The 15-watter of 5Z4JE was worked on cw. Ten stayed open as late as 0200 UTC for my R4C-T4XC, SB220



When are the bands open? These charts predict this month's average propagation conditions for high-frequency circuits between the U.S. and various overseas points. On 50 percent of the days of the

month, the highest frequency propagated will be at least as high as the upper curve. On 90 percent of the days of the month, it will be at least as high as the lower curve. See January 1977

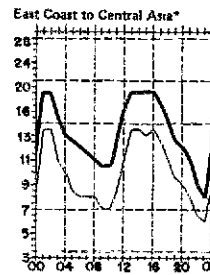
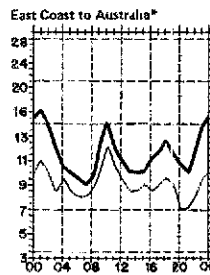
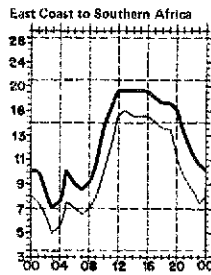
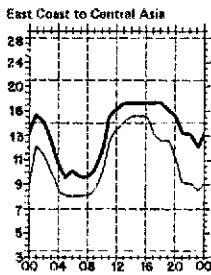
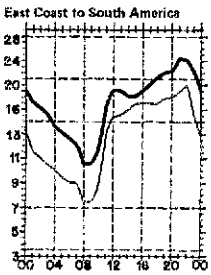
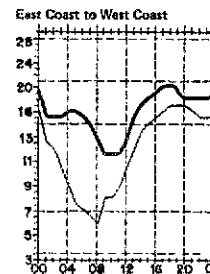
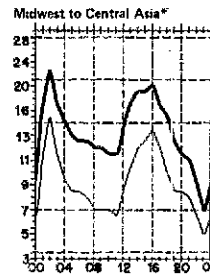
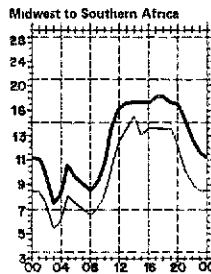
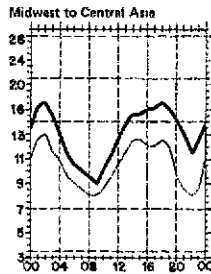
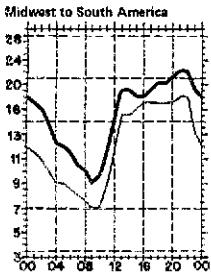
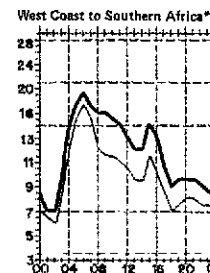
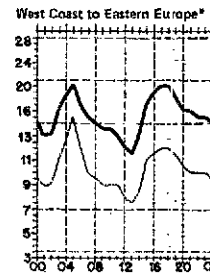
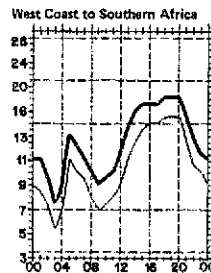
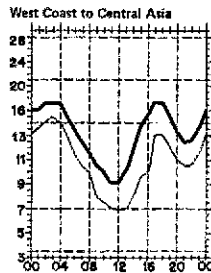
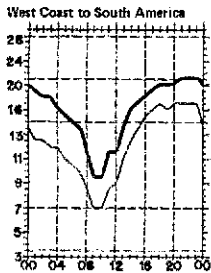
and 55-foot-high three-element quad. (WB4OSN) . . . Next month 160-meter DX stalwarts herald the coming 1977-'78 low-band season with transequatorial tests and equinoctial VK/ZL probing. Reception noise remains the big frustration at most locations. Elaborate countermeasures are widely reported. (W1BB) . . . Re old Press Wireless, the many hams who cut their high-speed cw teeth on PW press transmissions of 40 years ago will be glad to know that WCX/WJS tape-puncher A. W. Livingstone remains quite active as W5VBJ. Well-known colleague Dave Wingate, W2KEZ, joined Silent Keys some years back. (W6OWP) . . . FP8AA, PW8CO, KG6RT, 3D2ER and miscellaneous Russians pepped up the 7-MHz cw springtime scene out west. (W6LFB) . . . I'm curious about the history of radio's Q-signal code. What were the meanings of QRC, QRE, QSC, QSE and others now missing from the list? (W7VCB) . . . Picked up 20 new countries on 15 during this year's ARRL DX Test. (W3OJS) . . . Your Press Wireless memories recalled my own work at PW's Centereach, L.I., transmitting site in the early '60s. (K2GMF) . . . A new Extra ticket should blend well with my 175-foot-high antenna farm. Watch out, DX! (K9GMT) . . . Enjoyed rolling up a 117/109 worked/confirmed countries record as WB8HPN/YV4, then returned to a new Pennsylvania QTH. (WB3GDL) . . . VP2AZB, known back in Daventry as G3RBB, expects to keep active on Antigua for another year or so. (W1RF) . . . A little free time with the Amigos de las Americas medical program gave me a chance to put YN1QFX/4 on cw in late June. (W5QFX) . . . Barnstable Radio Club of Cape Cod plans commemorative festivities next January on the 75th anniversary of Marconi's first USA-Europe QSO. A portion of the site of his



CR9AJ ably represents rare Macao when Asia cracks through on 20. Torres often appears near 14,200 kHz around 1430 UTC. (W2AO photo)

South Wellfleet spark station still remains. (K1JV) . . . Your "Elmer" series brings back nostalgic memories of my own mentor, W9GIL, and school days of long ago. (W9GDI) . . . Finally tried the stuff myself after reading about DX in "How's" for many years. May was a profitable month from 10 through 40 but I find working 87 countries much easier than confirming them. (WB4FPH) . . . Moved from Tech to Advanced a few months ago and tried my DX luck on sideband. Caught some JAs and VKs, but more than a simple vertical seems called for on 20! After summertime DX sport on 50

MHz a directive array for lower bands may be in order. (WA51YX) . . . Onset of the warm season cooled 15 down to mostly South Americans. Being PY3CKO's first Stateside contact was as pleasurable as adding new ones to my 45/20 worked/confirmed tally. (WB8ZRL/n) . . . K5MY is pres., K5KR v.p., WA5AWF sec'y., W5CB treas. and W5NO a director of Delta DX Association. (DDXA) . . . OH2TI was my 10,000th contact for '77. Maybe I'm slowing down. (KV4AA) . . . I'll have VP2s A and M on 10 through 160, mostly cw, into mid-August. Novice/Technician hands will not be neglected. (W1CDC) . . . Latest VP8 status has OT OX and PF on South Georgia, PL South Orkneys, NW Adelaide Island, PJ Argentine Island, and OW at Hallee Bay. VP8s AI HA HZ JC LP NL NX OI OL PC PE and PM represent the Falklands. (DXNS) . . . Via WCDXB: Trinidad & Tobago 9Y4s plan an anniversary QSO party in this month's final weekend. . . . HH2MC spruced up his skywire system for greater DX coverage. . . . Ex-LUSHFI reports a lively spring on 28 MHz with surprisingly solid transoceanic openings. Fred, formerly W9SZR/3, now signs K3ZO. . . . Much of the monthly "How's" substance must be credited to Canadian DX Association *Long Slip* (VE1AL/VE3), Columbus Amateur Radio Association *CARAScope* (W8ZCQ), *DX News-Sheet* (G. Watts, Norwich, England), Newark News Radio Club *Bulletin* (M. Witkowski, Rte. 6, Box 255, Stevens Point, WI 54481), Northern California DX Club *DXer* (K6SSJ), North Florida DX Association *News* (WA4UFW), VERON's *DXpress* (PA0TO), West Coast *DX Bulletin* (WA6AUD) and Western Washington DX Club *Totem Tabloid* (K7VPF). Loads of hard work and lost DXing time goes into publication of those periodicals. Thanks, all!



DX Century Club Awards

Administered by Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmation for contacts with 100 or more countries on the official ARRL DXCC List. You may also submit cards to endorse your award in 20-country increments through 240, 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from May 1 through May 31, 1977. An s.a.s.e. will bring you the full rules for participation in the DXCC, the DXCC list and application forms.

New Members

Mixed

JA2INS/250	WA8MOA/125	SM4GLC/105	K1GMW/103	YU3MD/101
YU10DS/239	HB9BC/123	TR8BJ/105	K2VC/103	CT1HT/100
K6ACU/207	HB9BGN/122	WA1POJ/105	K9IDZ/103	EA3YY/100
PY1ZBJ/148	I0JCM/121	WA4PYF/105	4W1GM/103	K4JEZ/100
EA8LS/146	DJ3AG/112	WB7DPM/105	JF1VSA/102	WA2CXG/100
ZL3BK/143	G5AGN/108	WB8SBH/105	WB8RPU/102	WA4TZM/100
WA4LZR/133	W5ZPA/108	WB4EQQ/104	W9JXN/102	WB8QIS/100
SV0WLU/129	JA1MZM/JA7/107	W0RUR/104	W8EY/101	
WB5SFS/129	W2JDH/107			

Radiotelephone

PY1ZBJ/146	F6BDG/113	HB9BGN/104	WA7KNK/103	W6TPR/102
I1MCE/134	WD8BJK/110	H17JMB/W2/104	WA8MOA/103	WD8CRY/102
OE2BZL/129	ZP5YW/110	WA4ICK/104	W9TEU/103	K1YXG/101
ZL3BK/126	VE3ECP/107	W8KSB/3/104	WA1TAI/102	WB8RTY/101
WB5SFS/124	G5AGN/106	I5NDR/103	W4BV/102	K4FRM/100
I0WLL/119	WB9FUE/106	SV0WA/103	WA4PYF/102	W8TXM/100
I8WNF/116	WA0NJG/105			

CW

JA2INS/165	DJ5DA/110	HA5KHC/104	SM4GLC/101	K0DPO/100
W9BZW/133	I3WDT/110	K8YQW/104	DL1QT/100	WB5NBC/100
N2CW/128	VE7DTA/110	W3KFG/102	K4ZVS/100	W9IT/100
JH1RFM/126	JA1BN/105	JF1VSA/101		

5BDXCC

VE7HP	W9MIJ/4	I3PRK	K2GBC	IT9TAI
DK5AD	YU10DS			

Endorsements

Mixed

W7MB/360	WB4KZG/314	W3YX/269	ZP5RL/204	WB9REB/150
W5KC/359	JA2PJC/311	JF1PJK/265	W8CTR/200	K4JVS/159
W4EO/349	ZS6IW/311	W7PFZ/262	W8GE/194	W9VWV/154
W5FFW/348	W2FG/310	W4HG/260	K2IGW/193	WA4JTC/152
KH6IJ/340	W7YBX/309	W4FLA/256	K1RQF/190	W4VAB/149
W5GJ/338	K5FKD/305	HB9AOL/252	W4TYE/187	JA1JQY/148
XE1AE/338	W9RN/305	W6PQZ/252	WB4NDX/181	4U1TU/143
W6RJ/336	K4RA/303	K5DUT/251	K2GXC/181	JR1JFO/141
ON4PA/335	W0CAW/303	K1ZZ/250	K2GAT/180	W3FAE/141
UA9VB/333	PY5UG/302	WB5DDI/250	K6SF/180	JR1VMC/140
K4YFQ/325	W7VRO/300	WA3TZ/241	WA2FNY/180	WA2ERJ/140
SM5BHW/325	N4CC/294	DK5WS/240	W4BV/180	W4FL/140
K7ABV/322	KP4DJ/293	W4CZU/240	WA8PPE/180	VU2BEJ/137
WA6GFE/321	VE7IG/VE9/293	ZE3JO/233	W9KMN/180	WA1TAI/130
K4BBF/319	EA3NC/291	K9HLW/230	HB9T/177	VE3ECP/126
DJ4PI/318	K4TJ/291	WB5IYB/225	K5KEZ/168	W45MU/123
JA1QCA/318	K0GGSV/281	QZ5CV/224	K5KEZ/3/167	WA1AH/121
W4WSF/318	W3HTV/281	W2MIG/221	DL3TU/164	K4JNM/120
JA6GDG/317	WA6GFY/281	WA1STN/220	YU3DKS/162	K6QZ/120
WB2EPG/317	JH1VRQ/280	W9MYG/220	SP6AA/161	WA7OMX/120
W6AQ/315	W7XA/271	W1JDE/209	VE6CV/161	WB4AVG/118
W9KB/315	W1GDDQ/269	YU3TFB/206	WA5VUW/160	WB9MFC/115
XE1KS/315	W2PSU/269	YU4AAW/205	W6EGR/160	
W3ZNH/314		WA5SDV/204		

Radiotelephone

XE1AE/338	DL9DY/291	W2PSU/260	W2MIG/220	9M2CJ/176
PY3BXW/320	F6AO/290	W3CDL/257	K0GGSV/216	W7GXC/174
K4BBF/318	W8NXF/282	N4CC/255	ZP5RS/204	JA2UY5/174
JA1QCA/317	I5FC/280	JF1PJK/246	IT9UVA/200	WA4JD/156
W8JTD/316	QZ3PZ/279	W3YX/242	W5CB/197	W9VWV/147
XE1KS/314	EA3NC/276	WA7BPS/241	N2CW/197	ISKWH/140
JA6GDG/311	K4QPR/271	ZP5AN/241	W2GHV/187	K4FZU/140
W4WSF/309	JH1VRQ/270	DK5WS/240	WA2BDP/180	W3SEJ/140
W6LQC/308	K5FKD/266	I5SHU/240	WB4NDX/180	WA3YVW/140
K4YFQ/306	W3ZNH/265	WA3TZ/230	K5HWO/180	I3BUJ/138
SP5BSV/300	WA5SMM/263	K4TJ/228	W6AED/180	WA5VUW/122
WB4KZG/300	K3GZE/260	CT2BB/225	K9HLW/177	JR1VMC/120
W7YBX/292				

CW

K4YFQ/259	W4WSF/175	K5KEZ/3/161	JH1VRQ/151	DK5AD/132
K2TQC/220	SM5BHW/172	W4BV/160	W4TYE/150	K5KEZ/127
K4PI/220	JF1PJK/164			

Notes: W5TO's call was incorrectly given as W5IO in the June listing of Mixed Endorsements. K4KPH's call was incorrectly given as K3KPH in the June listing of Mixed Endorsements.

THE ARRL DX QSL BUREAU SYSTEM

The ARRL DX QSL bureau system distributes cards free of charge from DX stations to amateurs within the League membership area (see page 8). Every active DXer should keep several 5 x 7-inch envelopes on file with the bureau of his home district. Place your call sign in large block letters in the upper left corner, and attach a single first-class stamp unless you normally receive more cards. Unclaimed cards are discarded after one year. For more details on the bureau system, write ARRL hq.

- First Call Area: all calls* - Hampden County Radio Association, Box 216, Forest Park Station, Springfield, MA 01108.
- Second Call Area: all calls* - North Jersey DX Assn., P. O. Box 8160, Haledon, NJ 07508.
- Third Call Area: all calls* - Jesse Bieberman, W3KT, RD 1, Box 66, Valley Hill Rd., Malvern, PA 19355.
- Fourth Call Area: K4, N4, W4 - National Capitol DX Assn., Box DX, Boyce, VA 22620.
- Fourth Call Area: WA4, WB4, WD4, WN4 - Sterling Park Amateur Radio Club, P. O. Box 599, Sterling Park, VA 22170.
- Fifth Call Area: all calls* - ARRL WS QSL Bureau, Box 1690, Sherman, TX 75090.
- Sixth Call Area: all calls* - ARRL Sixth (6th) District DX QSL Bureau, 2814 Empire Avenue, Burbank, CA 91504.
- Seventh Call Area: all calls - Willamette Valley DX Club, Inc., P. O. Box 555, Portland, OR 97207.
- Eighth Call Area: all calls - Columbus Amateur Radio Assn., Radio Room, 280 E. Broad St., Columbus, OH 43215.
- Ninth Call Area: all calls - Northern Illinois DX Assn., Box 519, Elmhurst, IL 60126.
- Zero Call Area: all calls - W0 QSL Bureau Ak-Sar-Ben Radio Club, P. O. Box 291, Omaha, NE 68101.
- Puerto Rico: all calls* - Radio Club de Puerto Rico, P. O. Box 1061, San Juan, PR 00902.
- U.S. Virgin Islands: all calls - Graciano Berlando, P. O. Box 572, Christiansted, St. Croix, VI 00820.
- Panama Canal Zone: all calls* - KZ5 QSL Bureau, KZ5OD, Box 407, Balboa, C.Z.
- Hawaiian Islands: all calls* - John H. Okamoto, KH6DQ, P. O. Box 101, Aiea, Oahu, HI 96701.
- Alaska: all calls - Alaska QSL Bureau, Star Route, Box 2401, Wasilla, AK 99687.
- SWL - Leroy Waite, 39 Hannum St., Ballston Spa, NY 12020.
- QSL Cards for Canada (VE and VO) may be sent to: ARRL Central QSL Bureau, P. O. Box 663, Halifax, NS, Canada, B3J 2T3. Or QSL cards may be sent to the individual bureaus.

- VE1* - L. J. Fader, VE1FQ, P. O. Box 663, Halifax, NS B3J 2T3.
- VE2 - A. G. Daemen, VE2IJ, 2960 Douglas Avenue, Montreal, Quebec H3R 2E3.
- VE3 - The Ontario Trilliums, P. O. Box 157, Downsview, Ont., Canada M3M 3A3.
- VE4 - W. A. Stunden, VE4BJ, 378 Oxford St., Winnipeg, Man., Canada, R3M 319.
- VE5* - A. Lloyd Jones, VE5JI, 2328 Grant Road, Regina, Sask., S4S 5E3.
- VE6* - D. C. Davidson, VE6TK, 1108 Trafford Dr., N. W., Calgary, Alta., T2K 0X2.
- VE7* - Howard Martin, VE7AFY, No. 45-9960 Wilson Road, Ruskin, BC V0M 1R0.
- VE8* - Al Sturko, VE8NS, P. O. Box 72, Fort Smith, NWT X0E 0P0.
- VO1, VO2 - William Coffen, VO1KM, P. O. Box 6, St. John's, Nfld., A1C 5H5.

*These bureaus sell envelopes or postage credits. Send an s.a.s.e. to the bureau for further information.

QSL bureaus for other areas can be found in the December, 1975, issue of QST, page 64.

50 Years Ago

August, 1927

□ The Editor notes that around 40 meters seems the most efficient part of the spectrum for miles-per-watt, and that long-wave commercial services are turning jealous eyes in this direction. This gives considerable concern because an international conference is scheduled later in the year to allocate the short-waves.

□ Phone enthusiasts admit their signals need improvement, but complain that *QST* doesn't carry enough info. Tech Ed Kruse is looking for useful material to publish, but says it must be top quality. A first step is a description of an experimental commercial phone designed by Frank Jones for a Cuban sugar company.

□ Tests with underground antennas show them practically useless for transmission, but often helpful as receiving antennas in reducing the static levels.

□ At the Hudson Division Convention, Kruse and Boyd Phelps demonstrated a 401-Mc. station setup. Biggest problem is that the tube leads, even after debasing, form a large part of

the inductance so the tuning capacitor has comparatively little effect.

□ Lou Hatry, radio editor with the local *Hartford* paper, wonders why more of us ignore improvements in the audio system of our receivers, and shows some ways that filters and transformer alterations provide useful peaking of c.w. signals.

□ IANA says that r.f. amplifiers are often tried and discarded because of interaction with the detector, but if you carefully shield each stage of your receiver, you'll get considerably better results.

□ An amateur license has been issued in the Virgin Islands, 4AAN to a Richard Spenceley.

25 Years Ago

August, 1952

□ New RACES rules are now in effect, and the Editor points out this is the first time in our history that plans have been made in advance for amateurs to perform during any national emergency. Yardley Beers' installment of the "Wavelength Factor" this month analyzes the usefulness of the RACES subbands.

□ WIDBM gave a lecture and practical demonstration of TVI causes and cures to a RTMA (manufacturers) assembly, a major step in our campaign for better TV receivers.

□ W2PXR made use of W2BLL's phase detector to control a reversible motor automatically adjusting his remote antenna tuner as he changes frequency. W7BVV has a motor-driven rack-and-pinion gear system for changing the length of his beam elements!

□ Following up his earlier article on basic antenna principles, W1FTX shows Novices some simple designs of practical antenna couplers — the pi output circuit right up front, of course.

□ Technical Editor Grammer says the coil-resistor insertion in tetrode tube leads to prevent u.h.f. parasitics is not the best system, especially for the TVI situation. He suggests resistor overload of the circuit to stifle unwanted oscillations.

□ W3ASW finds one good way to reduce v.f.o. drift is WIDX's scheme of separating the tuned circuits from the heat of the tube, and coupling the two units by coax.

□ Anyone with a crystal-filter sideband exciter can get much aid from W4PIX's step-by-step alignment procedure.

□ W1JEQ has a neat little design for a 30-watt rig on 50 Mc. — *W1RW*

Silent Keys

It is with deep regret that we record the passing of these amateurs:

K1CEP, William G. Remington, Bristol, CT
W1NOV, William F. Mahoney, West Roxbury, MA

W1SKP, Thurston L. Stetson, Bridgewater, MA

W1UTQ, Harold A. Taylor, N. Anson, ME
Ex-K1YGN, Alexander G. Taylor, Jr., Westerly, RI

K1YYH, Raymond A. Carignan, N. Grosvenordale, CT

WB2ACS, Max Boritz, Elmont, NY

W2AJQ, Harry D. Smith, Freehold, NJ

W2BYR, Henry C. Furch, Jersey City, NJ

W2DND, Fred T. Morehouse, New Brunswick, NJ

W2DOE, George J. Gathman, Forked River, NJ

WB2EYH, John N. Meyer, W. Orange, NJ

K2FM, Richard H. Cross, Endicott, NY

W2HCR, Charles S. Moore, Trenton, NJ

K2LMV, Francis R. Bouchev, Russell, NY

WA2MWX, Charles J. McMann, Sr., Lakewood, NJ

W2PLZ, Edward C. Roberts, Auburn, NY

W2VEL, Joseph J. Augustaitis, Binghamton, NY

*WB3EIO, Louis W. Morgan, Canton, PA

K3GWF, Lewis D. Forsht, Altoona, PA

K3OZQ, W. Lee Marks, Baltimore, MD

W3PDE, Richard Dively, Hollidaysburg, PA

W3PDY, James E. Morse, New Castle, PA

W3QBO, C. Edward Galbreath, Bethesda, MD

W3QOH, Robert E. Bain, Ellicott City, MD

WA4ALB, John Berner, Greensboro, NC

WB4AVL, Timothy R. Morris, High Point, NC

W4BAV, Charles E. Smith, Woodruff, SC

WA4BOP, Andrew J. Patton, Eugene, OR

K4CVH, William G. Welch, Jr., Columbus, GA

W4FRH, Robert W. Franklin, Greensboro, NC

W4IA, Everett L. Battey, Mt. Dora, FL

WB4JJP, Roy T. Kruse, Mobile, AL

W4OTE, John A. Shipp, Newport, NC

W4PBO, Walden H. Phillips, Madison, FL

W4QAZ, Richard P. Austin, Greensboro, NC

K4RB, James A. Young, Clearwater, FL

K4RL, Eugene D. Van Duyne, Redington Beach, FL

WN4RML, Hollis M. Daniel, Phenix City, AL

WA4TOC, William A. Lloyd, Knoxville, TN

WB4VBS, Bruce D. Clayton, Roxboro, NC

WA4VKL, Rexford M. Morris, Aiken, SC

WA4YTR, Irwin W. Boden, Paris, TN

W5EGA, William S. McLaughlin, Dallas, TX

W5JAX, A. E. Nelson, Jr., Rose Bud, AR

Ex-K5LBH, Ivan W. Brown, Magnolia, AK

W5NHB, Jack E. Miller, Marble Falls, TX

W5RD, Rawleigh H. "Jack" Raifs, Fayetteville, AR

W5TSY, Edward H. Crawford, McAllen, TX

W5VV, Wilmer L. Allison, Austin, TX

WB5YLK, Charles W. Tyler, Houston, TX

*WB6CUG, William C. Mellenthin, Jr., N. Hollywood, CA

W6AL, William J. Erich, Lodi, CA

KH6AR, Ken C. Bryan, Kaneohe, HI

WA6KTF, David J. Mearns, Hesperia, CA

W6LNN, Ira F. Gardner, N. Sacramento, CA

WA6OJA, James D. Smoyer, Santa Clara, CA

W6QXF, George A. Sears, Jr., Porterville, CA

W6TRK, Arthur E. Grube, Sunnymead, CA

WB6UZG, Leo Shaulis, Palmdale, CA

W6YXO, Austin P. Bates, Lakewood, CA

W7DEG, James F. C. Robertson, Salem, OR

W7FDN, Tyrus T. McFadden, Walla Walla, WA

W7FPL, Harold V. Cheesman, Walla Walla, WA

W7HB, Dwight R. Hutton, John Day, OR

KL7HCQ, James J. Hisamoto, Fairbanks, AK

EX-W7HDL, Harold D. Huston, Bothell, WA

K7KAH, William C. Hendrickson, Bellevue, WA

K7UKS, William H. Bailey, Walla Walla, WA

WA8BGF, Kermit M. Althoff, Columbus, OH

WD8DRD, Adelbert A. Zink, North Royalton, OH

K8JCY, Theodore E. Tank, Toledo, OH

W8PZD, William G. Klink, Columbia Sta., OH

W8PZM, Julius Mosonics, Parma, OH

W8RR, Ronald J. Rockwell, Cincinnati, OH

WA8SUC, Elmer G. Boggs, Gallipolis, OH

W9AD, Herbert S. Brier, Chesterton, IN

WD9AKQ, John C. Luebke, Naperville, IL

Ex-W9BPS, Harry A. Fanckboner, Wilmette, IL

WA9EDF, George R. Despina, Round Lake, IL

W9FQA, John W. Storch, Northlake, IL

W9GVS, Bernard Frownfelter, Fort Wayne, IN

W9JYY, Eugene W. Gaynor, Sr., Chicago, IL

W9KTY, John W. Shaddon, Chicago, IL

W9SKU, Daniel J. Ward, Valparaiso, IN

K9YJF, Ralph Van Keuren, Beloit, WI

W9FOH, Kenneth W. Stevens, LeRoy, MN

W9LCW, Dale E. Cox, Willow Springs, MO

W9QCS, Erwin C. Gfeller, Alleman, IA

W9OMM, Donna I. Hosey, Raytown, MO

W9PAW, Virginia V. Davis, Pueblo West, CO

VE2BYJ, J. B. Ouellet, Matapedia, PQ

VE3GSG, Ray S. Sheppard, Aylmer, ON

VE6WW, Walter Watson, Hayter, AB

VE7DMS, John M. Rogers, Kimberley, BC

VE7HX, Mervyn Williams, Sidney, BC

VK3AKC, R. W. Wilkinson, Newtown, Victoria

TU2DO, John Doerr, Abidjan, Ivory Coast

YB7UD, Jon Bogar, Sanga Sanga, Indonesia

*Life Member

Strays



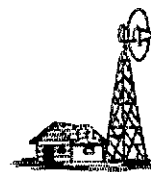
□ Herb Brier, W9EGQ/W9AD, died May 21 at

age 63 after a long and distinguished career of service to amateur radio. Despite being bed-ridden with rheumatoid arthritis since he was 13 years old, Herb accomplished a great deal during his lifetime.

Aside from his many articles for electronic and amateur journals (he was most recently

Novice editor for *CQ*), he co-authored the *VHF Handbook for Radio Amateurs*. In addition, he tutored prospective amateurs and local college students in various subjects, edited professional manuscripts and repaired and built amateur equipment for himself and others.

The World Above 50 MHz



Conducted By
William A. Tynan,* W3XO

Another View on the Polarization Question

The WAØDXZ thought-provoking guest editorial appearing in last month's column presented one side of a controversial question. To achieve compatibility with the many converts coming in from fm to ssb and cw, Bob advocates switching all 2-meter work to vertical polarization. Because this question is so vital to the future of 2-meter weak-signal operation, we asked veteran vhf'er, Ed Tilton, WIHDQ, to give us the benefit of his considerable polarization experience, both vertical and horizontal.

A guest editorial by Ed Tilton, WIHDQ: Activity in "the world above 50 Mc." started with vertical antennas, largely for reasons of convenience. We knew little about directional antennas in the early 1930s and nothing about the merits of horizontal or vertical polarization. A simple vertical was omnidirectional, a seeming advantage in those days, so vertical was used almost universally, until about 1938.

By then, emphasis was shifting from the major problem of just getting things to work that high in frequency to improving communications coverage. A significant development in the years just prior to World War II was the trend to directive arrays on all frequencies where they were practical in respect to size. The structural advantages of horizontal arrays, particularly those made for rotation, were obvious. Beam builders went horizontal on 10 and 20 meters (no 15, then) and their methods were adopted by newcomers to the 5-meter band. The stage was set for a polarization war, but it never materialized until "the other war" was over.

When hamming resumed late in 1945, the only band available at first was 112 Mc. (long before the term MHz became accepted). We picked up where we left off, mostly with vertical antennas left over from WERS days. But when the new 6-meter band was opened we got off to a running start with horizontals, whose supremacy has never been seriously challenged since. We missed an opportunity to standardize when 112 Mc. was abandoned in favor of 144. Again, we were concerned more with getting equipment to work at the new frequency, a real "frontier" in 1946, than in the niceties of polarization argument. We went vertical, mostly from force of habit. Several of the author's antennas made QST covers in those days. The 6-meter ones (September, 1946, January and July, 1947) were horizontal. The first big 2-meter one (May,

1946) was vertical. It was a great success, but structural problems with it started the builder to thinking about horizontal on this frequency, too.

The polarization war really started on 144 MHz; a bitter battle in which the undersigned was excoriated by "vertical forever" hecklers on both coasts. We still see an occasional "I'm Vertical" button when we attend vhf affairs in Southern California. They've been in circulation a long time!

Why Horizontal, Anyway?

Pressed by both sides to promote standardization, this author devoted several months of 1949 to an attempt to sort out the merits of both.¹ By then enough work was being done with horizontals on 144 MHz so that ambitious DXers were putting up flop-over arrays. At least two 32-element jobs were within range of WIHDQ, one at about 100 miles on Cape Cod, and the other about 275 miles away, in York, PA. The latter station, W3KBA, cooperated for several weeks in nightly skeds with WIHDQ. We put up a 12-element collinear that could be changed from horizontal to vertical by pulling on ropes at the base of the tower. There was soon a well-worn path between shack and tower, from countless checks with dozens of stations at distances from 15 to 450 miles. These were repeated as often as possible to sort out propagation effects which were many and varied.

Like many important questions, this one had no pat answer, but there were important differences over the long run. In the presence of man-made noise, horizontal gave better signal-to-noise ratio than vertical. This was substantiated years later in mobile work on both 50 and 144 MHz.² Horizontal was substantially better than vertical on some obstructed paths, a result that was never reversed except during periods of marked tropospheric bending, and then only at random times, which were in the minority.

In the interest of complete objectivity it must be stated that many tests showed no practical difference. Results were inconsistent on long paths. The biggest advantages of horizontal were turned up on short obstructed paths — *just the kind of operating that makes up so much of the fm communication today.* This works on fm, too. One early repeater where polarization tests were conducted carefully, in hilly terrain, had a much

larger service area with horizontal antenna.

There were many anomalies in our test particularly during tropospheric opening. During a fine tropo session with the Norfolk and Cape Henry area, over 400 miles, vertical was better one minute and horizontal the next. And signals at times were much stronger on a small temporary array 10 feet off ground than with the flop-over job at 50 feet. There were even periods when cross-polarization was better than matched, of either kind!

How About 1977?

Things are different now, you say? Isn't freedom from noise the reason so many of us are on fm now? And doesn't the mobile station dominate the vhf realm in a way never dreamed of when your work was done? The only honest answer is "yes," but with important reservations.

Noise is *there*; whether you hear it or not it is still a factor in weak-signal reception and thus in reliable coverage. Mostly you *will* hear it. The neat little "rice boxes" most of us use in vhf mobile work do not reach the true potential of fm for noise-free communication. You would hear it less with horizontal antennas at both ends, particularly on 6 meters.

If you would experience real vhf mobile communication, check with someone who has a good ssb rig and a horizontal mobile antenna. Beware the multimode rig in the comparison. Some imported jobs have systems designed primarily for fm service, and thus do not deliver anything like the true potential of ssb. In work with a base station equipped with a good horizontal beam array having at least a 10-dB advantage in transmitter power over the mobile, you may find yourself talking over paths that are quite beyond the range of the usual fm-and-repeat setups. Even thinking back to what we used to do routinely on a-m in the 1950s can generate strong doses of nostalgia, by comparison with much that is common to the scene of the 70s. Horizontal antennas were a factor in much that was good, in that era of vhf hamming — not that we really expect that to be a convincing argument!

Footnotes

- ¹ Tilton, "Antenna Polarization on 144 Mc." *QST*, January, 1950, p. 15.
- ² Tilton, "Polarization Effects in VHF Mobile," *QST*, December, 1956, p. 11.

ON THE BANDS

6 Meters — The lead for the May column was titled "More Excitement Ahead." Little did we know how prophetic these words would be. From results last year and this past winter, we had thought that the summer of 1977 might be a "good" sporadic-E season, but not in anyone's wildest dreams could a single

6-meter operator imagine the events which have taken place on the band over the last few weeks. As this is being written, it is mid-June. Even if not one more opening occurs for the rest of the summer, 1977 will go down in history as the "best Es year" since those first DX signals started 5-meter operators 42 years ago.

The most notable trait displayed by the E clouds this year has certainly been the numerous multihop conditions resulting in such "impossible" propagation as the East Coast to Hawaii, the West Coast to Japan and Europe

to Eastern Canada. Yes, all of these paths have been traversed by 6-meter signals so far this year. The extra long Es activity commenced June 3 with numerous contacts being made by western and central U.S. stations with KH6. Beginning at 2138 UTC WA8GUB/Q in Colorado Springs reported working KH6s EQ1, JJ and GRU as well as WA6MHZ/KH6, WB5CHW near Dallas also completed contacts with KH6IAA and KH6EQ1. After 18 years of waiting to work one KH6, K5ZMS of San Antonio worked three: JJ at 0250 UTC June 4, GRU at 031

*Send reports to Bill Tynan, W3XO, P. O. Box 117, Burtonsville, MD 20730 or call 301-384-6736 and record your message.

and IAA at 0424. From on-the-air contacts this editor learned that among others, WAQMRH, WQEKB and WAQTRO were each successful in salting away at least one KH6. W9KDR IL was another of the lucky ones. Nor was that the extent of it, WB4PXW FL went into the worked column at 0307. Bob also added, for good measure a QSO with KH6UJ at 0325. A letter from KH6GRU lists 12 states: WA, OR, CA, NV, AZ, NM, TX, CO, KS, IL, FL and MD. The writer has the honor of being Bert's MD contact - the first KH6 heard in this part of the country in almost 20 years!

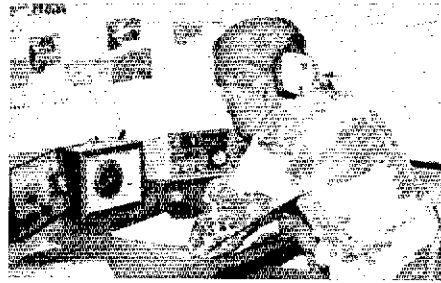
The next day, Saturday, June 4, the distance barrier between the U.S. and Japan was smashed by a number of southern CA 6-meter stations. The most definitive report on this record-breaking opening received to date is from WB6NMT in San Diego. After hearing many weak ssb signals up and down the band, finally Louie identified JA2DDN and hooked up with him at 2218 UTC. This QSO was followed by others with JA1UIU, JA1LZK, JA3EUD, JE1CZV, JA3EGE, JA2BZY, JH1ECU, JA6YAP, JA3LKY, JA6RJK, JA3RQ, JH6NIM, JA3CZA and finally at 2322 JH2HVL. The first three were on ssb but the rest on cw, signals ranging from RST 319 to 559. Other 6s known to have worked JAs that memorable day are WA6JRA and WB6FCD.

That's not all the old band had in store. WA1OUB was surprised on June 9 between 2111 and 2140 UTC to hear the KH6FQI beacon coming through about S-2. Another station reporting hearing the beacon was VE1ASJ. Here is another bombshell. The hard work of F8SH has already paid off! The French beacon which he set up on 50.1 under the call of FX3VHF has been heard on two occasions by VE1ASJ. Andy reports definite reception on June 7 and 10. He has also heard TV video signals on 51.175 apparently originating in Europe.

In comparison with the events reported above, occurrences such as double-hop and strong, steady single-hop signals seem commonplace. Nevertheless the 6-meter band has been treating everyone to a real show this year. The day of the SMIRK contest, Sunday, June 5, saw widespread openings throughout the country. Good scores will certainly be turned in by many participants. The next weekend during the June VHF QSO Party conditions were even better. Widespread double hop was worked, running up section totals. DX spice was added by the operations of WB2RLK/6Y5 and W2BN/C6A. Each of these stations logged several hundred contacts during their stays on their respective islands. KH6GRU's DX wasn't over either. Bert completed contest exchanges with VE3CRA among others.

2-Meters - In recent years when sporadic E has been most frequent on 6 meters and the lower bands, there has also been increasing impact on 2-meter operation. As this is being written in mid-June, the Es reports are far too numerous to mention them all. From informal word reaching me, the E layer played a significant role in 2-meter operation during the June VHF QSO Party at least in some parts of the country. I believe that this is the first contest in which this mode of propagation has figured to any significant extent in 2-meter scores.

June 6/7 seems to have been the big E-skip day so far this season with KIHTV reporting QSOs with WQKRX and WAQCCB both of the Twin Cities. The first at 2347 UTC June 6 on 144.110 and the second at 0005 June 7 UTC on 145.1. At 0140 UTC, WB4EFZ of Clemson, SC, tells of 145.1 ssb contacts by himself as well as WA4CUV and WA4MVS with WAQNR and KQAG, Rapid City, SD. WB3GPR in Pittsburgh, PA, had a notable fm contact with WQZK Northglenn, CO at 0142 UTC, June 7. The distance was estimated to be about 1500 miles. Apparently WQZK was transmitting on the 147.75/15 repeater output while Alan was replying through the repeater. In any case, it's a long way for 2-meter Es. At 1440 UTC, June 5, K2PC of Glens Falls, NY, completed a cw contact with W4WD in Miami, FL. Although the opening lasted only a few minutes, signals ran 599 both ways. A week earlier, on May 30, KQCIJ of



Popular 6-meter catch PJ2DW. Tirso runs an FT 620B to a 5-element beam at 30 feet. (Photo via WB4PXW/WB2RLK)

Two-Meter Standing

Figures are states, call areas and best DX in miles.

K1WHS	43 11	10749	W5UWB	20 7	1250
WA1FFO	40 10	2624	W6PO	32 10	8000
K1HTV	38 9	2616	K6REH	18 7	9500
W1FZA	35 10	2750	W6DDO	18 5	13250
K1ABR	35 8	1478	W6WSQ	16 4	1390
W1AZK	34 8	1412	K6HRA	13 4	2580
K1BKK	33 8	1450	K6JYO	13 4	1240
W1VTW	33 8	1430	WB6NMT	12 6	2540
K1PKX	33 8	1400	WA6JRA	11 5	2591
WA1OUB	32 8	1525	K6HMS	11 4	1258
K1UGQ	30 8	1370	WB6NMT	10 6	1250
W1WSM	30 8	1290	K6GAO	6 5	2500
W1VTJ	29 8	1296	K7N1J	35 10	2289
K1MNS	28 8	1368	WA7KYZ	30 10	6000
W1AJH	27 8	1300	WA7BUJ	30 10	2600
W1FJH	26 7	1250	W7JRQ	28 9	1320
K1MTJ	26 7	1040	W7RJC	26 9	2200
W1HDQ	24 7	1040	WA7BBM	21 7	2175
W1JR	23 7	1325	K7ICW	18 4	1278
K1RJH	22 7	1450	W7VEV	17 3	1300
K2RTH	42 10	11000	K7CVT	17 4	1225
W2AZL	38 9	2500	W4WVH/8	11 10	10500
W2CUX	38 8	1334	W8KPY	45 10	10100
W2NLY	37 8	1300	K8AXU	38 8	1275
W2XFD	37 8	1230	W8IDU	38 8	1150
W2ORI	37 8	1320	W8IDT	36 8	1150
W2BLV	36 8	1150	W8HAW	36 8	1100
WB2WJK	35 8	1680	W8YEO	35 8	1100
WA2CJX	35 8	1160	WB8DIO	35 8	1200
WA2BIT	34 10	10000	W8SPE	34 8	1100
W2FGK	33 8	1340	W8NOH	31 8	1165
W2CRF	32 8	1230	WA8LLY	28 8	820
K2EYW	29 8	1232	WA8HTL	27 8	1278
K2CEF	29 8	1200	W8ICW	26 9	1000
WB2VWV	27 8	1350	WB8KC	24 8	900
WA2PMW	27 8	1245	K8ZES	22 8	675
W2CNS	27 8	1150	K9HMB	47 11	9894
K2GAR	27 7	1200	W9DDB	46 10	4475
WB2TB	26 8	1000	K9UIJ	45 10	1874
WA2UDT	24 7	1020	W9YFF	44 10	4500
W2UZL	24 8	1310	K9UGD	42 9	1300
WB2CUT	24 8	1200	WA9AG	41 9	1200
WA2EMB	23 6	1335	K9AAJ	41 9	1200
K2BWR	23 6	1350	W9CAW	41	---
W2DWJ	23 6	860	WA9WHJ	41	---
W3BHC	40 10	2488	W9QII	37 8	1075
K3CRS	37 8	1250	K9UNM	37 8	930
K3CFY	37 8	1250	W9BRN	36 9	1260
W3RUE	36 8	1250	K9UYK	35 9	1600
WA3QVN	33 10	2500	WA9EJA	35 8	881
W3OMY	33 8	1200	W9NPS	34 8	1108
W3BDP	32 8	1275	W9PBP	34 8	820
W3TMZ	31 8	2410	K9OXY	30 8	1350
WA3JFU	31 8	1280	K9VWY	30 8	1052
W3XO	31 8	1200	W9JJO	29 8	1000
W3LNA	27 8	970	K9RVG	22 7	1100
K3CFA	25 8	1200	K9MKS	50 12	8008
K3WHC	24 8	1700	WA9QHS	47 11	2165
W3ZC	24 8	1350	W9ER	44 9	1440
WA3RF	23 8	1200	W8RLL	41 9	1345
W3FTA	22 8	1342	W8DGY	41 9	1300
K3OBU	21 7	930	W8EMS	40 10	1320
K4GL	44 10	4850	K9DAS	40 9	1146
K4IXC	40 10	4850	W9LCN	39 9	1450
W4HJQ	40 10	2000	W9PW	35 9	1380
W4DFK	39 11	12000	W9ECC	34 9	1360
WA4CQV	39 8	1350	W9PMN	34 9	1285
WA4MMV	38 10	2300	W9OHU	30 8	1073
W4HFK	38 9	1230	W9DRL	27 9	1295
K4EJQ	38 8	1350	WB9BVC	26 8	1181
WA4GPM	37 10	4200	W9MJS	26 8	1118
K4QIF	36 8	1225	W9PS	22	1287
W4VHH	36 8	1125	KH6NS	3 2	6000
K4VW	35 8	1440	K6YNB/KL7	15 11	2800
WA2CJX/4	35 8	1175	VE1ZN	7 2	500
W4RJC	34	---	W2DFO	41 10	10600
W4FJ	34 8	1150	VE2YU	32 8	1200
W4I5S	33 8	1090	W2EHW	18 6	800
W4AWS	29 8	1350	VE3ASO	38 9	2140
K4KAE	29 8	1200	VE3BQO	37 8	1250
K1FJM/4	29 8	1190	VE3EYC	37 8	1200
W4LNG	29 8	980	VE3AIB	29 8	1340
W5ORH	48 11	4600	VE3EVS	29 8	1100
K5BRG	47 11	4500	VE3EVS	29 8	1100
W5JCS	43 10	1398	VE3EVS	29 8	1100
W5UNL	42 10	1725	VE3EVS	29 8	1100
WB5LUA	42 10	1664	VE3EVS	29 8	1100
W5RCL	42 9	1289	VE3EVS	29 8	1100
K5WXZ	40 10	1450	VE3FVX	25 8	1300
W5WA	39 10	1370	VE3AQZ	18 8	1300
K5HVK	37 10	1285	VE7BQH	12 3	7920
W5HN	37 10	1500			
W5FF	34 8	1960	VK3ATN	4 4	10417
W5SWV	34 8	1260	VK5MC	7 7	10000
K5VWV	33 10	5200			
W5UKQ	33 9	1290	W1NUV/P9	8 3	800
K5YK	29 9	1350	SM6CKU	4 4	4200
WB5KY	29 8	1407	SM7BAE	15 9	11055
WA5HNK	29 8	1550			
K5FF	25 7	1349	ZL1AZR	2 2	11055
W55XD	25 6	1265			

Minneapolis (formerly W0LCN) worked WA2DPJ and W2AZL NJ with good ssb signals. A fascinating 2-meter Es opening is reported from the Azores by CT2BS/WA4CAD. At 1930 UTC, April 27, Dave heard a mainland Portuguese repeater on 145.750. Betting that it used a 600-kHz split, he set up his FT 221 and called in. What followed was a string of QSOs through the repeater. One of the stations, CT1AN, told him that he had ssb, so they switched to 144.900 and made it on that mode. Upon returning to the repeater, one of the CT1s told Dave that he was hearing him on the input so they made a direct fm QSO. Dave next encountered a group of CT1s working simplex on 145.054 talking about that CT2! He broke in and joined the round table. Altogether, the 1000-plus mile opening lasted over two hours and netted contacts with 16 CT1s.

Need the state of WA on 2? Many stations in the central part of the country have a pretty good m.s. shot at eastern WA but not the Seattle area where most of the activity is located. In order to give these fellows a chance, W7FN, W7DNU and K7KOT are mounting a Perseids DXpedition to the southeastern corner of the state. From August 9 through August 14 they will have a kW to stacked beams operating from a 4000-foot elevation near Clarkston, WA. They will also be on 3815 kHz for liaison. Those desiring schedules may contact W7FN at 206-232-3092.

Speaking of m.s. skeds, K9CJ would like one with Vermont. Either cw or ssb is all right with Clair. Address is 5036 17 Ave., South Minneapolis, MN 55417. The rare state of DE is also available for skeds of any kind from 6 meters through 70 cm. WA3QPX is well equipped on all of these bands. You can call Paul at 302-731-0613.

Tropo is still a popular mode on 2 meters. To illustrate this point, here is a tropo report from a part of the country where the mode is considered quite rare. On Sunday morning, May 29, W5FF noted good TV signals from the east. So Fred got on 145.1 ssb and started making some noise. This produced outstanding results in the form of QSOs with 15 TX stations, most of them in the Dallas/Fort Worth area, and two OK stations K5JL and WB5CWB. K5JL was also worked on 1-1/4 cw by Lee, K5FF, for a new state on that band for her. Fred and Lee say that this is the first real tropo opening that they have experienced at their QTH just east of Albuquerque. WA5TBE reports from Corpus Christi that on June 6 the Gulf came up with another one of its fine tropo shows. Carl worked Tampa, FL, stations W4VCL, WA4QHE and WB4JLV. A second contact was made with WB4JLV on 70 cm.

70 Cm -- Moonbounce continues to dominate 70-cm news. Despite some tracking problems with his 32-foot dish, ZE5JJ hands out African contacts to more stations each month. The setup at YV5ZZ is beginning to produce results. With his big 84-foot dish in MD, K3NSS is making steady progress toward a goal of being able to work stations with "minimum equipment." The 32-foot dish at W5FF (see December 76 column) is apparently cutting the mustard. A word to wise for those needing NM. Via W5NW, we hear that VK3ATN is constructing a 38-foot dish. That certainly should put him in the 70-cm EME business. Ray has worked WA6LET on the band and heard W2NFA on 23 cm. On 2 meters he has 3 countries, 2 VE call areas, 7 U.S. states and 4 U.S. call areas certainly giving VK3ATN credentials in the moon-bounce business.

In a recent issue of the 432 EME News, K2UYH says that he tied his hand at building the JA1VDV GaAsFET preamp with very good results. Al's unit took top honors at the Northeast Vhf Conference with a measured noise figure of 0.9 dB. Additional information from Aki indicates that adjustment of C-1 for between 0.7 and 1.0 pF provides optimum noise figure. Device currents between 7 and 20 mA make only about a 0.1 dB difference. Those seriously interested in 70-cm EME who desire to be included on the mailing list for the newsletter should contact K2UYH for details.

Blizzards in August?

A funny thing happened on the way to the Simulated Emergency Test this year. Old Man Winter must have missed the SET announcement in December *QST*; otherwise, he never would have dared to cause blizzard conditions on January 28, the threshold of the SET weekend.

Many ARRL Amateur Radio Emergency Service groups found that this severely cramped their style. They had to cancel their exercises to deal with the genuine article. Here's a sample of the services hams provided, based on those few reports that were filed with Headquarters. (We had planned to run this story as an accompanying piece to last month's SET results, but were thwarted by space limitations.)

□ National television showed us the mountainous snowdrifts and assorted chaos that was Buffalo. The city suffered its worst disaster since Bob McAdoo was traded to the New York Knicks. Over 25,000 people were stranded in downtown Buffalo alone.

Reports that found their way to Newington on the amateur involvement in the communications emergency have been underwhelming. However, it is reported that the Western New York Emergency Net (which meets on both 75 and 2 meters) immediately went into action (and scrapping plans for SET participation). Local net operations were handled on WR2ABU, the 31/91 repeater sponsored by the Buffalo Amateur Radio Repeater Association.

Amateur links were on the air from the Buffalo Red Cross and Salvation Army, and liaison was maintained with many surrounding communities. Telephone service was down, but Salvation Army commanders were able to have instant communications with each other via ham radio.

The WR2ABU net operated continuously until February 4, for a total of 160 hours. Over 1,500 messages were handled, including many emergency calls and requests for food and medical supplies. Many medical emergencies were averted by the coordination of food and drug supply deliveries to those in critical need. (WB2FTX)

□ In the Luzern/Schuylkill County area of

Pennsylvania, hams were hard at work assisting the public. Most of the activity centered on the Anthracite repeater, WR3ADF. At the outset of the storm, mobile units estimated that visibility was less than five feet. It wasn't long before state authorities closed parts of the Pennsylvania Turnpike and other interstate routes. Amateurs were extremely busy helping motorists who were stranded in the maelstrom. Lines of communication were set up with state police, fire department and Salvation Army, who established shelters for snowed-in travelers. Hams also supplied communications for doctors, ambulance crews and wreckers, as well as municipal officials. (W3TI)

□ The Pennsylvania RACES Net on 3993 kHz was in full swing during this time, operating around the clock, until finally securing Sunday evening. The Crawford Amateur Radio Society emergency net was also called up, and liaison was maintained with the local emergency services coordinator. Up-to-date weather data were passed to the e.s.c. via the net. (K3HWL)

□ W3AEN was the chief operator at the fully equipped ham station at the Western Area Council of Civil Defense command post. Reportedly, this station was the control point for the entire state of Pennsylvania. (W3BMD)

□ In Monroe County, Michigan, ARES members were called in to man the office of civil preparedness' communications center and six shelters. Most roads became impassable and citizens were evacuated from their stranded vehicles and housed overnight in shelters. Amateurs coordinated shelter logistics and provided a health-and-welfare message service for those who were stranded. (WA8EFK)

□ In Kent County, Michigan (Grand Rapids area), relief shelters were established at two locations — one at the Red Cross building and the other at the National Guard Armory. The ARES provided communications between the two, as well as compiling road-condition reports. Communications were handled over WR8ACN. (WB8ESK)

□ Muskegon County, Michigan, was also para-

lyzed by the weather. Thirty-five ARES members handled 4,000 telephone messages and dispatched necessary vehicles to transport over 2,000 priority personnel during a four-day operation. Life-and-death situations developed, but the ARES handled them in stride. (K8ROH)

□ Reports were also received from Van Wert County and Montgomery/Greene Counties in Ohio. Hams supplied much needed communications for Red Cross, civil defense, local government and the news media. (W8ILC W8SGX)

□ In Indiana, blinding snow and 60-mile-per-hour winds caused the closing of most roads in the state. Hundreds of motorists were stranded along interstate highways. Several counties declared martial law. The Indiana Traffic Nets and ARES Net provided information and assistance continuously from January 28 to January 30. Trucks and cars were piled up for miles. National Guard, state police and Red Cross units had to evacuate travelers to shelters, which were in operation in Indianapolis, Marion, Ft. Wayne, Lafayette, Peru and Rensselaer. Hams assisted in a variety of ways and situations, again primarily on 2 meters. (W9UMH)

For example, Tippecanoe County's Red Cross station, W9REG, was activated under emergency status, and a directed net was conducted by ARES personnel on WR9AHZ for four days. Communications links were maintained with the National Guard Armory civil defense hq. and state police hq., by way of WR9ACZ and WR9AHZ. (W9NQW)

Reports were also sent in from Allen County. Their SET plans were shelved as hams mobilized to handle communications in and around Ft. Wayne. All the major roads were snowed in and keeping in constant contact with the emergency operations center, hams accompanied Red Cross drivers on rescue missions. (W9KMY)

□ In the St. Catherine's area of Ontario snows trapped 600 students at a local college without telephone lines. The ARES provided a service for health-and-welfare traffic on the VE3NRS repeater. (VE3DVE)

□ Vicksburg, MS — April 27. Fire, police and the sheriff's departments were left without power after a sudden windstorm hit the city. Vicksburg ARC members set links to the power company for reports of downed lines. (VARC News)

□ Douglas Co., KS — May 4. The county's newly completed Emergency Operations Center received its first workout when a funnel cloud touched down at dusk. It was tracked by ARES units including WB0BBC, whose car was picked up by the twister. He suffered only minor injury. (WB0KDE)

□ Northern Saskatchewan — May 12-22. ARES members provided hf and vhf links from a 190,000-acre blaze to fire control hq. in Prince Albert, 90 miles south. More than 25 amateurs participated, handling over 300

PUBLIC SERVICE DIARY

□ Baja, Mexico — December 3 (1976). W7WYP was aboard a sailboat with six other persons when rough seas forced it aground. On 40 meters he contacted WB6ARO in San Francisco, who summoned U.S. Coast Guard aid. (W6OAT, SCM SF)

□ Alabama — February, March, April. During a series of severe storms and tornados, the Alabama ARES was activated for over 150 hours to report activity to the National Weather Service, Red Cross, c.d. and law enforcement agencies. Over 100 amateurs took part on emergency nets M, W and X and WR4s ADD, AGA and APS. (WB4CXD, EC Jefferson Co.)

*Asst. Communications Mgr., ARRL

messages and 100 phone patches for the firefighters. (VE5BO, EC Prince Albert)

Centerville, OH — May 20. Parents of an injured Toledo girl were known only to be at a wrestling match in Centerville. WB8MZZ got on the Ohio Single Sideband Service Net, requesting a station there, and was answered by W8HHQ, Dayton. He brought up W8TH, who called Centerville police and had the parents located within 30 minutes. (W8TH)

Coral Gables, FL — May 27-28. While newly licensed WD4CHZ was talking with an Italian station, HI8FEQ broke in requesting a special ointment for a woman near blindness. YV4BTG and 10 other stations helped in the search. WD4CHZ then persuaded her family doctor to issue the prescription while her hotel's switchboard operator spent the night calling consulates and airlines for transportation means. After the *Miami Herald* was called, a direct flight from Miami to El Salvador was located. (WD4CHZ)

Repeater Log. According to reports received to date, repeaters were used to report 71 automobile accidents and related occurrences, 10 disturbances, three fires, two rescues, two burglaries and one drowning. Repeaters involved were WR1s AAC AAL, WR5s ABA ABE ABY ADP AJG, WR7ACE, WR8s ADE AHC, WR9s ABY ADT AJE.

SEC reports received in May total 34; at this time last year 35 were submitted. Reported ARES membership totaled 13,433 as compared to 11,733 in May 1976. Sections reporting were Alta, Ariz, Ark, Conn, Del, ENY, EMass, Ga, Ind, Kans, Ky, Me, MDC, Mich, Mo, Mont, NLI, NC, NFla, NTex, Ohio, Okla, Ont, Org, Oreg, SDgo, Sask, SFla, Utah, Va, Wash, WVa, WMass, WPa.

NATIONAL TRAFFIC SYSTEM

You'll note that both IRN managers got together and submitted one report for the region this month. Making "one region-one report" standard operating procedure for NTS is definitely on the horizon, but we'd much prefer that it be done voluntarily. What say? *Who's Who, part two*: K1BA (WA1MSK), N2AR (WA2WKH), K2NO (WB2PYM), N2NT (WB2PLF), W2RQ (WB2RKK), K3AT (W2KAT/3), K3PA (WA3SXU), N4DY (WB4DXN), N4MD (W4RQS), N4WA (WA4FBI), N5ES (WB5AMN), K5GM (W5UJJ), W5KH (WB5KSS), K5MC (WA5VQE), N5YL (WA5ZZA), N6GW (W6BGF), W7EP (K7NHL), W0FG (K0DRL), W0SS (K0AZI), N0IA (W0LRN). 2RN certificates addendum: (5th annual) W2CS; (6th annual) W2CU; (7th annual) WB2LZL W2TZ; (8th annual) W2RQ; (9th annual) W2MTA; (10th annual) W2RUF.

May Reports

(evening sessions)
(daytime sessions)

	1	2	3	4	5	6	7
EAN	31	1449	46.7	1.218	96.2		
EAN	62	631	10.2	.509	84.9		
CAN	30	1046	34.8	.815	100.0		
CAN	56	348	6.2	.196	86.0		
PAN	31	1002	32.3	.825	100.0		
PAN	31	333	10.7	.312	96.0		
1RN	90	744	8.2	.447	91.9	92.7	
2RN	92	598	6.5	.469	93.9	87.1	
2RN	55	218	3.9	.428	66.7	74.2	
3RN	62	310	5.0	.376	98.3	100.0	
3RN	31	94	3.0	.470	100.0	100.0	
4RN	40	347	8.7	.364	47.8	100.0	
4RN	62	628	10.1	.436	68.5	98.4	
RN5	54	721	13.3	.443	81.5	100.0	
RN5	31	267	8.6	.308	85.0	90.3	
RN6	60	592	9.8	.458	96.7	100.0	
RN6	30	105	3.5	.161	74.2	100.0	
RN7	62	373	6.0	.517	87.3	100.0	
RN7	53	81	1.5	.142	42.6	100.0	
8RN	52	264	5.0	.308	75.3	96.7	
8RN	31	124	4.0	.599	78.5	93.5	
9RN	60	573	9.5	.513	86.0	100.0	
9RN	29	68	2.3	.285	75.8	79.0	
TEN	59	336	5.7	.292	64.5	100.0	
TEN	31	89	2.8	.440	45.7	88.7	
ECN	59	261	4.4	.354	90.3	100.0	
TWN	62	497	8.0	.346	99.3	100.0	
TWN	22	65	2.9	.160	40.0	97.1	
TCC 109 ¹		554					
Eastern TCC 87 ¹		490					
Central							

TCC 112 ¹	640	Pacific Sections ²
4225	17818	4.2
Summary	5593	32642 5.8
Record	5500	29677 18.4

¹TCC functions not counted as net sessions.
²Section and local nets reporting (129): APEN (AB), BCEN (BC), APN (Mar/NFid), MTN (MB), OPN (ON), WQV/UHF (PQ), SATN (SK), AENB AEND AENM AENR AENW (AL), ASN (AK), ATEN HARC (AZ), AMBN APN ARN OZK (AR), NCN NEN SCN (CA), CWN (CO, WY), CN CPN NVTN (CT), DEPN DPN (DE), EAST FMTN FPTN GN NFPN GFN QFN5 SPARC TPTN (FL), CVEN GARES GSSBN (GA), IMN MTN (ID, MT), ILN ISN (IL), I75MN TLGN (IA), QKS (KS), KNTN KRN KSN KTN KYN MKPN (KY), LAN LRN LSN LTN (LA), PTN SGN (ME), MDCTN MDD (MD), EMRI EMRIPN NENN WMN WMPN (MA), HEN KCEN MACS MNN M16m QMN WSN (MI), MSN MSPN MS5N MWX PAW (MN), MSBN MTN (MS), MON (MO), NHVTN (NH, VT), BARTEN NJN NJPN (NJ), SWN (NM), NLI NLIPLN NLS NYS (NY), NCSBN SCSSBN (NC, SC), BN BRN COARES-10 ONN OSSBN O6mN OSN (OH), OAN OFON OLZ OPEN OTWN STN (OK), SCN (OR, WA), PTN (Pac), PTTN WPA WPAP & TN (PA), ETTMN TN TNN TPN (TN), TEX TTN (TX), BUN UCN (UT), VFN VN VSN (VA), WVN WVN WVPN (WV), BEN BWN WIN WNN WSN (WI).

1 - NET	5 - RATE
2 - SESSIONS	6 - % REP.
3 - TRAFFIC	7 - % REP.
4 - AVG.	AREA NET

Transcontinental Corps

Bill Marsh, VE3SB, assistant director of TCC-Eastern, has been appointed Director, following the resignation of W2FR. Our thanks to Howie for all his hard work while serving in virtually every leadership role in NTS and congratulations on a job well done.
Certificates: K1GN (TCC-E), W0KLE (TCC-P).

	1	2	3	4	5
Eastern	124	91.6	1528	554	
Central	93	93.5	973	490	
Pacific	124	90.3	1284	640	
Summary	341	91.8	3785	1684	

1 - AREA	4 - TRAFFIC
2 - FUNCTIONS	5 - OUT-OF-NET
3 - % SUCCESSFUL	TRAFFIC

The TCC Roster

The TCC Roster (May): Eastern Area (W2FR, Dir.) — W1s NJM QYY, K1s BA EIR GN PAD XA, WA1FCM, W2s CS FR GKZ, K2HI/VE2, WA21CB, WB2s ASD EMU, WA3s SXU VBM, WA4U, K4KNP, W8s LTA PMJ, K8KMQ, WB8ITT, VE1AAO, VE3s GOL SB, Central Area (W5GHP, Dir.) — N4s DY MD, WB4SKI, W5s GHP MI RB, K5GM, W6s HNN IQU ZZA, W9s CX Y DND LF NXX, WB9s KTR NOZ TWT, W0s AM HI QMY, K0CVD, N0IN, WA0TNM, Pacific Area (K3MAT, Dir.) — W5s KH RE, K5MAT, N6GW, W6s EOT MLF OA VZT ZR J, K6s HW OE, W7s DZ X EP GHT KZ, K7s IWD QFG, N0IA, W0s ETT FG IW KLE LQ, K0TER, WB0QOT, VE7ZK.

Independent Nets (May)

	1	2	3	4
Clearing House	31	398	568	
Hit & Bounce	62	1149	474	
IMRA	26	352	970	
Mike Farad	26	54	267	
North American SSB	25	301	366	
North American Traffic and Awards	31	147	639	
Washington Region PON	16	42	244	
20 Meter ISSB	25	411	411	
75 Meter ISSB	31	587	1043	
7290 Traffic	42	385	1895	
1 - NET	3 - TRAFFIC			
2 - SESSIONS	4 - CHECK-INS			

Public Service Honor Roll May 1977

This listing is available to amateurs whose public service performance during the month indicated qualifies for 40 or more total points

in the following nine categories (as reported to their SCM). Please note maximum points for each category: (1) Checking into cw nets, 1 point each, max. 10; (2) Checking into phone/RTTY nets, 1 point each, max. 10; (3) NCS cw nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned liaison, 3 points each, max. 12; (6) Phone patches, 1 point each, max. 20; (7) Making BPL, 3 points regardless of traffic total; (8) Handling emergency traffic directly with a disaster area, 1 point each message; (9) Serving as net manager for entire month, 5 points. This listing is available to Novices and Technicians who achieve a total of 20 or more points.

68	WB2ASD	WA7MEL	N8CW
WD5ABL	WA2ERT/1	K0EVH	WB1Q
WA2BML	WB4DBK	W0FT	W9GGW
67	W5GHP	VE1ACU	K9ZTV
WA3YJG	WB5GVO	VO1GW	WB0HX
	N6CY	VE3DPO	W0YH
66	WB6RNL	48	WB0QOT
WB2IWX	WB0PGZ		WB0TAQ
K4ZN	55		VE3GOL
64	W7VSE	47	VE3GT
K1PAD	53		VE5XU
WA5RKU	W1BVR	WA1VKB	
61	WB4CAK	WA3VBM	43
WA1TEH	N5ES	WA4PSL	W4FMN
WB2CST	WB8WTS	WB4QBB	WA1GS
WB2EMU	52	WD8AVY	WB4OXT
WB4EKJ	52	WB8VLR	WA9QCF
66	W5KLV	K4BKX	WB8YVI
WB5NEZ	WA4EPJ	46	VE1ZH
WB5NKC	W4MEE	46	WA2DIW
WA5YEA	51	WA1MJE	WA4JPV
WA5ZZA	K3YHR	WA6UAZ	WA4TXM
WA6TVA	N4DY	W0OTF	W6JXK
WB8JGW	WB0OVZ	44	41
WB8YZD	W0RF	44	K1EF
60	50	WA1YWK	W2CS
WB5NUM	W2MLC	WA2VEN/0	WA2DSA
W4OGG	W4LXB	W2YJR	WB8DKQ
59	WA4SRD	W4Z2JP	WB8NCD
WA1UWF	49	K3KAJ	W8VPW
WA1VGP	K1RAW	44	WB8YBJ
WB4ARJ	W1RWG	WB4NHU	WB0PYD
57	WA1ZAZ	WA4OEM	VE41X
WB6PVH	K3ORW	N4SS	VE5AAE
56	WA3PRW	WA4UUX	40
K1BA	K4YFC		W1KVO
WA1FCM	WB5FHU		WA1VGM
WA1VEI	WA51QU	WA5JYH	W7DAN
	W7GHT	WB6FTY	28
			WA4QGV/T

Brass Pounders League May 1977

BPL Medallion (see December 1973 *QST*, p. 59) has been awarded to the following amateur since last month's listings: W4RQS.

The BPL is open to all amateurs in the United States, Canada and U.S. possessions who report to their SCM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL form.

Winners of BPL Certificates for May Traffic

	1	2	3	4	5	6
W3CUL	523	1110	1493	67	3193	
W0WYX	55	1915	431	584	2085	
K3NSN	46	900	900	32	1878	
WA4TXM	335	199	510	133	1077	
K0YFK		438		433	871	
W4MEE	2	446	386	14	848	
W3VR	275	201	340	10	826	
K0ZSQ	1	360		360	721	
WA0AUX	4	355	351	4	714	
WA4JDH		354	332	1	687	
K0ONK	15	515	139	17	686	
K9CPM		389	30	255	674	
WB4ARJ		303	345	2	650	
WB8DKG	2	315	279	9	605	
W2YJR	26	248	225	65	564	
WA3YJG	15	151	301	90	557	
WB6EIG	15	271	271		557	
K1BCS	102	174	254	23	553	
WB4QBB	39	207	257	8	511	
WA4JVP	21	230	228	27	506	
WA0VRE	2	250	250	3	505	
K4ZN	13	240	242	6	501	

BPL for 100 or more originations-plus-deliveries

WA3ATGI	263	WA3THT	148
W9IOH	205	WA4EPJ	144
K7VWA	188	WB4TZR	139
WA4EYW	173	W7SQT	129
W7TZK	171	W0FIR	125
WA4WBM	163	WA1VGP	112
WA2BMI	155	VE3CDK (Mar.)	105

1 - CALL	4 - SENT
2 - ORIG.	5 - DEL.
3 - RECD.	6 - TOTAL

Frequency Measuring Test

May 14 results. Tune in, turn on, and freq. out.

By Jean DeMaw,* W1CKK

The first Frequency Measuring Test using the new W1AW antenna system was, to say the least, a success. Those participants utilizing 20 meters registered in most cases a resounding "thumbs up" in response to the "bigger" signal on that band. Comments ranged from "first time I've heard the FMT on 20" to "finally the QRM level was below the level of the signal to be measured." The umpire also commented on the improvement in the W1AW signal and was able to take official measurements on all but the late 20-meter run (and that omission appeared to be due to deliberate interference).

For the record, the official early run readings in kHz were 3542.413, 7070.432 and 14108.358. The measurements of record for the late run were 3550.418 and 7022.759 kHz.

The 133 participants who submitted their results took a total of 2151 measurements, of these, 125 were able to at least make the cutoff point of 179 parts per million and, of those, 36 entrants measured their way into the coveted Honor Roll list.

September 17 is the next scheduled running of the FMT. Those interested should check "Operating Events," this issue, for details.

Honor Roll

This top listing is the standing of the frequency measuring leaders. In consideration of the minimum possible error due to Doppler (and other unavoidable factors), we accredit as of equal merit

all those reports computing 4/10th parts per million (or better) accuracy. Please note that a participant must submit a minimum of two measurements to qualify for this listing. Again, the following top achievers are of equal merit, most conveniently shown in an alphabetical listing by call area: W1BGW W1HJP K1VHO W2AXT WA2IFL K2MZN WA2VPA N3EE K3LPP WA3WBK N4HP W4JGE, W4NTO, W4RHZ WB4RLW W5FMO W5LJW W5QIV WB6AAL W6CBX W6CLM W6RQ WA6VPD W7ANF ex-7HM W8CUJ W8OK WB8STQ WA9AAT W9FKJ W9KO W9MNY W9TJ W0BJ W0KL VE2HN.

Better Than 35 Parts per Million (Class I OO Qualification)

(.5) K1BC, (.6) WA4APB W3BFF W6ME, (.8) W1DDO WA1QOI W2DW W3FYK W7BUN, (.9) WB2WQA, (1.0) W1PLJ, (1.2) WA4ZXC WB9VUO, (1.3) WA4TZD, (1.4) WA8ONI, (1.6) W1AYG, (1.8) K6EC, (1.9) WA4YVQ WA0EFN, (2.2) WB8YEK, (2.3) W1CQ WA0YCY, (2.4) W4QN W6CDF, (2.8) VE6BAF, (3.8) W0SS, (3.9) W9PBI K4WMP W0HBH, (4.0) K1GN, (4.1) W1VH W0CP, (4.5) K4OAO, (4.8) Johnston, (5.2) W4NUM, (6.1) W4AWS WA7HGB, (6.5) K1OGF W3ADE K7ISL, (6.6) WA8QBJ, (7.6) W4HU, (7.7) WH2MID K7DUE, (7.8) VE6XO, (8.1) W7FIJ, (8.5) K9CCX, (8.7) W7JMS, (9.4) WA3RPG, (10.0) W9FFN, (10.1) WA3JSZ, (10.5) K4JQY, (10.9) Ward, (12.2) VE3MJ, (12.4) W8DPW, (14.5) W6AEE, (15.2) WA2AIV, (17.0) W3PLI, (18.1) K6EPX,

(18.2) W6SSB (19.4) K2DW, (21.7) W2ND, (22.9) K4VM, (23.2) K4MZE (24.4) WA6GEN, (25.1) WB8ESK (27.5) W9TGN, (28.2) W3YO, (29.6) K4MZE, (31.1) WB2AYA, (31.6) WB4RUA.

Better Than 179 Parts per Million (Class II OO Qualification)

(37.2) K4ZN, (40.2) WA3UH (40.5) W8AYI, (44.6) W6FCD, (48.9) W4IBU, (58.3) WA1NAE, (63.0) WA4IBI, (69.7) WB8HAT, (77.4) W4NHY, (86.3) W1NJN, (87.0) WA6NOI, (88.2) K4ZVS, (89.0) Fernandez, (90.5) WB8WJZ, (92.6) W3KEK, (94.2) WB6RQE, (128.7) K6QPG, (155.1) WA1CRI.

HR Measuring Methods

A 1-MHz crystal oscillator, zero-beated to WWV, was digitally divided down to provide a one-second gating pulse. A BC-221 oscillator, zero-beated to W1AW, was gated on by this one-second pulse and the burst was counted with 22 binary stages. (WA3WBK) Tuned in a beat note and measure audio frequency. Key transmitter on dummy load and adjust to give same beat-note audio frequency. Measure transmitter output. Caution: Change receiver frequency dial, note and observe new audio frequency output. Key transmitter, audio note should be same as second reading. If not, you are on wrong sideband. (N4HIP) Method of measuring was to tune Swan receiver from zerobeat by 120 MHz and then beat this tone frequency against another 120-Hz tone to get a null. This second

*Communications Assistant, ARRL

tone derived from the 60-Hz power-line frequency, using the ripple frequency output from an unfiltered rectifier. Thus, it was a very stable and highly accurate source of 120 Hz (quite inexpensive). (W4JGE) I used a highly geared-down BC-221 as a source into a Heath SB-030 and counted with a Heath counter calibrated against WWV before and after the run. (WA2IFL) My measuring setup is as follows: (1) Homebrew frequency standard with temperature controlled AT-cut 4-MHz crystal and digital dividers to 100 kHz and 1 kHz. There is also an audio output 1-kHz sine wave from the same system. Crystal accuracy is checked to WWV at better than 1 in 10⁷. (2) Homebrew frequency counter with 1-Hz resolution, using the previously mentioned crystal for reference. (3) Old (WWII surplus) general-coverage receiver, used with BFO off, tuned to WIAW. (4) Retired (tube type) homebrew VFO, modified with vernier tuning to make setting easy to 1 Hz. (5) Simple one-IC comparator, battery operated, driven from 1-kHz reference square wave and the receiver audio output. First the VFO is zerobeat to WIAW for approximate (to 10 Hz or so) frequency measurement. VFO is offset exactly 1 kHz, as determined by ear from beat with 1-kHz sine reference. Using the VFO vernier tuning and the comparator led indicator, the offset is manually maintained at exactly 1 kHz and the VFO frequency is read from the frequency meter. The actual reading is corrected by the exact 1-kHz offset. The reason for this complex setup is to

avoid difficulties in determining true zerobeat with WIAW due to poor audio low frequency response in receiver. (VE2HN)

QRGe

New antenna system on 20 meters great! First time I have ever been able to measure 20-meter signals. (WB8STQ) Receiving conditions excellent. If Friday the 13th caused this, let's have more of them. (W9MNY) Signals on all three bands were the best I have heard during an FMT. Had to swamp them down to get proper zerobeating. (W0KL) A fine time was had by all and especially by me. (K1BC) Thanks for providing the opportunity to match our gear against professionals. (WA4APB) Conditions were great with big signals on all bands. (W4QN) 14 MHz was so loud that a weak continuous backwave was audible. Fantastic conditions. (W0SS) Surprised to hear you on 20 meters. First time there (W9PBI) Guessed on first run with help of Electrotech FC-50 counter. Wired scope to detector on af board of TS-820 so I could see zerobeat. (W0CP) Would like to see a shorter turnaround time between the FMT and date of publication in *QST*. (WA7HGB) My fourth time with the FMT. Used a modified BC-221, Drake R-4 receiver and IB-1100 Heath counter. 20 meters, strongest ever. 40 meters, halfway decent. 80 meters, all but wiped out with QRM. If there were only some method of education for those who don't understand our reasons. Keep up the good work. (WA8QBJ) WIAW should put out a

bulletin the week before each scheduled FMT as a reminder of the day and time of this and other special events. (WA2MID) Enjoyed it. However, the real challenge, I find, is not in determining FMT frequencies but just being able to zero beat WIAW without tripping over a Spanish phone patch or a truculent carrier. (W9FNN) Lots of carriers on 75 meters made it difficult to find the zerobeat of the frequency. Still had lots of fun. (K4JQY) I was astounded that I was able to hear all six runs. This is the first time. (Ward) The evening was interesting even though the conditions on 20 meters were rough. W3PLI I enjoy participating in the test. Please continue them. (W2ND) Zero beat MFJ frequency standard (25-kHz position) with WWV (10MHz) in SX-111 receiver, then calibrate BC-221 frequency meter at 14.075, 7.025 or at .550 MHz. Zero beat BC-221 with WIAW signal in NCX-3 transceiver and read BC-221 dial to one nonsignificant figure. Referring to BC-221 calibration book, use linear regression to obtain one extra significant figure of dial settings, then use linear interpolation to obtain frequency. (WA6GEN) Always fun to see how old equipment does. (W9GTN)

Feedback

- In the results of the February FMT, W6RQ should be included in the Honor Roll Listing rather than at .6 ppm.
- February results has WB8EUK 1.2 ppm. It should have read WB8UEK 1.2 ppm.

QST

Strays

FEEDBACK

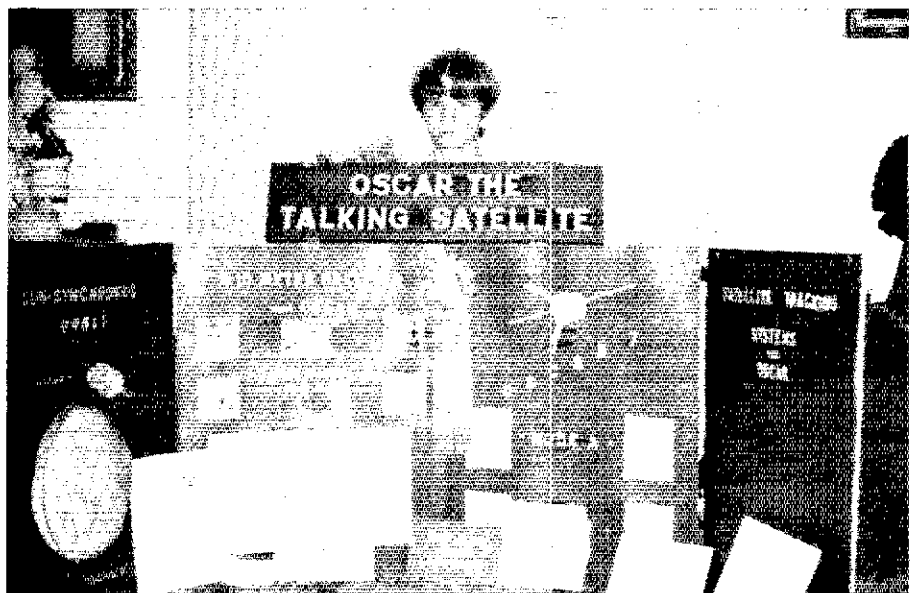
□ We goofed, these High-Claimed scores for the 1977 ARRL DX Competition were accidentally left out of July *QST*, sorry. — *K1WJ/K1ZX*

W/V/E HIGH-BAND PHONE

WA4CQD	1,100,835-1439-255
N4MM	1,087,110-1542-235
K1CSJ	1,937,413-1467-213
WB9LHI	924,558-1382-223
WA6EKL	854,514-1637-174
W6AQ(WB6PXP)	818,706-1414-193
W2MB	791,856-1222-216
WB0QHV	718,965-1229-195
WB9HAD	649,194-1066-203
WB8JBM(WB8DQP)	610,152-1106-184

W/V/E LOW-BAND PHONE

K4YFQ	184,353- 377-163
W2HHC	176,364- 414-142
W1FC	146,610- 543- 90



For Mark Redmon of Shalimar, FL, there's more to school than the 3Rs. Mark recently won honorable mention at the Florida State Science Fair with this nifty OSCAR 7 exhibit. His display also won first place at the regional competition at Pensacola.

Results, 30th ARRL VHF Sweepstakes

A super weekend kicks off the 1977 contest calendar.

By Bill Jennings,* K1WJ

Thirty years young and going stronger than ever. An apt description of the most recent running of the vhf SS, held on January 8 and 9, in view of the substantial increase in the number of entries received. The 742 separate entries received this year represent an almost 16-percent increase over the 640 logs entered in the 1976 VHF SS.

Does a correlation exist between rising (or falling) scores and the amount of participation in the VHF SS? The figures from the 1977 SS seem to indicate no. Although numbers of entries were up, the average scores of the Top Ten, both single and multiple operator, declined on the average of 1000 points from the scores of 1976. Perhaps the variables of propagation and the increased availability of multimode vhf and uhf rigs are more viable indicators.

Steve Katz, WB2WIK, an operator in the top multiop effort of 1976, K2OWR, struck out on his own this year and turned in the top single-operator score in 1977. Five operators in the Top Ten for single operators last year, turned in repeat performances for 1977, although not necessarily in the same numerical order. Among those to return to the Top Ten are WA1NGR/3 (from DE in 1977 and CT in 1976), K3MWV, W3HQT, W3ZD and WA3AXV. On their way to the number-one spot among the multioperator stations, the operators at K8III broke the existing all-time division record in the Great Lakes division by over 4,000 points. The lineup in the Top Ten for multioperator stations includes five "repeaters" also, among them W1FMF, W2PAU, WA2SNA/2, W3KKN and WB81GY.

Five new division records were set, two in the single-operator category and three on the multioperator side of the ledger. WB4JGG now owns the Delta division record, while WB2WIK broke the existing Hudson division mark by

Top Ten

SINGLE

WB2WIK	54,132
WA3AXV	30,912
W3HFY	28,056
K3MWV	27,296
W3HQT	26,720
WA1NGR/3	26,560
W3HMU	26,240
W3ZD	23,880
W2EIF	23,490
WA3KPS	21,084

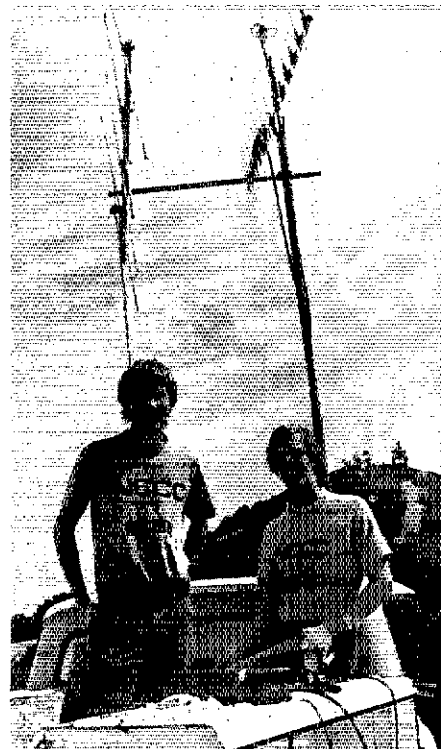
MULTI

K8III	64,395
WA2SNA	59,004
WA2ZPT	38,560
W3KKN	34,307
W1FMF	31,524
WA2BLM	29,700
WB81GY	25,340
WA6BMV	24,814
WB8HUC	22,500
W2PAU	21,180

nearly 22,000 points. Multioperator stations to set new division records include K8III, Great Lakes; WA6BMV, shattering the old mark in the Pacific division by almost 11,000 points; and W4VO breaking the old W4TOE record in the Southeastern division.

Despite increased pressure, in the form of healthy total-score increases by the competition, the Mt. Airy VHF Radio Club retains the top spot in affiliated club competition in the vhf SS. Perhaps the Packrats' success can be attributed to the interest generated within the group and a corresponding spirit of competition. Not a club to rest on past laurels, the Packrats, fielding the same number of individual entries as they did in 1976, managed to come up with an almost 90k total-point increase to retain their stranglehold on first place. The top club in the VHF SS club competition and the Packrats are starting to become synonymous.

The top-10 positions in the affiliated club competition showed very little change from those same positions as listed in 1976. In fact, the first six positions are held by the same clubs that held them last year. Positions seven through ten are clubs that held positions seven through ten in 1976, although the order of these positions is somewhat altered. The Rochester (NY) VHF



WA6BMV (right) and WA6VEF teamed up to break the multiop record in the Pacific division.



Sherry, WA4RNS, shown operating the 6-meter station at the K4LHB multiop effort in Virginia.

*Communications Assistant, ARRL

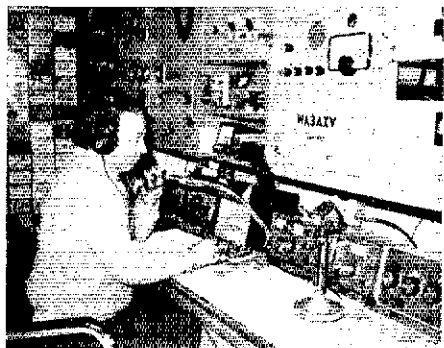
Division Leaders

SINGLE OP	DIVISION	MULTIOP
WA3AXV	Atlantic	W3KKN
K9HDE	Central	WB9GCS
W00HU	Dakota	WB0IYN
WB4JGG*	Delta	WB4CAD
WA8CLN	Great Lakes	K8III*
WB2WIK*	Hudson	WA2SNA
K0MST	Midwest	---
WA11QJ	New England	W1FMF
WA7BJU	Northwestern	WA7YEW/7
WB6KBZ/6	Pacific	WA6BMV*
WA4LJQ	Roanoke	W4BFB/4
WB7FHL	Rocky Mtn.	---
WA4NJP	Southeastern	W4VO*
K6YNB	Southwestern	W6AB/6
K5WVX	West Gulf	K5LZO
VE3BQN	Canadian	VE3FHK

*New Record

All-Time Division Leaders

SINGLE OPERATOR			MULTIOPERATOR			
CALL	SCORE	YEAR	DIVISION	CALL	SCORE	YEAR
W3MFY	52,910	68	Atlantic	W3KKN	38,304	76
K9HMB	20,746	73	Central	K9DZK	26,520	68
WA0CSL	8190	76	Dakota	WB0PIV	3640	76
WB4JGG	11,270	77	Delta	WB4HEL/4	8880	73
K8LEE	41,080	76	Great Lakes	K8III	64,395	77
WB2WIK	54,132	77	Hudson	K2OWR	65,562	76
K9ECV/0	12,690	68	Midwest	K0VUY	14,196	76
WA1NGR	33,110	76	New England	W1FMF	46,440	76
K7AAD	7650	58	Northwestern	K7BBO/7	5642	63
WA6JUD/6	23,868	76	Pacific	WA6BMV	24,814	77
WA4GPM	15,456	76	Roanoke	W4BFB/4	21,880	76
K7UFO	5320	68	Rocky Mountain	WA0PHZ/0	8062	68
W4GDS	26,400	73	Southeastern	W4VO	8284	77
K6YNB	12,300	70	Southwestern	W6FNE/6	20,352	63
K5TKR	13,640	60	West Gulf	K5STI	12,804	59
VE3ZZZ	12,896	72	Canadian	VE3ASO	7800	74



Ron, WA3AXV, used 6, 2, 220 and 450 to score 30k points to lead the Atlantic division (single op), Eastern Pa. section, score number two in the Top Ten nationally, and become the top-scoring single op for the Packrats.

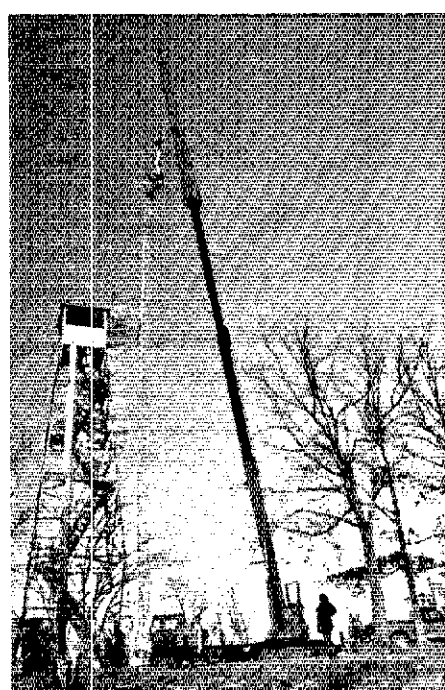
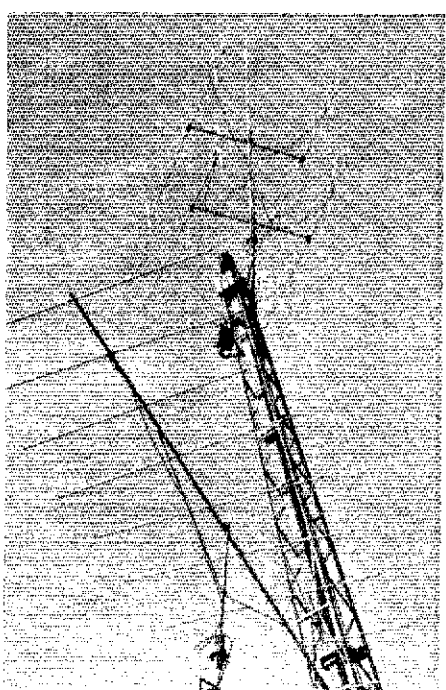
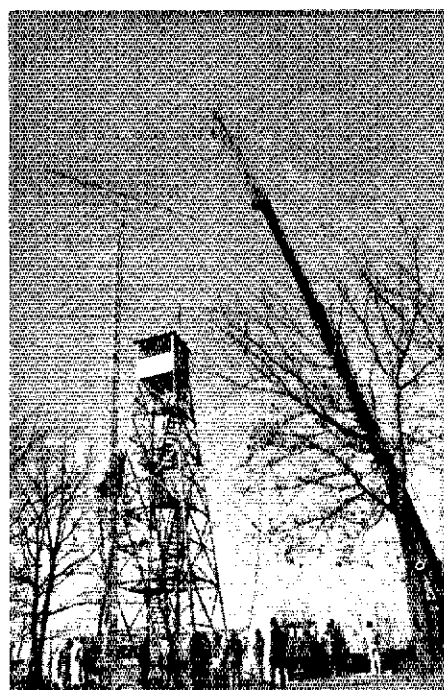
Group, recorded a very respectable 60k total-point increase to grab second position.

A new shorter exchange consisting of consecutive serial number, signal report and ARRL section was implemented for the first time in the 1977 VHF SS. Majority opinion approved of the brevity of the exchange, while feelings seemed mixed on the point of the consecutive serial number. While the rules require consecutive (by time of QSO not by band) serial numbers, one school of thought favors a revision to issue consecutive numbers by band, i.e. blocks of serial numbers to be issued on each band used. The blocks of serial numbers favor multi/multi (multi-

operator/multitransmitter) type operation, while consecutive serial numbers issued regardless of band favors the single operator and multioperator, single-transmitter operations.

Any input regarding contests is actively solicited by the Contest Advisory Committee (CAC). The CAC is the group that evaluates input data from contest entrants and, based on that input, recommends rules changes or modifications. If you have something concerning the contest program, that you feel should be heard, a letter addressed to the CAC here at Hq. will indeed insure that the proper persons are informed of your opinion.

The able assistance of ARRL contest



Logistics and teamwork are the name of the game for the Mecklenburg ARS. Shown are the fire-watch tower, 60-foot tower, and the 110-foot crane used as antenna supports. W4BFB/4 multiop effort netted 391 QSOs for 20k points to lead the Roanoke division for multiops.

aides Dan Street, WA1QNF; Jim White, WA1NNC; and Rita Tilley, WA1WEV, in preparing this report is gratefully acknowledged.

Soapbox

Let's take another look at that section multiplier and hopefully decide to place more value on sections worked by eliminating the "... plus 10" rule. I believe that this would encourage advancement of the vhf DXing art instead of favoring short-haul contacts in major metropolitan areas. (K9JPR) Great fun despite the cold! Three electric heaters and a coal fire and we still couldn't raise the temperature at the mountaintop QTH above 44°F. W2WUR sat through a good portion of the contest with a 10-lb, 24-volt surplus transformer on his lap, plugged into his electric underwear. (K2ZER/2) I wish that more people would realize how much fun they could have with a small beam instead of becoming "repeater-bound" with their 19-inch or 5/8-wave verticals. (WB5AOX) Sideband activity is picking up on 2 meters here in eastern Nebraska. (WB0DGF/0) Pep talks were given at the two local ham clubs, and with any luck 10-12 more logs than normal will come from this area. The talks also eased the pain of losing the use of the simplex channels for the duration of the contest for the noncontesters. (K9HDE) Zounds! The rotator ate the 2-meter feed line prior to the SS. Egads! New-comer WB4TMT got carried away with SS fever. Eureka! K4GL and K4GMJ

joined the contest after some years' absence. (WB4NBK) Operating a vhf SS in January from South Texas is a lonely endeavor. (W5HMK) First contest where I've worked every letter of the alphabet (as the first letter of the suffix) in a call area (W1). Thanks to W1XM. (W1JAA) The only time that 6 meters was open was when I was in church on Sunday morning. There ain't no justice. (W6PAJ) Appreciate the shorter exchanges. Would like it more if the exchange was cut down to RS (T) and section. (WA5IYX) The new WD and N prefixes are a challenge to enter in the dupe sheet. (WB9EBL) In addition to power-line noise, I had a lot of "MRI" from a model railroad in the room next to the shack. I figured that the kids should enjoy their hobby too. (W2AWX) Activity and band conditions were much better than those of the contest last September. No special openings were noted and several sections which are usually heard were absent. (W3ANX) Had a very good Jan. contest. Even worked Delaware. Very good scatter. (WB4YAB) Who says that cw is unpopular? Two meters is a cw operator's delight! (VE3DSS) Operated from WTOP a-m broadcast transmitter site. Good location. Colder than the shade side of a glacier during the antenna setups. Activity good on all bands except 450 fm. Heard several W9/W0 calls on 6 during early hours of the 9th. Called a VE3; thought he confirmed. However, can't be sure, so just fond memories of an "escaped" section

multiplier. (K3FPE/3) I found out what snow noise (5 inches worth) sounds like during the contest. (WA8OGS) Why no different power classes? What chance do 10 watts have against several hundred or even 50 watts? (WA8KUR) Most activity that I've ever heard in this area especially on 2-meter ssb. Scatter on 6 meters was excellent. I also caught a small E-skip opening on Sunday night that lasted for about 20 minutes at about 8:45 P.M. local time. (WB4JGG) We are sorry that we did not answer all our calls on 6 meters, but only after we set up operations did we discover a S7-S9 noise level. (W4BFB/4) This year's conditions on 6 meters were not as good as last year. There were no band openings during the entire contest period. . . . It was even very difficult to work many sections on scatter, as the bursts were very few, short and weak. . . . There was also a marked improvement in 432 activity. (K3MWV) We did unexpectedly well. Attribution success to putting up most all of the antennas in the cold. (WA2SEY/2) Worked 22 stations where the letter Y was first in the suffix. Odd that the second most popular letters were Y and Z (10 each). (WB2WPA) Clean swept a California section on 144-MHz ssb/cw for the first time from my station. Almost as gratifying as the clean sweep in Nov. SS would be. (K6ZX) Who was the one who planned this for Super Bowl weekend? If I had transmitted on 6 meters during that game, my neighbors would have strung me up from my own tower! (WB4NJA) It's a shame that so few stations in the Midwest stayed up late (early Sunday morning). Could have worked every section east of the Mississippi on 6-meter meteor scatter! (WA3HGX/2) Conditions were "E-Stinko" and an unheated shack forced "defrost" breaks, which were not too helpful either. However, I got a new state (Maine) on 432 and got a good start on the 6-meter 600 Award (if only I can just get QSLs from those that worked!). (W2CXC) Conditions were typical for Jan. contests from here. Had the same multipliers on 2 meters (due to ssb) as we had on 6 meters. Contacted with WB8IGY in Ohio on 6 meters via on short scatter opening. Would have had much better results on 6 meters if I could run an amplifier, as we could hear stations in all call areas except 6 and 7. Live in near-fringe channel 2 area and 6-meter overload is had enough with 100 watts from SB-110A. (WB4EXW) . . . There should be a low-power award or even an award for so many contacts, say 200. This would create more activity and give the average vhf a chance at an award that now only goes to the "big guns." (WB4NXY/2) Three stations worked by 144-MHz EME (W7FN)

Affiliated Club Scores

CLUB-SCORE-ENTRIES-WINNER

Mt. Airy VHF Radio Club Inc. (Packrats) (PA)	624,258	70	WA3AXV
Rochester VHF Group (NY)	429,586	147	K2YCO
South Jersey Radio Association	165,222	32	W2BV
Potomac Area VHF Society (MD)	109,938	14	K3DUA
Mobile Sixers Radio Club (PA)	72,175	27	WB3BDD
Northern California Contest Club	71,827	7	W6YKM
Dutchess Co. VHF Society (NY)	57,926	4	W2CXC
Hampden County Amateur Radio Assn. (MA)	32,570	22	W1STR
West Jersey Radio Association	31,831	12	W2FPY
Suburban Amateur Radio Club (PA)	31,824	7	WB2YEH
Mount Tom Repeater Association (MA)	26,120	18	K1NWE
Dayton Amateur Radio Association (OH)	25,990	4	W8KKF
Central Michigan Amateur Radio Club	20,078	18	WA8ABN
Radio Amateur Technical Society (IL)	19,927	4	K9HDE
Gloucester County Amateur Radio Club (NJ)	17,733	4	WB2BZY
Six Meter Club of Chicago	17,420	8	WA9FIH
Murphy's Marauders (CT)	16,988	3	WA1IQJ
Opequon Radio Society	14,218	3	WB8IJW
Steel City Amateur Radio Club (PA)	14,060	3	W3ANX
RCA Amateur Radio Club (IN)	10,992	8	WB9CEP
Penn Wireless Assn. (PA)	7,735	6	WB3BLE/3
York Radio Club (IL)	7,956	6	WB9SCY
Warren Amateur Radio Assn.	6,740	3	WA8TJL
Lake Success Radio Club (NY)	6,138	6	WB2GVD
Texas DX Society	5,918	4	WB5IFY
MITRE Bedford ARC (MA)	4,197	3	K1CHY
Rochester Amateur Radio Club (MN)	2,128	3	W0OHU

Scores are grouped by call area, section and in order from highest to lowest score; single-operator first and multioperator second. Line score indicates call, score, number of contacts, multiplier and bands operated; A = 50 MHz, B = 144 MHz, C = 220 MHz, D = 420 MHz, E = 1215 MHz and above. Asterisks denote Headquarters employees, who are not eligible for awards when operating their own station or that of another staff member.

U.S.A.	WA2YQV,K8BRC)	WA2CER	4944-206-2-AB	7920-180-12-AB	WA3NUGI(+WB3 BCH FCR)
	38,560-483-30-AB	W2EGW	4840-220-1-AB	K2ZER/2(multiop)	11,320-283-10-AB
	WA2BLM(+WA2I L5S LOA SHI UXKW,	WA2ALW	4800-150-6-AB	WA2EKR(+WA2IMG)	14,446-233-21-AB
	25,000-450-23-ABC	WA2WCE	4800-132-2-AB	WA2EYK	4,662-111-11-AB
	K2BAI(+W2KQH, WA2S BA1 GP)	WA22DZ	4660-190-2-AB	WA2EYI(WA2S EKR [IMG],opr)	4,660-190-2-AB
	DOA L5U PVQ QIN WNI,WB2BYP,	WB25NA	4440-185-2-AB		891-2-236-11-ABC
	WB4BMZ	W25N1	4212-162-3-AB	WA2GJCX(+WA2ABG)	4,536-189-2-AB
	W2HMCZ(+K2UKE,W2AHAB)	W25NF	4200-170-2-AB	W2DBV(+WA25JK)	4,368-182-2-AB
	5980-119-16-AB	W25NH	4080-170-2-AB		2,904-121-2-AB
		W25TK	4032-168-2-AB	K2JD(WA2S EKR [EY],opr)	1,968-82-2-AB
		W25TP	3996-74-1-ABCD		1,364-62-1-AB
		W25ZP	3648-182-2-AB	WA2MBW(+WB2DPT)	
		W25ZQ	3624-151-2-AB		
		W25ZV	3600-150-2-AB		
		W25ZW	3552-148-2-AB		
		W25ZT	3504-146-2-AB		
		W25ZU	3504-146-2-AB		
		W25ZE	3456-144-2-AB		
		W25ZF	3436-119-5-AB		
		W25ZG	3432-143-2-AB		
		W25ZH	3288-137-2-AB		
		W25ZI	3240-135-2-ABC		
		W25ZJ	3158-120-2-AB		
		W25ZK	3102-141-1-AB		
		W25ZL	3096-129-2-AB		
		W25ZM	3078-81-9-AB		
		W25ZN	3010-151-1-AB		
		W25ZP	2970-155-1-AB		
		W25ZQ	2904-132-1-AB		
		W25ZR	2882-21-1-AB		
		W25ZS	2882-21-1-AB		
		W25ZT	2800-100-4-AB		
		W25ZU	2772-126-1-AB		
		W25ZV	2761-126-1-AB		
		W25ZW	2720-68-10-AB		
		W25ZX	2688-112-12-AB		
		W25ZY	2640-110-2-AB		
		W25ZZ	2640-110-2-AB		
		W25ZA	2640-110-2-AB		
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WA4ALJ 2016-56-8-AB WB4UYD 1568-56-4-AB WA4ATI 364-13-4-A WB4CAD(+WA4COG,WB48X4) 1820-77-3-AB	Los Angeles W6PAJ 2408-86-4-ABC WB6SYN 192-8-2-B	Utah WB7FHL 552-23-2-AB	WAEC 4850-97-15-8D WDSEGW 868-31-4-B	K9REE 1474-34-12-A K9OXY 976-31-6-AB WA9LZM 860-28-9-AB WB9CUH 480-15-6-B WB9ROE 120-5-2-A
Virginia WA4JG 15,120-270-18-ABCD WA4GPM 13,370-191-23-ABD K2UOP/4 9600-192-19-ABCD WA2CJ/K/4 6664-132-14-B K5DZF/4 5124-122-11-R W4UCH 3864-84-13-ABCDE K4EVH 3822-147-3-BC K4FTO 3400-85-10-AB WA4VE 3080-77-10-B WA4BLC 3068-118-3-B WB4QVU 2828-101-4-B WA4SBG 2310-77-5-BD WA4MCK 1729-72-2-5 WA4HS 456-22-2-ABC WA4EPI 338-13-3-ABD WA4JY 240-10-2-B WB4CC1 144-6-2-B K4LHB(+WA4HNS,WB4E FYP YFT) 12,750-255-15-ABC WA4NXM(+WB4RD1) 10,948-202-18-ABD	Orange WB6KXC 1020-34-5-B WB6MFW 924-33-4-R	Washington WA7ZSA 3458-133-3-B W7KFS 1888-59-6-AB W7GLS 1232-44-4-B W7FN 1178-31-9-AB K7YNU 1170-39-5-AB WA7YEW/7(+WA7V VHW VCP V1Z) 1104-46-2-B	Illinois K9HDE 13,047-244-17-ABCD WB9JG 920-185-6-AB K9MBX 5744-180-6-B WB9FH 5040-180-4-ABC WB9LY 4584-164-3-B WB9VGE 4332-181-2-B WB9KLV 3456-144-2-ABC WB9NHV 2744-98-4-B WB9GK 2548-107-2-B WB9SXY 2444-106-2-B WA9RSH 2448-102-2-B K9ZWL 2400-100-2-ABC WB9BL 2400-80-5-B K9ZVY 2376-99-2-ABC WB9QL 2296-82-4-B WA9DDS 2074-61-7-AB K9SJD 2048-64-6-B WB9NL 2036-63-1-B WA9AHZ 1974-71-1-B WA9VB 1958-89-1-B WB9QBU 1830-61-5-BD W9TAL 1776-74-2-B K9ENZM9 1728-72-2-AB W9JAN 1704-71-2-B K9ZJH 1682-59-4-BCD K9NLI 1634-53-1-B W9ABA 1600-50-6-B WA9CJZ 1536-64-2-AB K9DTB 1512-63-2-ABD W9DLZ 1492-63-2-B WB9VIC 1320-58-2-B WA9OHU 1232-56-1-B W9MTS 1170-34-5-BD WB9NRI 936-39-2-AB WB9N 209-43-1-B WB9IRX 858-39-1-B K9ENZ/9 836-38-1-B W9DLT/9 814-33-2-AB WB9JSR 648-27-2-B K9KQR 598-23-3-BCD WB9PZC 670-19-5-AB WB9LFD 560-25-1-B WB9NEY 350-13-4-AB WB9AXH 242-11-1-B WA9RIJ 220-10-1-AB WB9TWW 220-10-1-AB K9JLU 198-8-1-AB K9GJU/M9 198-9-1-B K9JNW 132-6-1-B WB9VI 110-5-1-B WB9GCS(+WB9VJ NK9LCCB SDE) 14,942-241-21-AB W9RVG(multitop) 4640-146-6-AB	Colorado WA9TVZ 308-14-1-AB WB9VGC 184-7-1-A
Louisiana WA5UUD 2160-60-8-AB K4CHE/5 864-36-2-ABD	Santa Barbara K6YNB 8160-204-10-ABCD W6OAL 140-5-4-BD WB6B/6(W6FLL, WA6S ITJ MSN, WB6S GRW HJW JHJ,oprs.) 2304-64-2-B	Michigan WB8BK 5750-125-13-ABD WB8BG 5040-140-8-ABD WA8ABN 3852-107-8-AB WB8JHS 3248-102-6-AB K8BZ 1848-64-1-B K8BZ2 1696-93-6-B WA8EJU 1650-55-5-ABD WB8IPJ 1440-40-8-AB K8JLU 61-1-B WB8NLC 1280-40-6-AB WB8VWY 1188-64-1-B WB8DB 1122-51-1-B WB8JK 1105-50-2-AB K8NGF 1012-46-1-B W8QJN 968-44-1-B WA8YJW 866-44-1-B WB8AA 770-35-1-B WB8AAX 702-27-3-B K8ZKM 572-25-1-B WB8EJF 510-25-1-B WB8E 396-18-1-B WA8VB 390-13-5-B WB8MHY 330-15-1-B WB8TCD 264-12-1-B WB8UW 198-8-1-AB WB8VC 176-8-1-A	Wisconsin WB9AC 4850-97-15-8D WB9EGW 868-31-4-B	Iowa K0MST 2772-65-11-AB WB9NZ 1156-34-7-AB WB9DXZ 640-20-6-B
Mississippi WB5DCY 624-24-3-B	Santa Clara Valley WB6KBZ/6 14,174-373-9-AB WA6PKY 3024-84-8-B WA6GYD 2760-92-5-ABD WB6CTW 2490-83-5-AB K6Z 1824-48-9-B WA6UZA 1656-46-8-B WB6D 144-6-2-B K6KLY(+WB6FFC) 20,780-495-11-ABCD WB6PCO/6(+WA6S FAK UOM) 2272-71-6-B	Ohio WB8CLN 16,830-250-24-AB WB8GGS 688-128-17-AB WB8K 4238-163-3-BCD K8DIO 3576-105-7-B K8ZLU 3292-71-13-AB WB8PAT 2992-88-7-ABD WB8BOB 2784-87-6-AB WB8M 2600-109-3-AB WB8JA 2432-77-6-B WB8TX 2380-85-4-AB WB8FLZ 1700-50-7-AB WB8G 866-49-7-B WB8YF 1320-44-5-AB WB8LXJ 992-31-6-AB WB8IEA 949-37-3-B WB8K 32-7-2-B K8CKY 676-26-3-AB WB8NTY 528-22-2-B WB8VI 312-13-2-B K8I(+K3ZFP WA32X KSLGA) WB8RCN 64,395-608-43-AB WB8IGY(+WB8HWB, WA8S NJR ONQ, WB8FFP) 26,340-362-29-ABD WB8JUC(WB8S GEU GEU GX SEY GFA,oprs.) 25,500-375-20-AB WB8CJ(WB8LUC,WA8S L XJ WQC, WB8YJU,oprs.) 17,992-346-16-AB WB8KY(+G3PAC,WA8S SVY ZJG) 15,288-294-16-ABC WB8VP(WB8S RVJ VNO,WB8CVH,oprs.) 7410-195-9-AB WB8ZLK(+WB8NOJ) 732-31-2-AB	Kansas WA9TRO 1288-29-13-AB	Minnesota WB9OHU 576-18-6-B WB9QWY 240-10-2-AB WB8TY/9 144-6-2-B WB8LYN(multitop) 86-3-1-A WB9SJJ(+WA9ATI,WB9S MBD RJA) 2108-63-7-AB WB9S 1912-41-6-AB
Missouri WB9OHU 576-18-6-B WB9QWY 240-10-2-AB WB8TY/9 144-6-2-B WB8LYN(multitop) 86-3-1-A WB9SJJ(+WA9ATI,WB9S MBD RJA) 2108-63-7-AB WB9S 1912-41-6-AB	San Diego WB6FTW/6 4964-163-4-B WB6NMT 2295-69-7-ABCD WA4MMP/6 22-1-1-B	West Virginia WB8JW 8500-171-15-8D WB8QR/8 5096-98-16-AB	Nebraska WB9OHU 576-18-6-B WB9QWY 240-10-2-AB WB8TY/9 144-6-2-B WB8LYN(multitop) 86-3-1-A WB9SJJ(+WA9ATI,WB9S MBD RJA) 2108-63-7-AB WB9S 1912-41-6-AB	Montana WB9OHU 576-18-6-B WB9QWY 240-10-2-AB WB8TY/9 144-6-2-B WB8LYN(multitop) 86-3-1-A WB9SJJ(+WA9ATI,WB9S MBD RJA) 2108-63-7-AB WB9S 1912-41-6-AB
New Mexico WB1XR 121-6-1-B	San Francisco WA6S5T 1836-51-8-8D WB6KG 1618-48-7-A	Wisconsin WB9AC 4850-97-15-8D WB9EGW 868-31-4-B	Nebraska WB9OHU 576-18-6-B WB9QWY 240-10-2-AB WB8TY/9 144-6-2-B WB8LYN(multitop) 86-3-1-A WB9SJJ(+WA9ATI,WB9S MBD RJA) 2108-63-7-AB WB9S 1912-41-6-AB	North Dakota WB9OHU 576-18-6-B WB9QWY 240-10-2-AB WB8TY/9 144-6-2-B WB8LYN(multitop) 86-3-1-A WB9SJJ(+WA9ATI,WB9S MBD RJA) 2108-63-7-AB WB9S 1912-41-6-AB
Northern Texas WB5FCR 910-35-3-AB WB5OFM 744-31-2-8D	San Joaquin Valley WB6YKM 12,012-286-11-ABCD WB6LBR 504-18-4-AB	Wisconsin WB9AC 4850-97-15-8D WB9EGW 868-31-4-B	Nebraska WB9OHU 576-18-6-B WB9QWY 240-10-2-AB WB8TY/9 144-6-2-B WB8LYN(multitop) 86-3-1-A WB9SJJ(+WA9ATI,WB9S MBD RJA) 2108-63-7-AB WB9S 1912-41-6-AB	Oklahoma WB9OHU 576-18-6-B WB9QWY 240-10-2-AB WB8TY/9 144-6-2-B WB8LYN(multitop) 86-3-1-A WB9SJJ(+WA9ATI,WB9S MBD RJA) 2108-63-7-AB WB9S 1912-41-6-AB
Oklahoma K5WVX 5336-92-19-AB WA5VHL 2907-77-9-AB WB5ONL 748-34-1-B WB5RO 22-1-1-A	Pacific KH6BZ/ 88-4-1-BD	Wisconsin WB9AC 4850-97-15-8D WB9EGW 868-31-4-B	Nebraska WB9OHU 576-18-6-B WB9QWY 240-10-2-AB WB8TY/9 144-6-2-B WB8LYN(multitop) 86-3-1-A WB9SJJ(+WA9ATI,WB9S MBD RJA) 2108-63-7-AB WB9S 1912-41-6-AB	Oklahoma WB9OHU 576-18-6-B WB9QWY 240-10-2-AB WB8TY/9 144-6-2-B WB8LYN(multitop) 86-3-1-A WB9SJJ(+WA9ATI,WB9S MBD RJA) 2108-63-7-AB WB9S 1912-41-6-AB
Southern Texas WB9OHU 576-18-6-B WB9QWY 240-10-2-AB WB8TY/9 144-6-2-B WB8LYN(multitop) 86-3-1-A WB9SJJ(+WA9ATI,WB9S MBD RJA) 2108-63-7-AB WB9S 1912-41-6-AB	Arizona WA7EPU 338-13-3-AB	Wisconsin WB9AC 4850-97-15-8D WB9EGW 868-31-4-B	Nebraska WB9OHU 576-18-6-B WB9QWY 240-10-2-AB WB8TY/9 144-6-2-B WB8LYN(multitop) 86-3-1-A WB9SJJ(+WA9ATI,WB9S MBD RJA) 2108-63-7-AB WB9S 1912-41-6-AB	Oklahoma WB9OHU 576-18-6-B WB9QWY 240-10-2-AB WB8TY/9 144-6-2-B WB8LYN(multitop) 86-3-1-A WB9SJJ(+WA9ATI,WB9S MBD RJA) 2108-63-7-AB WB9S 1912-41-6-AB
Utah WB7FHL 552-23-2-AB	Idaho W7UQ/7(WB7S CLS DZO,oprs.) 650-25-3-B	Wisconsin WB9AC 4850-97-15-8D WB9EGW 868-31-4-B	Nebraska WB9OHU 576-18-6-B WB9QWY 240-10-2-AB WB8TY/9 144-6-2-B WB8LYN(multitop) 86-3-1-A WB9SJJ(+WA9ATI,WB9S MBD RJA) 2108-63-7-AB WB9S 1912-41-6-AB	Oklahoma WB9OHU 576-18-6-B WB9QWY 240-10-2-AB WB8TY/9 144-6-2-B WB8LYN(multitop) 86-3-1-A WB9SJJ(+WA9ATI,WB9S MBD RJA) 2108-63-7-AB WB9S 1912-41-6-AB
Washington WA7ZSA 3458-133-3-B W7KFS 1888-59-6-AB W7GLS 1232-44-4-B W7FN 1178-31-9-AB K7YNU 1170-39-5-AB WA7YEW/7(+WA7V VHW VCP V1Z) 1104-46-2-B	Nevada WA6HCl/7(+WB6PY1) 720-24-5-AB	Wisconsin WB9AC 4850-97-15-8D WB9EGW 868-31-4-B	Nebraska WB9OHU 576-18-6-B WB9QWY 240-10-2-AB WB8TY/9 144-6-2-B WB8LYN(multitop) 86-3-1-A WB9SJJ(+WA9ATI,WB9S MBD RJA) 2108-63-7-AB WB9S 1912-41-6-AB	Oklahoma WB9OHU 576-18-6-B WB9QWY 240-10-2-AB WB8TY/9 144-6-2-B WB8LYN(multitop) 86-3-1-A WB9SJJ(+WA9ATI,WB9S MBD RJA) 2108-63-7-AB WB9S 1912-41-6-AB
West Virginia WB8JW 8500-171-15-8D WB8QR/8 5096-98-16-AB	Oregon WA7BJU 3930-131-5-ABD W7UDM 1512-63-2-AB W7TYR 1196-46-3-AB K7ZCB/7 312-13-2-ABD WB7AVU 176-8-1-B	Wisconsin WB9AC 4850-97-15-8D WB9EGW 868-31-4-B	Nebraska WB9OHU 576-18-6-B WB9QWY 240-10-2-AB WB8TY/9 144-6-2-B WB8LYN(multitop) 86-3-1-A WB9SJJ(+WA9ATI,WB9S MBD RJA) 2108-63-7-AB WB9S 1912-41-6-AB	Oklahoma WB9OHU 576-18-6-B WB9QWY 240-10-2-AB WB8TY/9 144-6-2-B WB8LYN(multitop) 86-3-1-A WB9SJJ(+WA9ATI,WB9S MBD RJA) 2108-63-7-AB WB9S 1912-41-6-AB

Strays



□ The Gater brothers, Brian and Eric, probably the youngest hams in Iowa, come by their interest naturally, as they have a 13-year-old Novice cousin, a 33-year-old Extra Class uncle and a great-uncle who also holds an Extra. Oh, yes, their father Ron, K0PNZ, was licensed at age 12.

I would like to get in touch with . . .

□ aviator amateurs with ideas on what obscure frequencies we could use for "cloud talk" so as to not key up repeaters for several states around. Need a universal simplex 2-meter frequency. William D. Bowen, W9MHZ, 334 Broken Arrow Ct., Indianapolis, IN 46234.



Eric Gater, WB0ZRL, age 10, and brother Brian, WB0ZRS, age 7, are believed to be the youngest hams in Iowa.

September VHF QSO Party

September 10-11 could still bring some summertime sporadic E.

Two-meter DXing (like QSOs between the East Coast and Bermuda) is possible. Last year it happened in mid-September, yes September!

Flash! The rules below look the same as June but late-breaking changes surfaced via the CAC: 52 simplex is permitted for a maximum of four hours. Full details in "League Lines," this issue.

Circle October 3 on your calendar: That's the deadline for mailing in your logs. CU on the high bands. GL. -- K1ZX

Rules

1) The 1977 September VHF QSO Party begins at 1900 UTC, Saturday, September 10, and ends at 0600 UTC, Monday, September 12. Entrants may operate no more than 28 out of the 35 hours. The seven hours of off-time must be taken in increments of 30 minutes or more. Listening time counts as operating time. All contacts must be made on amateur bands above 50 MHz using

authorized modes of emission.

2) Name-of-section exchanges must be acknowledged by both operators before either may claim contact point(s). A one-way exchange does not count.

3) Fixed, portable or mobile operation under one call, from one location only, is permitted. A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest period (with the exception of family stations where more than one call is assigned to one location by FCC/DOC). Multitransmitter operations are limited to *only one signal per band* (6, 2, 1-1/4, etc.).

While no minimum distance is specified for contacts, equipment in use should be capable of real communications (i.e., able to communicate over at least a mile).

Use of the segment 146.0 to 148.0 MHz is restricted as follows: Contest contacts *may be made only* on recognized simplex frequencies (per the

ARRL official band plan): 146.49, .55, .58; 147.42, .45, .48, .51, .54, .57. Contest contacts may NOT be made on any other frequency in the range 146.0 to 148.0; this restriction *includes all* repeater frequencies (including 146.94) and *also includes* the frequency 146.52.

4) Scoring: 1 point for completed two-way exchanges on 50 or 144 MHz; 2 points for such exchanges on 220 or 420 MHz; 3 points for such exchanges on the higher uhf bands. The sum of these points will be multiplied by the number of different ARRL sections worked per band. Crossband work does not count. Aircraft mobile stations cannot be counted for section multipliers.

5) Foreign entries: All contacts with foreign countries count for score. All foreign countries are grouped together, and a multiplier of no more than one per band may be claimed for contacts with all foreign stations worked. Foreign stations may only work stations in ARRL sections for contest credit and will give their country name.

6) A contact per band may be counted for each station worked. Example: W2EIF (SNJ) works K1YON (Conn) on 50, 144 and 220 MHz for complete exchanges. This gives W2EIF 4 points (1 - 1 - 2) and also 3 section-multiplier credits. (If W2EIF contacts other Connecticut stations on these bands, they do not add to his section multiplier but they do pay off in additional contact points.)

7) Each section multiplier requires a complete exchange with at least one station. The same section can provide another multiplier point only when contacted on a new vhf band.

8) Awards: Entries must be post-marked no later than October 3, 1977. A certificate will be awarded to the high-scoring single-operator station in each ARRL section. In addition, the high-scoring multioperator station will receive a certificate in each section from which three or more valid multiple-operator entries are received or where exceptional effort has been displayed.

9) Disqualifications: See January, 1977, *QST*, page 85.

This form is a grid for logging contacts. It has columns for 'Call', 'Band', 'Station worked', 'Time', 'Date', 'Operator', and 'Points'. Below the grid is a summary section with fields for 'Total points', 'Total stations', and 'Total sections'. At the bottom, there is a section for 'Operator' and 'Station' with checkboxes for 'Single operator' and 'Multiple operator'. The form is titled 'ARRL VHF QSO Party' and includes a note about the use of the log and summary sheet.

This form is a grid for logging contacts. It has columns for 'Call', 'Band', 'Station worked', 'Time', 'Date', 'Operator', and 'Points'. Below the grid is a summary section with fields for 'Total points', 'Total stations', and 'Total sections'. At the bottom, there is a section for 'Operator' and 'Station' with checkboxes for 'Single operator' and 'Multiple operator'. The form is titled 'ARRL VHF QSO Party' and includes a note about the use of the log and summary sheet.

Use of the ARRL log and summary sheet (CD-68) is preferred. Although reasonable facsimiles of these will be accepted by the awards committee, the CD-68 is easy to use, both for you and for us.

How to Get Rid of Your SCM

Your SCM is your Section Communications Manager. He is elected every two years by the ARRL full membership in his section (see page 8 for a complete list of sections).

Unfortunately, many SCMs don't last that long — for a variety of reasons. Some become Silent Keys while in office. Some discover that the job is bigger than they thought and find they don't have time for it. Some suddenly are assailed by personal problems and have to give it up. Alas, some are disillusioned and lose heart. Once in a while we get a resignation because of too much harassment from the members, or too much political pressure. There have even been times when an SCM has been asked to resign. But hardly ever has an SCM been "kicked out" of office. In all our years of electing SCMs, we have yet to have an SCM "Watergate."

The average SCM is a busy, hardworking, conscientious guy — like your director, but on a smaller scale and with a different objective. He gets no pay; a few travel and administrative expenses (usually not enough to pay the full load), but that's all. He usually gets little thanks for the big wads of personal time he spends on the job. Sometimes it's hard to get a candidate, because no one seems to need all the aggravation that results from election. But through the 52 years or so of having elected SCMs in our field organization, there have seldom been vacancies in SCM offices. If no one wants to run for office, someone will usually accept appointment.

Almost invariably, however, when the section membership, or a pressure group within it, starts trying to get the SCM removed from office, that SCM was elected, not appointed — elected either through default (i.e., he was the only candidate) or in a contested, balloted election with all the trimmings. We wonder why this should be? Sort of shakes your faith in the democratic process.

This office (i.e., the office of communi-

cations manager) traditionally takes a dim view of attempts on the part of membership groups within a section to oust the SCM. The rationale is that the guy was elected by the membership to do a job, and unless gross malfeasance or neglect can be *proved*, the removal process should be a difficult one. Where were all the objectors when nominating petitions were being solicited? Where were they when the ballots were passed out? Especially SCMs in office as a result of a contested election are pretty well entrenched and should be hard to remove.

And they are. Oh, you can sometimes put the bee on an SCM to resign, but more often that not an SCM duly elected will seek to serve out his term and take his chances with malcontents. Therefore, the best way to get rid of an SCM you don't like, or who you don't think is doing his job properly, is to make plans to run a candidate you approve of (yourself, maybe?) next time an election comes up. SCMs are elected every two years. It usually takes a while for an SCM to make himself unpopular, so by the time he does so a new election is not too far in the future.

The communications manager cannot "fire" the SCM. This is as it should be, since the SCM is an elected official and the CM is just an employee. The only way an SCM can be tossed out is through action of the League's Executive Committee. The EC is a body consisting of the president, the first vice president, the general manager and four of the elected directors, themselves elected to the committee by the Board of Directors. The EC meets on call of the president, not less often than quarterly.

Here is a quote from rule 6 of the Rules and Regulations of the Communications Department:

"6. The office of any Section Communications Manager may be declared vacant by the Executive Committee whenever it appears to be in the best interests of the membership so to do."

This leaves the matter entirely in the hands of the committee, which has also traditionally been very hard-nosed about kicking out SCMs. There are no definitive grounds for such action, and none are contemplated. Each case is decided on its specific merits.

Actually, such matters seldom come before the committee. They are usually resolved before they reach that stage, just as most legal proceedings are resolved before they reach the Supreme Court. So submitting an SCM case to the Executive Committee is a last-resort measure.

Supposing an amateur, or an amateur group, feels it has a legitimate gripe about the SCM. How are the provisions of rule 6 invoked? Well, this has so seldom been done in the past that there are no standardized channels. Any member of the Executive Committee can bring up anything he wants at meetings, but usually a preannounced agenda is adhered to. As the person "in charge" of SCMs, the communications manager is always involved, but if you don't get satisfaction out of him (not an unusual experience) you can always go to your director. If he is on the committee, that just makes it easier, but whether he is or not, he can very readily refer the matter to a director who is, or to the president.

Getting rid of your SCM isn't easy, and this is the way it is supposed to be and we hope will remain. Electing an SCM is a serious matter, one likely to have an effect on your own operating. Instead of trying to get rid of an SCM you don't like or want, give more thought and effort to getting one you do like and do want in the first place. If your candidate loses — well, that's democracy for you. Try again, next time. But if you have a candidate, you *can't* win. So check page 62 January 1977 *QST*, and note the election schedule for your section. If the wrong guy gets in, and you had no part in the election you have only yourself to blame.

SCM ELECTION NOTICE

To all ARRL members in the New Mexico, Alabama, Western Massachusetts, Alaska, Santa Barbara, Kansas, Tennessee, Michigan, East Bay and Delaware sections: You are hereby solicited for nominating petitions pursuant to an election for Section Communications Manager. A petition, to be valid, must contain the signatures of five or more full ARRL members residing in the section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures on that petition. No member may sign more than one petition. It is

*Communications Mgr., ARRL

advisable to have a few more than five signatures on each petition.

Petition forms (CD-129) are available on request from ARRL headquarters but are not required. The following form is suggested:

(Place and date)

Communications Manager, ARRL

225 Main Street, Newington, CT 06111

We, the undersigned full members of the . . . ARRL Section of the . . . Division, hereby nominate . . . as candidate for Section Communications Manager for this Section for the next two-year term of office.

(Signature . . . Call . . . City . . . Zip . . .)

SCM candidates must have been a member of the League for a continuous term of at least two years and a licensed amateur of

General class or higher (Canadian Advanced Amateur Certificate) immediately prior to receipt of petition at Headquarters.

Petitions must have been received at Headquarters on or before 5:30 P.M. Eastern Local Time, September 10, 1977.

Wherever more than one member is nominated in a single section, ballots will be mailed from Headquarters on October 1, 1977, returns counted November 22, 1977 and SCM elected as a result of the above procedure will take office January 1, 1978.

If only one valid petition is received for a section, that nominee shall be declared elected without opposition, for a two-year term beginning January 1, 1978.

If no petitions are received for a section

by the specified closing date, such section will be resolicited in January QST, and an SCM elected through the resolicitation process will serve a term of 18 months.

Vacancies in any SCM office between elections are filled by appointment by the communications manager.

You are urged to take the initiative and file a nominating petition immediately.

George Hart, WINJM
Communications Manager

REPEAT SCM NOMINATING SOLICITATION

Since no petitions were received for the Nevada section as a result of notices in

January and February QST, nominating petitions for this section are herewith resolicited. See the above notice for details on how to nominate.

BALLOTING RESULTS

In the New Hampshire Section, Robert C. Mitchell, W1NH/W1SWX, defeated J. Langdon Prescott, K1BCS, 222-96.

In the Rhode Island Section, John Titterington, W1EOF, defeated John E. Johnson, K1AAV, 140-83.

In the San Joaquin Valley Section, Charles P. McConnell, W6DPD, defeated Donald V. Moran, WB6NON, 343-70.

In the Utah Section, Carl R. Ruthstrom,

W7GPN, defeated John H. Sampson, Jr., W7OCX, 145-95.

SCM ELECTION RESULTS

The following were elected for two-year terms of office beginning October 1, 1977:

UNCONTESTED

B.C.	H. E. Savage, VE7FB
Colo.	C. O. Penney, WA0HLQ
Ga.	A. H. Stakely, K4WC
S.F.	M. L. Neilson, WB6NHF
S. Tex.	A. Ross, W5KR
W. Va.	D. B. Morris, W8JM

W1AW Operating Schedule (April 24-October 30, 1977)

PDST	CDST	EDST	UTC	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
6 A.M.	8 A.M.	9 A.M.	1300	Slow ¹	Fast ²	Slow ¹	Fast ²	Slow ¹		
7 A.M.	9 A.M.	10 A.M.	1400	← Cw Bulletins ³ →		← RTTY Bulletins ⁴ →				
8 A.M.	10 A.M.	11 A.M.	1500	Fast ²	Slow ¹	Fast ²	Slow ¹	Fast ²	Slow ¹	Slow ¹
1 P.M.	3 P.M.	4 P.M.	2000	← Cw Bulletins ³ →		← RTTY Bulletins ⁴ →				
2 P.M.	4 P.M.	5 P.M.	2100	Fast ²	Slow ¹	Fast ²	Slow ¹	Fast ²	Slow ¹	Fast ²
3 P.M.	5 P.M.	6 P.M.	2200	← Cw Bulletins ³ →		← RTTY Bulletins ⁴ →				
4 P.M.	6 P.M.	7 P.M.	2300	Slow ¹	Fast ²	Slow ¹	Fast ²	Slow ¹	Fast ²	Fast ²
5 P.M.	7 P.M.	8 P.M.	0000	← Cw Bulletins ³ →		← RTTY Bulletins ⁴ →				
6 P.M.	8 P.M.	9 P.M.	0100	← Phone Bulletins ⁵ →		← Phone Bulletins ⁵ →				
6:30 P.M.	8:30 P.M.	9:30 P.M.	0130	Fast ²	Slow ¹	Fast ²	Slow ¹	Fast ²	Slow ¹	Slow ¹
7 P.M.	9 P.M.	10 P.M.	0200	← Cw Bulletins ³ →		← RTTY Bulletins ⁴ →				
8 P.M.	10 P.M.	11 P.M.	0300	← Phone Bulletins ⁵ →		← Phone Bulletins ⁵ →				
9 P.M.	11 P.M.	12 P.M.	0400	Fast ²	Slow ¹	Fast ²	Slow ¹	Fast ²	Slow ¹	Slow ¹
9:30 P.M.	11:30 P.M.	12:30	0430	← Cw Bulletins ³ →		← RTTY Bulletins ⁴ →				
				← Phone Bulletins ⁵ →		← Phone Bulletins ⁵ →				

¹ Slow code practice on cw bulletin frequencies, 8 minutes each session; 5, 5, 7-1/2, 7-1/2, 10, 13, 15 wpm.

² Fast code practice on cw bulletin frequencies, 8 minutes each session; 35, 30, 25, 20, 15, 13, 10 wpm.

³ Cw bulletins, 18 wpm, on: 1.835 3.58 7.08 14.08 21.08 28.08 50.08 147.555 MHz.

⁴ RTTY bulletins 60 wpm/170-Hz shift on 3.625 7.095 14.095 21.095 28.095 MHz.

⁵ Phone bulletins on 1.835 3.99 7.29 14.29 21.39 28.59 50.19 147.555 MHz.

Operating-visiting hours are Monday through Friday 7:30 A.M. to 1 A.M. and Saturday and Sunday 3:30 P.M. to 1 A.M. (all local Eastern Time). The station address is 225 Main St., Newington, CT 06111 (about 7 miles south of Hartford). Maps with local street detail are available upon request. Please note that all footnoted frequencies are approximate. If you wish to operate when visiting, you must have your original operator's license with you. (Schedules can also be arranged to work W1AW.) The station will be closed Sept. 5. Staff: Chief operator/ Asst. Communications Mgr. C. R. Bender, W1WPR; Chris Schenck, W1EH; Stan Gibilisco, W1GV.

In a communications emergency monitor W1AW for special bulletins as follows (times in UTC): phone on the hour, RTTY at 15 minutes past the hour, cw on the half hour.

To improve your list by sending in step with W1AW (but not over the air!) and to allow checking the accuracy on certain tapes, note the UTC dates and QST text to be sent in the 0200 practice from the issue of QST two calendar months past: Aug 5, It Seems to Us; Aug 9, Correspondence; Aug. 15, League Lines; Aug. 18, Public Service; Aug. 24, World Above; Aug. 29, Operating News.

Operating Events

AUGUST

- 4: West Coast Qualifying Run**
- 6-7: YO DX Contest,* Illinois QSO Party*
- 13: Wonderful Wisconsin Rapids Week*
- 13-14: WAE cw*
- 19: W1AW Qualifying Run**
- 20-22: CAN-AM Championship,* NJ QSO Party, SEANET Contest phone*
- 25: W1AW Qualifying Run**
- 27-28: 9Y4 Contest,* All-Asian Contest cw (p. 102 May), Ohio and KY QSO Parties**

SEPTEMBER

- 2-4: W7GV Grand Canyon DXpedition**
- 3-5: Four-Land QSO Party**
- 4: LZ DX Contest**
- 7: West Coast Qualifying Run (+40 wpm)***
- 10-11: VHF QSO Party,** WAE phone,* PA QSO Party,** WA State QSO Party**
- 11: The North American CW Sprint**

*Detailed last month
**Details this issue
***Details next issue

- 13: W1AW Qualifying Run***
- 17-18: SAC cw,*** MDC QSO Party,*** VE/W Contest***
- 18: FMT***
- 20: W1AW Morning Qualifying Run***
- 24-25: Delta QSO Party,*** SAC phone***

OCTOBER

- 1-2: California QSO Party
- 6: West Coast Qualifying Run
- 8-9: CD Party cw, RSGB 21/28 MHz Contest
- 12-13: YL/AP cw
- 15-16: CD Party phone, RSGB 7 MHz cw, WADM, Manitoba QSO Party, JOTA, CARTG RTTY SS
- 19: W1AW Qualifying Run
- 29-30: CQWW phone

AUGUST

- 4: West Coast Qualifying Run (W6OWP prime, W6ZKJ alternate), 10-35 wpm at 0400Z (Universal Coordinated Time, abbreviated UTC with Z shown as a time designator). The run will take place at 2100 PDST (9

P.M. PDST the night of August 3) on approximately 3590/7090 kHz. Dates are always shown several months in advance and times are always the same local Pacific time of 9 P.M. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please include your full name, call (if any) and complete mailing address. A large stamped addressed envelope will help to expedite your award/endorsements.

19: W1AW Qualifying Run, 10-35 wpm at 0200 UTC, transmitted simultaneously on 1.835 3.58 7.08 14.08 21.08 28.08 50.08 and 147.555 MHz. This is 2200 EDST, 10 P.M. local Eastern time, the night of August 18. Underline one minute of the highest speed copied, certify that the copy was made without aid and send it to ARRL per the instructions above.

25: W1AW Qualifying Run at 2000Z (4 P.M. local Eastern time). All other details as above.
27-28: Kentucky QSO Party, sponsored by the Bluegrass Amateur Radio Club, the full 48-hour period UTC. Rules are the same as last year (page 86, August 1976 QST). KY stations work other states/countries, others work KY counties (120 total). Entry deadline Oct. 1. Send to Tom Fitzpatrick, WB4FOT, 3709 Niagara Dr., Lexington, KY 40502.

Ohio Interstate QSO Party, sponsored by the Ohio Council of Amateur Radio Clubs and the Farout ARC (Kettering). Noon to 10 P.M. EDST each day (1600-0200Z). Out-of-state stations work Ohio only, Ohio amateurs work any station. A station may be worked once per band and mode. Exchange serial number, RS(T), and ARRL section or country (out-of-state); or Ohio county for Ohio stations. Score 1 point per contact. Repeater contacts not allowed (OSCAR OK). Multiply score by 1.5 for operating portable, signing /8, using temporary power and antennas in any county of Ohio except Butler, Clark, Cuyahoga, Franklin, Hamilton, Lake, Lorain, Lucas, Mahoning, Montgomery, Portage, Richland, Stark, Summit or Trumbull. Add 50 points to final score for working the Ohio State Fair Station NO8HTO. The Buckeye Belles promise to be out in force, their memorial station W8MBI will be active both days. Multi-multis permitted but ineligible for awards. Operate in the area about 5 kHz up from the lower edge of the General class bands, trophies for highest out-of-state, and highest Ohio entry. Certificates for Ohio county leaders, out-of-section and DX scores. Participation certificate to each entrant with 50 or more contacts. A special certificate for working 3 or more members of the Farout Amateur Radio Club. Logs (time, band, mode, exchanges) plus summary with claimed score and mail address constitute an entry. Send an s.a.s.e. for complete results. Logs must be postmarked by Sept. 15 and sent to Joe Subich, WB8HWE, Box 7825, SR 188, Circleville, OH 43133. All entries become property of the FARC.

SEPTEMBER

2-4: DXpedition to the rim of the Grand Canyon, sponsored by the Old Pueblo Radio Club of Tucson, Arizona. W7GV will operate per the following schedule: 1500-1800, 14.035 and 21.435; 1800-2100, 21.035 and 14.335; 2100-0000, 21.135 14.035 and 21.435 (includes Novice and Technician); 0000-0200, 21.035 and 14.335; 0200-0400; 14.035 and 7.235; 0600-1000, 7.035; 1000-1400, 3.735 and 7.135 (includes Novice/Technician). A wide assortment of unique prizes (check with WB7BQN for full details). Rules: all out-of-AZ portables must sign portable, i.e. WB7BQN/6, to be eligible for prizes. They must also be at least 100 miles from the contest site. Likewise, all Novices and Technicians must sign /N or /T. Log date/time in UTC. Follow procedural rules as designated by the operator of W7GV. Ungentlemanly conduct will slow down the process and may result in disqualification of the participant. U.S. stations must have their logs received by W7GV by Nov. 1; DX stations deadline Dec. 31. Your log extracts must show times, dates, frequencies, mode. Enclose your QSL, or a facsimile, plus a 5 x 7 s.a.s.e. for your results, QSL, and any certificates you may have won. Mail to Joe Sands, WA7VTM, c/o W7GV, Box 6497, Tucson, AZ 85733. DX stations are asked to enclose two IRCs. Some of the award categories, for North American stations and U.S. possessions within 2,000 miles of the U.S.: grand prize goes to the first station to work W7GV, each of the three days, on any two bands, once on cw and once on phone (a total of 12 contacts, 4 per day). Second prize to the first three stations to work W7GV any two days out of the three, on any two bands, once on cw and once on phone (total of 8 contacts, 4 per day on any of the two days). Third prize, the first six stations to work W7GV, any one day out of the three, on any two bands, once on cw and once on ssb (total of 4 contacts in any one day). These are in addition to certificates to the first and second station from each state or U.S. possession that works W7GV, once on cw and once on ssb, on any band, any two of the three days (total of 4 contacts).

3-4: Savaria C.C.S. Contest (HA), sponsored by the Claudius RC of Hungary, uhf 1500-2300Z Sept. 3, hf 0000-1400Z Sept. 4, open to all, 80-10 cw, 144 and 432 cw and phone. Call CQ CCS. Exchange report plus

QSO no. starting with 001. Three points per QSO with an hf station, a mult. of one for each of the 10 HA call areas. Score for each band will be the no. of mults. times no. of points; for all-band score use the sum of mults. for all bands. Usual log info (separate logs for separate bands), include declaration. Categories: Single op. all band, single op. single band, multiop. all band (club stations in this last category). Awards. Logs must be postmarked by Nov. 30 and sent to the Claudius RC, 9701 Szombathely, P. O. Box 145, Hungary.

3-5: Four-Land QSO Party, 8th annual, sponsored by the Fourth Call District AR Assn., begins 1800Z Sept. 3 and ends 0200Z Sept. 5. The same station may be worked on each band and/or mode fixed, and repeated again if operated portable or mobile, and from each different county. Stations within the 4th call area may work each other, 4s count 1 point for W/VE QSOs, 3 points for DX (including KH6/KL7). Final score computed by multiplying total points times states and provinces (multipliers count once only). All other score 2 points for each QSO times the total of 4th district states, plus 4th district counties. Count each state and county once only. Suggested frequencies plus/minus 10 kHz are phone, 3940 7260 14340 28600; cw, 3575 7060 14060 21090 28090; Novice, 3710 7110 21110 28110. Awards. Mail logs within 30 days to Bob Knapp, W4OMW, 105 Dupont Circle, Greenville, NC 27834 (an s.a.s.e. will bring copy of the results).

4: LZ DX Contest, the full 24-hour period, UTC. Look for LZ 3520-3750, 7010-7090, 14020-14300, 21020-21300, 28020-28500 kHz. Call CQ LZ, cw and ssb. Send report plus serial starting with 001. LZs will send a report plus a two-digit number signifying their administrative district. Phone and cw are separate categories: single op., multiop. (both individual and club stations), SWLs. Each contact with one's own continent earns one point, with another continent 3 points. Contacts with LZs earn 6 points for non EU. Contact a station only once per band, no crossband or crossmode contacts. Multipliers are 1 plus the no. of LZ administrative districts worked on all bands. Maximum multiplier: 28 districts x 5 bands = 140 plus 1 = 141. Awards. Logs by mid-October to BFRA (Bulgarian Federal of Radio Amateurs), Box 830, Sofia, Bulgaria.

10-11: Pennsylvania QSO Party, sponsored by the Nittany Amateur Radio Club from 1700Z Sept. 10 through 2359Z Sept. 11. Transmit usual QSO no., and RS(T) plus county (for PA) or ARRL section. Suggested freqs: Phone 1815 3980 7280 14315 21380 28560, cw 1810 3550 7050 14050 21050 28050, Novice 3715 7160 21115 28115. PA stations score 3 points per out-of-state QSO, 1 point for PA, multiply by no. of ARRL sections (including E. Pa. and W. Pa.). One mult. may be counted for DX QSOs, only 1 regardless of the no. of different stations/countries worked. Non-PA stations score 1 point per QSO times the no. of PA counties worked. Stations may be worked once on each cw and once on each phone band. Usual logs, info, soapbox, summary, etc. Mail by Oct. 15 and send to Douglas R. Maddox, W3HHD, 1187 S. Garner St., State College, PA 16801. **Washington State QSO Party**, sponsored by the Boeing Employees Amateur Radio Society, 12th annual, open to all. Operating periods: 0100Z-0700Z Sept. 10, 1300Z Sept. 10 - 0700Z Sept. 11, 1300Z Sept. 11 - 0100Z Sept. 12. All bands and modes may be used, stations may be worked once each band and mode for contact points and more than once if they are additional multipliers. WA stations score 2 points per QSO (including other Washington stations). All others score 2 points for each contact with a Washington station. WA stations multiply contact points by the total of different states. VE provinces and other countries worked. All others use total of different WA counties worked (maximum of 39). There will be an extra multiplier of one for each group of 8 contacts with the same WA county for all non-WA stations. Send RST, QSO no., and county (for WA); others send state, province or country. Suggested freqs: cw 1805 3560 7060 14060 21060 28160, phone 1815 3935 7260 14310 21380 28660, Novice 3735 7125 21150 28160. Usual complete logs

with declarations. S.a.s.e. not required. Postmark entries by Oct. 10, and send to Boeing Employees' Amateur Radio Society, c/o Contest Committee, Willis D. Propst, K7RS, 18415 38th Avenue South, Seattle, WA 98188.

11: The North American CW Sprint, sponsored by the National Contest Journal, 0200-0600Z. (Note: This is the 4-hour period of 7 P.M. to 11 P.M. Pacific Daylight Time the night of September 10, no rest periods.) Open to any licensed amateur. The object is to work as many North American stations (and/or other stations if you are in N.A.) as possible and as many multipliers as possible during the contest periods. Participants agree to be bound by the provisions of this announcement, the regulations of their licensing authority and by the decisions of the NCJ Contest Review Committee. Entry classifications: single operator, no helpers, one active transmitter multiple active receivers no spotting net assistance; multi-single, multiple operators, one active transmitter multiple active receivers no spotting net assistance; multi-multi, multiple operators multiple active transmitters (one signal per band). Suggested frequencies: 1800-1820, 3530-3550, 7030-7050, 14030-14050. Stations may be worked on each band. Try 160 during the last half hour. You must make the entire exchange as follows: his call, your call, serial number, your nickname, state/province/country. For example: WA7NIN de K0TO NR32, Tod, MN. A valid contact is a completely correctly copied and logged two-way exchange between a North American station and another station. Proper logging requires the time of each contact. Log each band separately. Serial numbers must be sequential by time. N.A. stations are defined by the rules used for the CQWW. Scoring: N.A. stations multiply total valid contacts by the sum of states/VE multipliers/countries to get final score. Others multiply valid contacts by the sum of states, VE multipliers/N.A. countries. Note: KH6 is not counted as a state and is not an N.A. country. VE multipliers are Maritime (VE1, VO1, VO2, etc.), and each VE call district VE2 through VES. N.A. stations note: If a station calling CQ NA is called by another station and makes a valid exchange with him, he cannot then call CQ again on that frequency (nor can he solicit contacts by calling QRZ, QRZ?, etc.). He must move plus/minus 5 kHz before calling CQ NA again. He may answer a CQ NA on the frequency and, following a valid exchange, call CQ NA on that frequency, however. Entries must be sent to Rusty Epps, W6OAT, 35 Belcher St., San Francisco, CA 94114. Entries must be received by October 10 to be eligible for trophies and awards. An entry consists of a summary showing valid contacts by band, total multipliers, total score, name/call operator, station call and the statement "I have observed the conditions of entry" followed by the signatures of all operators; and a complete, legible log of all contacts (indicate dupes) by band with indication by numbered sequence of each multiplier claimed, and a separate check sheet for each band. Forms may be homemade or patterned after those shown in the *National Contest Journal*. Club competition is limited to a maximum of 15 operators as a single club entry unit. Clubs with more than 15 members may submit more than one entry unit. In this case members of each unit must be drawn by lottery from the pool of members who will compete. To qualify as a club entry unit the names/calls of each operator in the unit must be registered with the contest coordinator (W6OAT) before 6:30 P.M. Sept. 10. Changes may be made in the unit members up to that deadline. This rule also limits multi-multi entries to a maximum of 15 operators if they are a club entry. Multi-multis, multi-singles and singles can be combined in a single unit, but the total number of operators cannot exceed 15. There are no distance requirements nor meeting requirements for a club entry unit. The only requirement is pre-registration of the club-entry unit. An entry may be disqualified on the basis of ineligibility, non-correctness, illegal operation, violation of the conditions of entry or nonethical operation. Such disqualification is at the discretion of the NCJ Contest Review Committee.

Station Activities

SCM & AREC & OPS & OVS & SEC & OBS & TCC & OO & NTS & WAC & CP & A-1 OPR & EC & DXCC & CLUBS & RM & OPS & RCC & PAM & WAS

CANADIAN DIVISION

ALBERTA: SCM, Sydney T. Jones, VE6MJ - SEC: VE6XC, PAM: VE6AF. Members of the NARC under the leadership of VE6VM did an excellent job on the dry run communications coverage for the Commonwealth Games. VE6CE and XYL had an enjoyable trip to B.C. VE6ABC is coordinating the province, wide Swap and shop VE6RM. VE6AH & VE6KO were old timers elected to the NARC executive for the next term. VE6AQZ has returned from an enjoyable trip to G-Land. VE6LY is reported to be in hospital with a broken leg. Get well soon Stan. VE6EA has relinquished the job of editing the "Emitter" after many years. Congrats on a job well done. Traffic: VE6FS 149, VE6AAT 17, VE6AWJ 2, VE6MJ 1, VE6VY 1.

BRITISH COLUMBIA: SCM, H. E. Savage, VE7FB - British Columbia Emergency Net, CW, 3650 KHz has proven that slowing the net to ten or fifteen words has increased the check-ins and new members. No. If a way could be found to originate traffic and our prayers will be answered. VE7SH and VE7FF now has the BCFM autopatch, new shack and 40 foot tower. Edna's two meters tops out at 50 feet on that tower. VE7AIA leaned too far up the ladder, now in hospital with multiple fractures of the arm. New officer Senior Citizens ARC, VE7AWL, pres.: VE7AMW, secy: Traffic: (May) VE7ZK 123, VE7FB 30, VE7BL 7, VE7TT 4, (Apr.) VE7DKY 104, VE7DFY 72.

MANITOBA: SCM, Steve Fink, VE4FQ - Asst. SCM: Peter Guenther, VE4PQ. RM: VE4UL. PAM: VE4JP. With regret we record the passing of VE4SH VE4UO VE4OB and VE4TM. Eight VE4s attended the ARRL National Convention in Toronto in June. New Junior ops, have arrived at VE4MA and at VE4AH, while wedding bells rang for MANAM editor VE4MG. MTN will meet Mon-Thur. only for the duration of the summer. New EC appointments: VE4HU Winnipeg; VE4AAJ Virden. MTN: 18 sessions, 85 QNI, 56 QTC. MEPN: 30 sessions, 875 QNI, 41 QTC. Traffic: VE4UL 56, VE4AI 53, VE4HJ 27, VE4P 18, VE4EA 4, VE4CR 2, VE4RO 2, VE4XN 2, VE4AAU 1, VE4FG 1, VE4FK 1, VE4IM 1, VE4OD 1.

MARITIME & NFLD.: SCM, Aaron D. Solomon, VE1OC - Asst. SCM: Maurice Gladden, VO1EG. SEC: VE1DA, PAM: VO1RM. MGR: VE1AMR. NTN Mgr.: VO1GW. Hosp. Incl. VE1S IY HE QV VX WX ASN BFX. New appts.: EC: VE1BLO, Asst. ECs: VE1S APY ASL, VE1PX apt. CARF Atlantic Dir. Welcome to VE1S BKE SKF BLL BLO BMA BMG. NS & Lobster Car Rallies sched. July. MAARC & HARC part. HARC asst. EMO S&R Ex. Also Marble Mountain WA's Counties & Counties County Award Details from HARC, Box 663, Halifax, NS. VE1FQ awarded Amateur of Year by CRRL. Congrats! NSVHF held Annual Picnic in Truro, July. SARC operating CG1CR from site of Int. G. Camp. VE1S DB DX EJ GB GH GK PL of 2 are being re-issued. VE1AIF and VE1OC received publicity in recent press. VE1BGL moving to High 27. VE16L 18. VE1ARL BFLV. HJ NE have Keyboard keys. Maritime T. T. Net. Sun. 3620 KHz 1400Z. During Can. Summer Games Aug. VO1 & VO2 become XO1 & XO1. VE1OC paid visit to SONRA & addressed club. Last call: All Saints Hamfest, St. Andrews, NB, Sept. 3-9th. APN sessions 26 QNI 114, Q & B37. NTN sessions 23, QNI 112, Q & B37. VE1ACU 114, VE1ZH 111, VO1GW 46, VE1HJ 40, VE1ABG 34.

ONTARIO: SCM, Larry Thivierge, VE3GT - Asst. SCM: Noreen Nimmons, VE3GL. The ARRL '77 National Convention held in Toronto and sponsored by the Scarborough ARC was a resounding success. 2200 plus were registered and treated to the biggest National yet. Many excellent radio people attended and enjoyed the Toronto clubs who worked together for the past four years towards this common goal. Under convention committee chairman, Gord Steane, VE3BMG, who has been awarded the ARRL Certificate of Merit, their unselfish efforts culminated in a most successful convention. Forums and group meetings were excellent. 800 people attended the superb banquet where Noel Eaton, VE3CJ, IARU pres. and Harry Dannels, W2HD, pres. of the ARRL were guest speakers. VE1FQ was voted the Canadian Amateur of the Year for his work with the QSL bureaus. A most sincere thanks and a vote of appreciation to all the many amateur who contributed to make the Convention a success. Special thanks to VE3ODM, pres. of the Radio Society of Ont., who postponed their convention so that the National could be held. New station appointees are VE3JWS as an OPS and K6GMU/VE3 as EC for Port Colborne. VE3GV received his OSN certificate while VE3BDM was issued his GBN certificate. I regretly announce that VE1BGL is leaving for the Silent Key Club sympathies to their families. After having interference problems, London repeater VE3TTT now operating on 147.78/147.18 MHz with autopatch facilities. Plans are to link with VE3TFM. Call sign for the Canadian Summer Games being held in Newfound-land will be XOI55G. The new ARRL Repeater Directory lists over 1200 repeaters. It is available free to members, for return postage using a 6 X 9 inch envelope. Metro ARC has become an affiliated club. VE3QB spoke to the OVMRC on micro-processors. Newcomers VE3J JJD and JJE all in Port Francis with VE3S 11W IOJ and IOG in South Western Ontario. Traffic: (May) VE3SB 21, VE3GL 245, VE3FN 11, VE3PO 136, VE3JWS 136, VE3HGJ 105, VE3CDK 101, VE3GT 97, VE3DY 82, VE3EWC 64, VE3GJ 56, VE3GNW 35, VE3ATR 33, VE3BZ 20, VE3CYR 16, VE3EBC 14, VE3FHQ 13, VE3GCC 8, VE3DH 6. (Apr.) VE3AWE 25, VE3FHQ 6.

SASKATCHEWAN: SCM, P. A. Crosthwaite, VE5RP - Northern Saskatchewan was hit very hard with forest fires that raged from the Alberta border to the Manitoba border. Our amateurs under the direction of EC, VE6BO, volunteered their help. The amateurs did

an excellent job in handling traffic from the flaming North. The Yellow Head Repeater group and the Melfort group have been linked with 220 MHz. I understand the experiment has been most successful and am looking forward in seeing more linkage done in Saskatchewan. Traffic: VE5BO 175, VE5CJ 175, VE5SU 70, VE5AE 54, VE5HP 39, VE5XU 30, VE5EO 10, VE5RP 10, VE5VM 10, VE5QS 8, VE5TT 6, VE5MP 4, VE5OL 4, VE5JN 2, VE5LN 2.

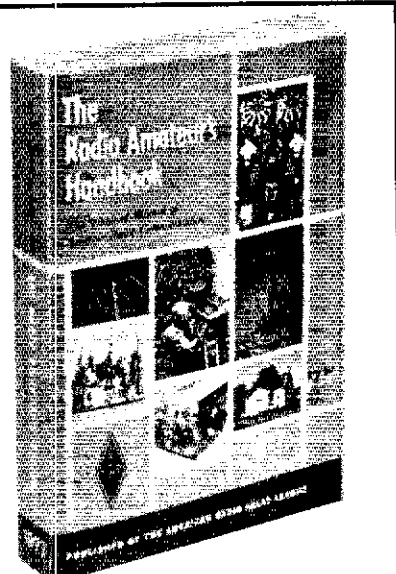
ATLANTIC DIVISION

DELAWARE: SCM, Roger E. Cole, W3DKX - SEC: K3AJ, RM: 3EEB. PAM: WA3DUM. PSHR: K3YHR 51, K3KA 44, WA3LMY/N2UT is now /5 at 231 Muriel N.E., Sp. No. 1 Albuquerque, NM 87123 until mid-Sept. The Annual Spring Delmarva Ham Campout at Tuckahoe Acres, Dagsboro, was enjoyed by all who attended. Campers included W3BSS W3DKX, W3EOLU, W3BFF, W3FEG, K4NVY, WA3SLS, W3TCI, WA3WPY, WA3WTK and W3TYO. Visitors included W3DUG, WA3VEE, WA3VIT, W3WD, WA3WV, K3YHR and WA4IE. DEPN: QNI 53, QTC 3. DTN: QNI 304, QTC 48. Traffic: K3KAJ 112, WA3WY 36, W3DKX 34, K3YHR 30, W3WD 21, K3HBP 1.

EASTERN PENNSYLVANIA: SCM, Geo. S. Van Dyke, Jr., W3HK - SEC: W3FB, RM: WA3SXU, WA3YJG. PAMs: WA3PZO, WA3VJ. Net reports: PFN QNI 456, QTC 461; PTTN QNI 240, QTC 114; AREC 10 QNI 4; AREC 2 QNI 5. Net reports are lax again RMs and PAMs note deadline, net members get after your chief to report! OO reports: K3RDT W3KEK K3NSN W3CL. OBS reports: W3VJ W3LWR W3ATJ W3JYG. OBS reports: WA3BJG W3GAA W3WJ W3YJG. W3YJG. SBL: W3YJG W3VR K3NSN WA3ATQ WA3THT WA3YJG, WA3ZXI now K3NGN. W3CUL & W3VR report rebuilding nearly completed on inside now start on outside! WA3YJG reports the PTTN newsletter really did some good. W3BFR is battling 1U1 RFI and needs help for antennas. W3ID holding on to 2- and 2-meter nets but needs liaison from 1tc nets and more check-ins for outlets, what say? W3CFU will be /3 at Harvey's lake most of the summer. June was the VHF and HF FD contests, hope you got some photos or writeups in the local papers, we need the publicity. W3WRE now has her voice back, also latched onto key nr 239! Glad to report W3BVR's XYL out of trouble and on W3WRE. W3SJK and W3ZBR put up new ant and get back on 1tc nets, but then he forgot to report himself! W3EU and Murphy are brothers, repaired recurv wrecked in return shipment! I see our OOs are right in there, some of them with ZERO DEFECTS! WA3CKA temp GRT, baby girl at QTH! W3GMK another relative of Murphy, but he thinks he has him on the run. Don't know how to report in a report for a safe summer. Traffic: W3CUL 319, K3NSN 1878, W3VR 826, WA3YJG 557, WA3ATQ 443, WA3THT 431, WA3ZRY 277, K3KW 218, K3NGN 175, W3PX 108, WA3WQP 91, W3AVJ 59, W3ATJ 54, W3BFR 50, K3RVC 26, W3ID 25, N3KZ 25, W3CFU 22, WA3LWR 16, W3CL 12, W3VA 11, W3WRE 10, WA3YHR 6, W3ZBR 6, W3EJ 2, K3KX 2, WA3TMP 4, W3BKR 2, W3SD 2, WA3BQ 1, WA3CKA 1, W3EU 1, W3GMK 1, W3GQA 1, W3HK 1, WA3ZBR 1.

MARYLAND - DISTRICT OF COLUMBIA: SCM, Karl R. Medrow, W3FA - The way ARES activity gets reported is by you reporting to your local repeater reports to our SEC N3II. Are you doing your bit? K3KAJ statistics man for MDO reports May a slow month. The two net managers for fone made PSHR this month. How about you others including Novices and Techs? W3IKA leads in 1tc, and operated FC493AM for Armed Forces Day. W3BFR activated AIR, W3EOV, is interested in graphology - anyone else? EC K3EUG joined the MEPN, WA3ZTW finishes school, then an engineering seminar at the USNA followed by music camp. W3WBY repaired his 2-mtr antenna in time for the openings on both 2 and 6 meters. W3GDC is getting cranked up for visit to his family. W3ADQ fascinated with his TS-820. Problem how to put a 160 mtr antenna on a city lot! W3FCJ visited the CRC gang during his OH visit. W3ZNV keeps fighting daylites saving time. WA3RSK is climbing the executive ladder quickly with a 2nd promotion this year. W3WV reports WA3ZXD a new General in rare Calvert. WA3GXN is trailing west the rest of the club. W3EOP W3ZEP. W3ZEP had top mtr work collection, and a 2-year old son hindering ham activities, but look out FD. WA3PRW has a class of ten going full blast at work. W3BETD is now permanent plant 4 in Columbia, VA. W3BEPN/WB2TJR is spending 6 weeks in San Fernando Valley before taking up law school. WA3UH and XYL, W3EBC delivered a Year of Conf. to Mr. Goddard. The Goddard ARS has its 20 mtr beam on the 70-ft. pole at long last. With the nets: Mr. Sessions/TTC/ONI average. W3OYV, MDC PON 4/12/19.5 W3DFW, WR PON 16/42/15.3, WA3PRV, MEPN 21/54/20.1. Toppers W3ADQ 100%. Others W3LDD W3OMN and K3ORW. K3ORW MDCNTN 18/47/14.3. Top honors to W3BQ. W3BQPT, W3ZRW and W3ZRW W3BEB MDD 60/127/6.0. Top Brass W3EBE WA3UYF and W3IKA. For Apr. MDD 56/182 with an all DE cast K3KAJ WA3WPY and W3EBE. WA3OAS is now K3RJ. MDD-MEPN-MDCTN picnic Patapsco State Park McKeldin area No. 501 Sat. Aug. 27. Ya ait come. Traffic: (May) W3IKA 78, W3FA 51, W3ORW 34, W3BETD 35, W3BWR 22, W3EBC 18, W3EOP 11, K3EUG 6, WA3ZTW 1. (Apr.) WA3EOP 20.

SOUTHERN NEW JERSEY: SCM, Raymond F. Clancy, WB2GTE - Congratulations to new hams from W2EA's SJRA class and WA2VYA's RCA-SJRA class. YLs: WA2NBE WA2NB, WA2NBH WA2NBQ. OMs: W2JWB W2JBY md NAT NAW A/JZ HES QMP. OMV OMN OMS OMO OMX ORL; WB2S NBP NBI NMC NBE NBL NBN NAW NBK NBJ NAQ LXR IMU OML OMO OMI OMM OMU. WB3HTC. K2JOC now K2YY. WA2IAZ is General. WA2WJL Advanced. WB2LBT Extra. WB2PTH active on 55TV. W2PH has 12 countries SSTV. W2FFU retired. WA2BGL speaks Japanese. W2JQ a Silent Key. WA2WRS had operation. W2JI quad up for DX. W2ZQ new roof on shack, plus microprocessor to help



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in contests. WB2YA sends line OD report. K2Z active in NJN. K2QVQ reenters. Delaware Valley ARC may replace repeater. West Jersey ARC has had display at Wilmington Public Library. Maple Shade ARC celebrated 20th anniversary in June so W2DEB WA2LND has 24 countries in 3 mo. WA2HEP back on after 15 yrs. New rigs at WA2BZY WB2VGF W2PAL W2SDB moves to FL. WB2GTE licensed 50 yrs. pas. Apr. Camden County Auto Patch Repeater Assn. Inc. officers are Chmn WB2EH; vc WA2OFN; WA2EL. Treas. K2HW. secy. K2JXK. reports a 2nd repeater WA2ALP on air. L landmark. Capri Merry Hill on 447.35/442.35 MHz. WB2UBU on 2M. WB2UJ enjous 15 M cw. W2NM has been a DXer for 21 yrs. Traffic: W2ZQ 204, WB2LCC 12U, WA2WSV 58 WA2AWU 48, W2J1 20, K2BG 14, W2IU 3.

WESTERN NEW YORK: SCM, Joseph M. Hone K2YA. Asst. SCM: W. B. Thompson, W2MTA. SEC N2JC. Had quite a hamfest and State ARRL convention here in May. Attendance was near 7000. A most deserved Amateur of The Year award was given to WA2PUU at the Hamfest Banquet. Congratulations Code contest winner was K2VV at 40 wpm with W2JU as runner up at slightly less than 40 wpm. The FCC exams at the Hamfest were administered to approximately 600 by K3CT from the Philadelphia Office with help from Jim Thiemer, Engineer-in-Charge of the Buffalo Office and his staff plus volunteers; W2BIU WA2UEB WA2CER WA2SSU and K2YA. Approximately 350 passed. This explains the sudden influx of Interim, PA calls in late May. Speaking of Interim PA calls, the following was heard on a local repeater following the Hamfest: New ham signs into the Interim PA suffix on his first call. An Old Timer calls him and asks how he is able to access the repeater from so far south and then asks to the exact location of Interim, Pennsylvania! WB2FTT is the new Erie County EC replacing WB2FXY who moved to Rochester. WA2VAM is now EC to Carleton County and reports that the Skyline ARC is again active with K2QHV pres; WA2JFL, vice-pres WA2VAM, secy-treas. Congratulations to the 1000 Amateur Repeater and Tupper Lake High School ARCs on their recent ARRL affiliation. New director for ARATS are: K2MNE WA2BUN and WB2UY. W2ICE appeared on a WOKR-TV segment about the Antique Wireless Association's Museum. More two letter calls: WB2DT is now K2JY. W2MPM now K2MP. K2ISP now W2HZ. WA2VY now W2KS. WB2VPK now W2XR. WA2EAH now K2VV. WA2CNE now W2JU, and W2CYG is W2DN. WB2ELE a new QYS. Yours truly joined the Ban-Dit-Dahs to Field Day again this year. Stations requesting field appointment applications by radiogram must include their mailing address in the message text. Traffic: WA2ELD 173, W2RUF 107, WA2ZP 75, WA2ZJP 75, WB2QIX 44, WA2SFT 26, W2UYE 23, WA2AIV 18, K2GJC 14, K2VR 13, WA2UAR 11, WA2ECA 1.

WESTERN PENNSYLVANIA: SCM, Donald J. Myslewski, K3CHD — SEC: WA3VUP. Asst. SECs: K3SMB WA3LJW. PAM: K3SMB. RMs: K3AJ, W3NEM W3LOS W3KUN.

Net	KHz	Time/Days
WPA CW Traffic	3585.0	7:00 PM Dy
WPA Phone Traffic	3983.0	6:30 PM Dy
Pa. Traffic & Training	3610.0	6:30 PM M-F
WPA RACES	3990.0	9:00 AM Su

It is with deep regret that I note the Silent Key of K3VYO. Get well wishes to WA3SH. The annual WPA picnic is scheduled for Sun, Sept. 11 at Cook's Forest. All appointment holders and WPA net members are invited to an enjoyable day of eyeballing. Hope to see you all there. The following stations have been upgraded to Technician, WA3ZS4 to General, WB3AGB WB3CIM WB3EYH WA3YYA WB3UDP; to Advanced, WA3DET; to Extra W3KQD. Congratulations. Welcome to WB3HGB who recently received the Novice license. WB3SKD reports that the Washington Amateur Communications Club (WACOM) members assisted WQLD TV as telephone operators during their annual fund drive. Special thanks to the following WPA clubs who faithfully submit newsletters for this column: WACOM, Indiana ARC, Greater Pgh. VHF Society, Skyview ARC, South Hills Brass Pounders & Modulators, Steel City Radio Assoc. of Erie, Foothills ARC, Penn State ARC, Crown A.A. Society, Nittany ARC, Two Rivers ARC, North Hills ARC. The WPA CW Traffic Net had 31 sessions in May, handled 155 messages with 386 check-ins. The WPA Phone & Traffic Net had 31 sessions in May, handled 61 messages with 307 check-ins. PSHR credits WA3VEM traffic: W3VEM 293, K3AT 210, WA3AHP 98, W3KUN 34, W3LOS 24, WB3AGB 24, K3SMB 24, W3EGJ 23, W3AB 14, K3CHD 12, W3SN 10, W3ATQ 9, W3AS 8, K3CR 6, WA3YXJ 6, W3YD 4, W3INI 2, K3VQV 2, WA3UDZ 1.

CENTRAL DIVISION

ILLINOIS: SCM, Edmond A. Metzger, W9PRN — Asst. SCM: Harry Stador, W9KYU. SEC: W9AES, PAM: WA9KEK. RM: W9NJP, Cook County EC: W9HPG.

Net — Freq.	GMT	Days	Tfc.	Sess.
ILN — 3690	2400/	Daily	330	62
	0300/			
III Phne — 3915	1300/	M-S	212	31
	1800/			
NCPN — 3915	1300/	M-S	356	26
	1800/			
IEN — 3940	1400	Su	no report	
ISN — 3717	1400	M-F	11	17
ISSB — 4277	1400	M-S	441	25

Our sympathy to the family and many friends of W9IER, Ettingham, who became a Silent Key on Wed. May 11th. A new two meter FM repeater, WR9ALN, 147.81-21 is now in operation through the courtesy of W9SLO, Knox County Emergency Services (CE) Dir. WB9SNA now holds a 2nd Class Radiotelegraph license. The League's Executive Committee has approved the application of the LaSalle-Peru Area Vocational Center Radio Club's affiliation and has declared it a duly affiliated society. W9NQG WB9OHJ WB9WNN and W9NMO are the newly elected officers of Northwest Amateur Radio Club. W9IB is one of the top 20 operators in the QCWA contest. K9EIV is now an Extra Class licensee and also passed his second class radiotelephone exam. WB9YJC and WB9JAB are new Generals. K9EIV WB9NBX and W9NQA are now active 2-meter AFSK 146.70 MHz. WB9UCY a lat 9/13 has received a General ticket. It is with deep sympathy that we announce the death of W9EGG, editor of the Popular Electronics Radio Amateur Column. The Western IL Radio Club (Quincy) has changed their name to Western IL Amateur Radio Club. WB9SAD is seeking for Chicago area hams to start a DX and Contest club. Please contact if interested. WD9DNR WD9DJS WD9DNY WD9DNN WD9DNX WD9DNY WD9DNI WD9DPK WD9DPN WD9DPP WD9DPV WD9DPW WD9DPX and WD9DPQ are new Novices who graduated from the latest York Radio Club's novice code and theory class. The Genois Amateur Radio Club handed a communications for the Memorial Day host 2288.7. John (2288.7) was

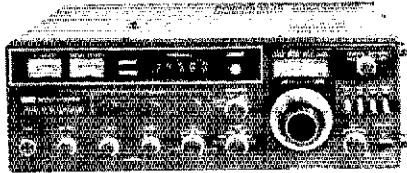
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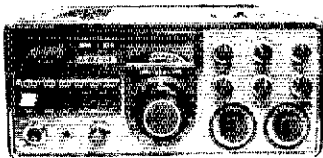
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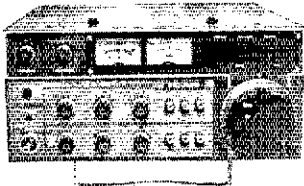
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at
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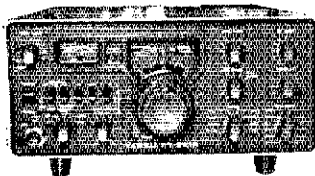
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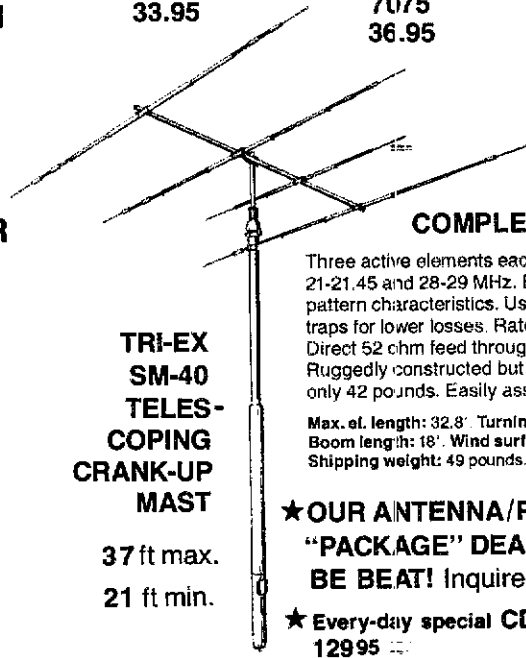
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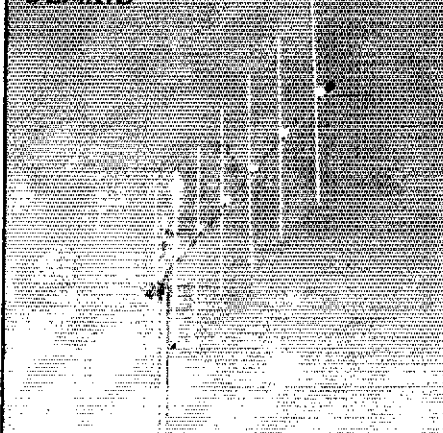
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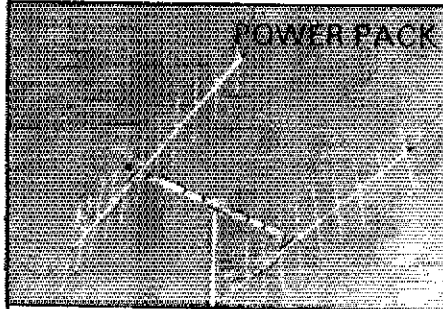
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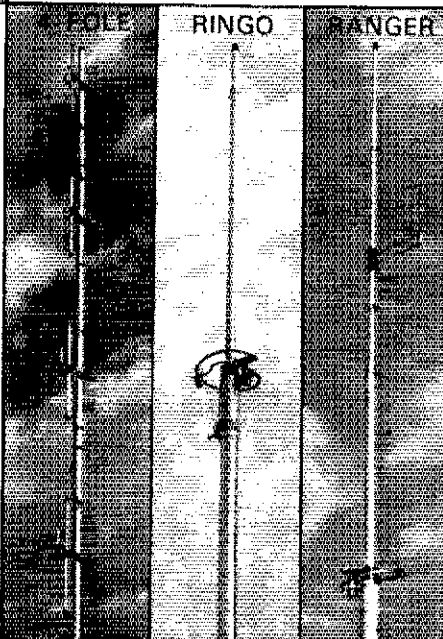
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munications furnished by members of the St. Clair Amateur Radio Club. W9MSK became a Silent Key on May 31st. This column's sympathy to his family and friends. W9UAB is now a General. Traffic: (May) W9NXJ 216, W9HJ 140, W9UAB 134, W9JSR 128, W9UJE 126, W9VJW 132, W9NGD 113, W9AGW 111, K9ZTV 100, W9FLF 80, W9QK 64, K9KHI 48, W9LNQ 44, W9JL 35, W9RSW 25, W9GKX 24, W9SNA 21, W9PRN 22, W9PHM 15, K9EEA 13, W9NEH 8, K9AR 6, K9DDA 6, W9PE 6, W9QBK 2. (Apr.) K9EEA 9.

INDIANA: SCM, M. P. Hunter, W9LF -- SEC: W9UMH. Be sure to attend the Indy Hamfest on July 10 at the Marion Co. Fairgrounds. It promises to be a good one. Also remember the Lafayette Hamfest/IRCC picnic in Aug. The Lake Co. repeater W9DJP is now functioning on 84/24. FWRC presently sports a membership of 333 and still growing -- all clubs should be so lucky. W9LTY must find ground wave communications to be the easiest way -- he lost his antennas again! By the time you read this, the N9MM/W9KTA operation from Kingman Reef, Palmyra should be history. Their planned operation from Clipperton did not fell due to massive red tape. DXing continues to be very good with S.E. Asia/Central Asia/Europe openings at the same time becoming common 20 meters. Congrats to W9MTT for top Section and Division honors during the 2ARRL 160-Meter contest. Lafayette should be big on the contest lists in the future as N9MM prepares to locate here after his trip to the Pacific. Congrats to W9WKA on his Extra Class ticket and WAZ award. Net hrs: LTN 319, INTN 63, IPON 1, ICN 26, QIN 298, HOOS VHF Traffic: (May) W9IOH 417, W9LTU 255, W9GGW 219, W9HJF 135, W9FTS 142, W9DZV 124, W9QCF 124, W9FOT 121, W9QLW 94, W9ITB 85, W9IHR 76, W9JFU 66, W9EI 65, W9QEZ 60, K9YBM 50, W9UEM 43, W9YB 40, W9PIR 33, K9KTB 31, W9LTI 29, W9YKN 28, W9SOY 25, W9NAG 23, W9BKA 23, K9TKE 23, K9WVG 20, W9WT 13, K9WVJ 11, K9RPZ 10, W9DIX 9, W9FLF 8, W9PWF 8, W9HCH 7, K9JQY 7, W9QHX 7, W9BKR 6, W9SLV 4, W9PIE 3, W9BOP 1, W9YVY 1. (Apr.) W9SQH 30.

WISCONSIN: SCM, Roy A. Pedersen, K9FHI -- SEC: K9ZZ. PAMS: W9AYK, W9IEM, K9UTQ. RMs: W9IHC, W9SFL, K9LGU, K9KSA, K9EN. Nets, Freq., Time, QNI, QTC, Mgr.: BWN, 3985 KHz, 1145Z M-5, 5:11, 215. W9AYK: BEN, 3985 KHz, 1700Z Dv, 6:08, 1:12. W9IEM: W9BZ, 3985 KHz, 2230 Dv, 9:44, 1:60. K9UTQ: WNN, 3725 KHz, 2215Z Dv, 49, 4. W9SIC: WIN-E, 3662 KHz, 0000Z Dv, 175, 68. W9SFL: WIN-L, 3662 KHz, 0300Z, 158, 84. K9LGU: RTTY, 3662 KHz, Sat, 0030Z 8, 0. K9EN: WI EX PD, 3925 KHz, 1701Z M-F, 588, 32. W9NIX: 21 amateurs from the greater Madison area provided communications for the 64th annual Wisconsin bus tour held in Madison. W9LKC enjoyed giving QRP talks at Dayton. W9KAX passed Gen. W9QVT moved to Beaver Dam. W9LXZ now QBS. Mancorad club started out a class of 35 Novices; 12 took the test. Instructors were K9RFZ, W9QBZ, W9E5N. W9E5N Mancorad banquet was well attended with 64 present. This club has been affiliated with 30 years. Don't forget to check into the D9RN. W9SFL, W9WFM Novice to Gen. W9YMM Novice to Advanced. W9YSC Novice to Tech. (from Intercom) W9HWQ now K9GU. Wisconsin State convention at Lake Delton was well attended, all had a good time. Don Miller Central Division Director and his XYL, Bob White from ARRL, were at this affair. This year's XYL were all there. K9CPM made BPL, W9UOJ to Tech. W9MGP will be operating from EL for the next few years (from FLARC). New hams from Racine area, W9DSX, W9DSY, W9DST, W9DTE, W9DTE, W9DTE, W9DTH, W9DTH, W9DTH, Traffic: (May) K9CPM 674, W9SFL 210, W9CXV 207, K9MZO 99, W9DND 84, W9IEM 78, K9FHI 71, W9ICH 68, K9LGU 54, W9AYK 47, K9UTQ 35, W9YFW 33, K9JPS 31, W9IHW 26, K9ANV 24, W9JSW 24, W9LKC 23, W9HLS 14, W9KPK 10, W9NDV 10, W9QV 7, W9QKH 5, W9RKR 5, W9YXY 3. (Apr.) W9QKH 57, K9ASC 6.

DAKOTA DIVISION

MINNESOTA: SCM, Gordon Olson, K9EC -- The Month of May brought another fire emergency to our Section. W9QOB Itasca Co. EC was called by the DNR May 8 to help fight a bad forest fire near Hill City. W9SLI, W9QLZ, W9QOB and W9QGW responded and handled most communications May 9 then all Commo the 10th and 11th. They then were on alert for the next several days. Thanks to the Northern Lakes ARC and Itasca Co. AREC for a job well done. After all that action I bet Field Day was quiet! More new calls: W9JPR is N9JP, W9URW is K9L, K9RMY, XYL is new Novice. W9BBD, W9RYQ passed Extra -- congrats to all. K9CVB chief RM MN Section will be leaving. He has been promoted to pres. of his Co. and is moving to NY. Good luck and QNI MSN when you can. W9QFG past RM MSN will take over MSN I with assistance from W9LDW. Visited a well attended Amateur Fair '77 in St. Paul and put on by the Twin City FM Club. A very good show of elements. Hope it's the first of many. W9JYT sent a copy of MARC News containing interesting articles by W9RBI and W9SCN. Sorry to report that W9AYN and W9DP are Silent Keys.

Net - Freq.	Time/Day	QNI	QTC
Manager			
MSN - 3685	1015 PM	88	49
W9LDW			
MSPN - 3925	545 PM	616	104
W9HOX			
MSPN Noon - 3945	1205 PM	856	85
W9OSJ			
PAW - 3925	9-12/1-5	3758	232
W9YVT			
MSSN - 3710	530 PM	198	24
W9QWH			
MWX - 3925	615 PM	195	132
W9PKG			
W9HOX 147, W9YVT 96, W9LDW 71, W9PGZ 66, W9PKG 65, W9DND 65, W9GLI 51, W9DFC 59, W9VNC 44, W9QCY 44, W9DUW 44, W9HZU 17, W9QFG 35, W9JYT 30, K9ZBI 29, K9JTW 22, W9EQZ 21, W9NZB 17, W9QPK 10, W9UMX 4, K9FLT 3.			

NORTH DAKOTA: SCM, Mark J. Worcester, W9WLP -- W9RS RWM RWK VGJ are going to New York to attend W9RWL's graduation and leaving on

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3.3K ohm	82K ohm
4.7K ohm	100K ohm
6.8K ohm	150K ohm
10K ohm	220K ohm
20K ohm	

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7806	7824
7808	7905
7812	7912
7815	7915
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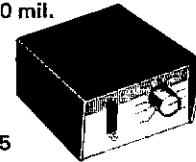
FND70 .4"C.C.	.59
FND800 .8"C.C.	1.69
TI 6 digit array C.C.	3/1.00

MAN 8 .3"CA Yellow	.89
LT767 .7" C.C. 4 digit stick	\$ 3.95

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*2N2907	1.10/00
2N3906	6.10/00
*2N4000	6.10/00
*2N4433 SCR	3.10/00
1N4004	1.10/00
1N4007	1.00/00
1N4148 (1N914) 200 uA	0.10/00
N2911 VHT Pre amp .40	
4D0C1 Power Darl - 8/1.00	

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7402 .17	7475 .55
7403 .17	7476 .35
74H04 .25	7480 .45
7404 .17	7483 .75
7406 .25	7485 .89
7408 .17	7486 .35
7409 .17	7490 .71
7410 .17	7491 .71
7411 .25	7492 .71
7413 .45	7493 .57
7420 .17	7494 .90
7421 .17	7495 .71
7423 .35	7496 .85
7425 .27	74100 .96
7426 .25	74121 .31
7427 .17	74123 .51
7430 .25	74125 .44
7432 .30	74141 .71
7437 .35	74145 .97
7438 .35	74151 .71
7440 .17	74153 .81
7442 .50	74154 .97
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7444 .65	74163 1.05
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74LS20 .31	CD4010 .45	CD4047 .59
74LS21 .33	CD4011 .16	CD4049 .35
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NOTICE: 73 MAGAZINE printed an untrue report in the June, 1977, issue regarding the KDK FM144. They are now printing a retraction regarding this untrue report. The FM144 does not need tuning to cover the full 5 MHz range.



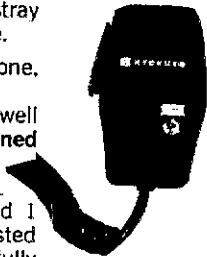
NEW! FM144-10SXRII

All Solid State-PLL digital synthesized — No Crystals to buy! 5KHz steps — 144-149 MHz-LED digital readout PLUS MARS-CAP.*

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- **TRUE FM:** Not phase modulation — for superb emphasized hi-fi audio quality second to none.
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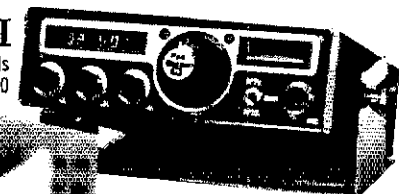


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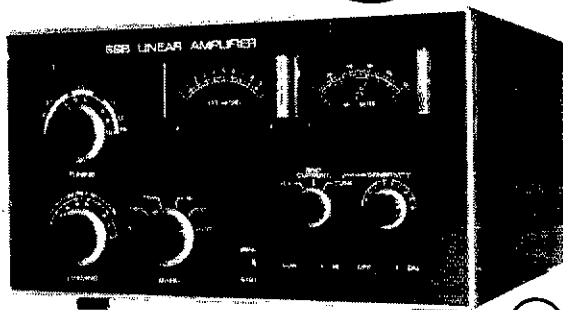
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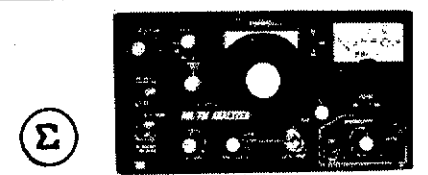
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KDK		
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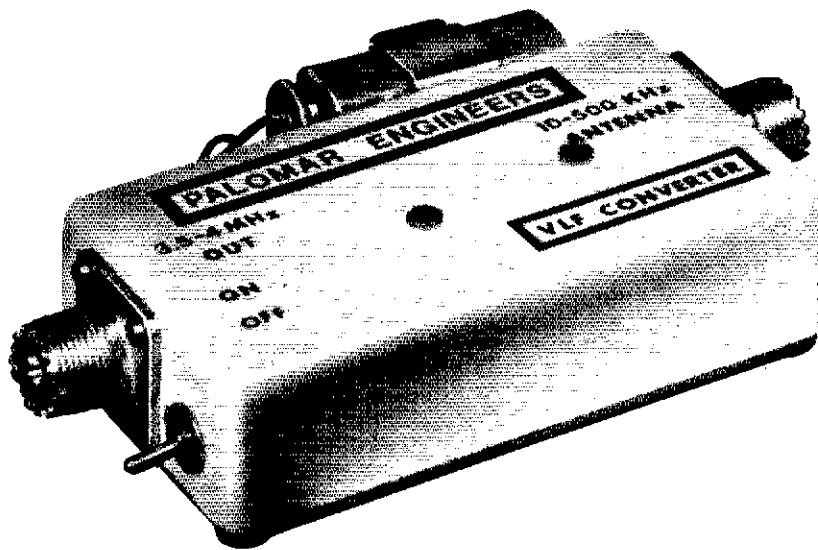
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the 16th of June. ARC gave 20 Novice exams and 6 Novice exams at the State School for the blind. WBYKA was the education chmn. KMOH formerly of G.F. now is W5PDH. WA0QVW back at UND with new call of N0ND. BARK participated in a Bike-A-Thon for retarded children providing 2-meter check points on a 25 mile course. Bismarck Rept. now has Auto reports to W5G3W. WA9EWW has set up a Ham Shop in Bismarck. Lets give our support. WBAZN, Riverdale, making Bis. and Minot Repeaters. Met — kHz CDT/Days Sess. QNI QTC Manager DA Fa — 2996.5 1800 S-S 28 187 45 WA9SUF Traffic: WA0RWM 64, WA0SUF 37, W0DM 12.

SOUTH DAKOTA: SCM, Ed Gray, W8SD — New two letter calls are K9OL formerly W9HJ and K9ZZ formerly WA0NL. The Rapid City gang has been working on the 22/82 Bear Mountain Repeater. WA0VPY and WA0ULX report good June sporadic E openings on six meters. A good two meter sporadic E opening occurred on two meters, June 6 during the evening with WA0VRE, WA0JED, KA9G, WB0LKL and WA0ULX working between SC, KY, IL, MI, MO and TN. WB0AFY has his Tech. and WB0JHD now Extra. Field Day activity was reportedly held by the Yankton/Vermillion, Lake Area ARC (Watertown) Mitchell, Huron, Rapid City, Aberdeen and Sioux Falls groups. Met reports: Morning Net: QNI 248 and QTC 23. NJQ Net: QNI 79. QTC Evening Net: QNI 1150 QTC. 40 QNI. Traffic: WA0VRE 505, WB0EVQ 52, W0MZI 21.

DELTA DIVISION

ARKANSAS: SCM, S. M. Pokorny, W5U4U — SEC: W5SVNV. PAMs: W5POH, W5ZWX, K5MEA, RM: W5MYZ. Nets, kHz, Times/Day, QNI, QTC, Mgr.: QZK, 3760, 0000/DV, 129, 23, W5MYZ; APN 3937, 1700/M-S, 784, 32, W5POH; M-Bird, 3928, 2130/M-F, 520, 18, W5ZWX; ARN, 3925, 2130/DV, 3:33, 35, W5MYZ; ARN, 3925, 2130/DV, 3:33, 35, W5MYZ. K5LPS now K5OD. New ECs W5BHD for Crittenden Co. and W5WPV for Yell Co. We now have 23 ECs in 23 counties. W5SVNV would appreciate it if you have no EC in your county to contact him. Welcome to new hams in AR W5s BXA BXB BXD BXS BYC BYG BYH BXX BZD BZU BZV CAC CAL CAM CAN CAQ CAP CAQ CAR CAS CAT CAU CCV — QCW. Razorback Chapter held their spring meeting at Mountain Home May 21st with 42 oldtimers and their YFs. New sec/treas for QCW is W5POH. Traffic: W5HNN 109, K5MEA 46, W5NBC 30, W5POH 20, W5U4U 18, W5EJL 16, W5KLL 10, K5LDW 8.

LOUISIANA: SCM, Robert P. Schmidt, W5GHP — Asst. SCM: John Meyer, W5JFB. SEC: W5CIG, RM: W5ZZA. PAM: W5NEZ. VHF PAM: W5VBX. Again congrats to W5FMO on making the Honor Roll on the FM I, SLARC. Hammond had a very successful Shrimp Ball on June 3. SLARC 2-Meter Net now moved to 8:30 PM Sun. New calls: W5AMN now N5ES, W5DGP now N5BZ, W5CQX has been appointed Asst. Mgr. Daylight RNS. LARN the RITY net has moved their time to 6:30 PM Sun, and added an extra schedule on Wed. night. Anyone with RTTY gear is invited to check in. If you desire some help, please QNI on CW, and the net members will be glad to assist. LARC Summer social was a large success on June 4. OO W5TPG very active, with a station set up at Toledo Bend. New Code Certificates received by K5MC 35 wpm, and W5VNB, 30 wpm. New Extra license W5CIZ, who is very active on LAN. Net — 100 Time/Day QNI QTC Manager LAN — 3615 7 & 10 PM DV 534 282 W5ZZA LTN — 3910 6:30 PM DV 120 65 W5BNEZ LSN — 3703 8:30 PM M-F 73 20 W5ANV LRN — 3487.5 6:30 PM Su & W 21 8 W5BFHU Traffic: (May) W5GHP 330, W5PTH 218, W5ZZA 204, K5MC 201, W5JGU 139, W5BFHU 76, W5CQX 66, N5ES 52, W5BNEZ 51, W5ANV 18, W5CIZ 28, W5LBR 24, W5ANV 24, W5YN 12. (Apr.) W5CIZ 5, W5VJM 4.

MISSISSIPPI: SCM, E. Ed Robinson, W5YTN — SEC: W5FXA. Everybody enjoyed a fine Hamfest in Jackson, May 14-15, good attendance and fine swapping. W5FHA reports better QNI on TN. W5LJZ found very active openings on 2-meters from Gulfport. N4JS/5 (formerly W4MPC) Meridian has been away at FAA School — welcome back. A 6-meter repeater is being planned in Shannon, MS, all interested contact W5JZN or W5MUQ. Also enjoyed visit to Natchez Hamfest and overall QSOs there. Miss. Side Band Net (W5ZLX) 3987.5 kHz 1815 CDST daily. Traffic Net (W5FHA) 3665 kHz 1845 CDST daily. Miss. Slo Net (W5MTQ) 3733 kHz 1800 CDST MWF. Gulf Coast Side Band Net (W5JHS) 3925 kHz 1830 CDST daily. Central Gulf Coast Hurricane Net (W5TWK) 3835 kHz 1900 CDST daily. Don't forget Mid-Delta Hamfest-Cenvis, MS, Apr. 19 & 24. DRNS (W5KLV) Sess. 31, QTC 267; G5CHN (K5OWK) QNI 2298, QTC 61; MSBN (W5S5NB) QNI 2169, QTC 95; MTN (W5FHA) QNI 179, QTC 77; Miss-Lou Weather Net (K5VXV) QNI 103, QTC 11; Shannon Amateur Radio Net (was MS-AL FM Net) W5STZL QNI 3211, QTC 10. Traffic: W5FHA 159, W5LSG 67, W5WZ 5, W5YTN QTC W5KVV 5 24, W5OKI 20, W5NCB 16, W5VKR 14, W5GQA 13, K5VXV 11, W5RUB 9, W5S5NB 8, W5BW 7, N5CW 7, W5NGF 5, W5VFS 3, N5XA 3, W5LL 2.

TENNESSEE: SCM, O. D. Keaton, W44GLS — Net — Freq. Time(Z)/Days Sess. QNI QTC Manager TPN — 3.980 1140 M-F 81 4533 368 W44BW W44F 1245 M-F W44YPO 0130 M-Su 1400 S5uH 0130 DV TN — 3.635 30 245 103 K4YFC TNN — 3.710 2300 M & Th 7 56 31 W44CNV E1VHF-N — 50.4 0200 MWF 13 100 3 WA4W7J E1VHF-N — 145.2 0200 TTh 8 40 0 W44DZG MTTM — 28.8 0200 TTh 8 89 0 W44AY W44HF 146.17 — 146.97 2330 Dy 32 923 460 WA4VX TCDARCN 146.16 — 146.76 0200 W 4 133 0 W4CYL

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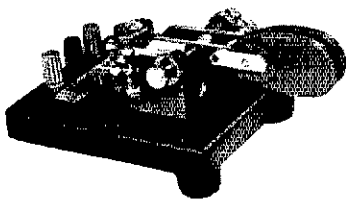
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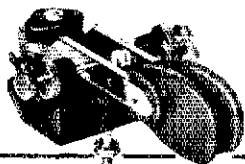
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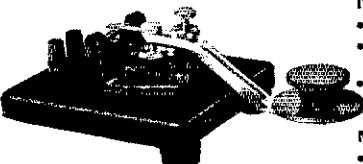
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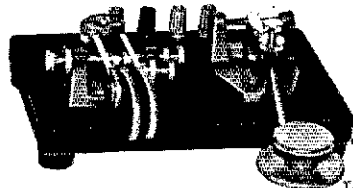
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each month so there will be no delay in QSL reporting. PSHR for Apr. were K4YFC 47, WB4DJU 44, WA4CNY 27, W4JGG chmn. or the TN QSO party report 87. TN logs received for new records; first place phone K4RTA, first place CW NAZZ, first place mobile K4LTA and first place portable W4QD. Every one is invited to attend the Cedars of Lebanon Hamfest on the 28th at the Cedars of Lebanon State Park, bring your food and the flea market goodies for a great afternoon. The following are commended for their participation in the Swap Meets held in Nashville May 20 & 21: WB4DYR WA4M, WB4JGL WB4GOF, K4ALK, W4CJY, WA4ROB, WB4GN, WA4HW, WB4ZCQ, WA4GLS, W4CYL, WA4WMC, K3CQ, WB4WHC, WA4HCS, K4XE, WA4VTS, WA4GWA, WA4SGP. You are invited to attend the Bristol Hamfest to be held on the 13th & 14th, at the Seacrest Drive-in Theater, bring your swap and sell year Traffic: WA4CNY 45, K4LNY 210, K4YFC 70, WB4PRF 85, WB4RRK 80, WB4DJU 77, W4JGG 75, WB4HKF 58, WB4ZGZ 35, WA4VVK 49, WB4PRH 43, WA4DKC 38, W4TZG 36, W4CYL 31, WB4HCH 28, WA4GLS 24, K4JSE 23, WA4LYN 20, W4VLS 17, WA4WXT 17, WA4OSH 15, WB4WHE 15, WB4YCP 15, WA4YSJ 14, N4ZZ 11, WB4GBI 10, W4MECA 9, WA4WHQ 9, W4PSN 7, WA4KGR 6, WA4BGG 4.

GREAT LAKES DIVISION

KENTUCKY: SCM, Ted Huddle, W4CID — SEC

WB4ZML, May Nets:					
Net	QNI	QTC	Net	QNI	QTC
KRN	331	33	KYN	165	104
6MKN	87	87	KNTN	280	122
KTN	916	84	50AREC	64	6
KPON	64	3			

RM WA4IG5 reports KYN activity as slow with late session KSN taking a beating. K4UMN has spent some time recently in the hospital. WA8FJK/4 is flying his R/C model planes via 6 meters. Less crowded than the W4C from the W4C assigned as PAM of KTN. WA4AVV is appointed to replace him. Inx for a good job Chet and good luck Earl. WB4ZBX assisted in the disastrous Southgate, Beverly Hills fire using 2 meters. Paul handled health and welfare from his mobile at the scene of the fire. Traffic: W4BAZ 154, W4AIG5 103, WB4GCR 61, W4CID 47, WA4WSM 40, WA4JAV 36, K4HRF 34, WB4ALM 29, WB4ZML 27, WA4AVV 26, W4CDA 22, WA4RCD 20, WB4VAF 18, WA4FAF 17, K4UMN 11, WA4SAC 10, WA4AGH 8, WB4KLC 2, WA4NAR 1.

MICHIGAN: SCM, A. L. Baker, W8TZZ — Asst. SCM: Stan Briggs, W8MPD. SEC: WA8EFK. RMS: W8JYA, W8BNCN. PAMS: K8LNE, W8SOP. VHF PAM: WA8WVY.

Net — Freq.	Time/Days	QNI	QTC	Sess.
MACS — 3953	1500 Dy	482	394	8
QMN — 3663	2230	730	207	81
	0200 Dy			
WSBN — 3935	2301 Dy	727	87	31
BRMEN — 3930	2130 Dy	645	73	31
OPEN — 3922	1130 Dy	613	57	36
CLETN — 3930	0130 Dy	621	54	31
MINN — 3722	2230 Dy	62	28	24
MIGM — 50.7	2301 Dy	169	23	24
VHF PAM				
report		595	16	20

At last we have an Asst. SCM, Stan Briggs, W8MPD, our long time liaison in this position in June. MACS net Amateurs of the Month were Jan, WB4CN, Feb, WA8DHB, Mar, W8VPW, Ford AR League elections: WA8NLL, pres.; WB8LWX, vice-pres.; WA8GDI, secy.; WB8RQC, treas. Recent appointees: Asst. SCM: W8MPD. ECS: WA8CKT, WB8YYG, WB8NF, KBQEZ, W8VPM, QES, New licenses: General WB8RTV, WD8QZ, Tech WB8SOG, WD8DFX, W8UJEQ. Congratulations, Who's Who Dept. K8BYX-W8TJ, K8EHD-K8EJ, W8EDC-K8EC, W8KSP-K8GG, K8HLR-K8IA, W8STDY-K8LJG, W8AJUN-K8MD, W8Z7AV-N8NA, KRIDE-W8TA, W8SVMQ-K8ID, W8TEZ-N8TT, WB8WDP-W8AF, K8S/W-N8BG, WD8CBU won a Hy-Gain 203-BA at Muskegon. K8ODYX-YL won a watch. K8ZJU and W8FZL won wattmeters. Regrettably I report K8MZG K8ECC and W8IBP are Silent Keys. Traffic: (May) WB8DKQ 605, W8VPW 126, W8BITT 112, W8YIQ 110, WB8YDZ 108, W9NOH 104, WA8WZF 98, WJKJG 94, K8LNE 87, K8DYI 82, WB8POL 80, WA8DHB 70, WA8DIE 66, W8SOP 66, K8ZJU 66, W8GLC 55, W8TZZ 50, W8JYA 45, W8C50 39, WB8DJS 39, W8CW 34, W8IUP 38, W8NCD 33, W8H8G 29, W8IHX 26, W8UFS 24, K8JED 16, W8POZ 16, W8SFW 15, W8S5A 15, W8HJX 14, W8SVM 12, W8IUC 12, W8FXR 11, W8MTD 11, K8DTS 10, K8VLS 10, W8JWA 7, W8WGC 7, W8QBE 6, W8UOQ 6, W8VY 5, WA8WVY 5, W8DCN 5, W8HJF 5, W8JAX 5, W8SDB 5, W8EU 4, W8WVL 4, W8BETU 2, K8HJU 1, W8HKL 1, (Apr.) WB8NCD 22, W8S5A 15, W8DC 12, W8SVM 8.

OHIO: SCM, Hank Greeb, W8CHT/N8XX — Remember, Ohio Interstate QSO Party, Aug. 27 & 28, 1977. Details in Operating Events section, Central OHARES will be displaying amateur radio at the State Fair. Please send information on code and theory classes you plan to sponsor to WB8KO. Net reports (May) Net — Freq. Time(Z) Sess. QNI QTC
BN — 3.577 2245 58 390 199
0200

Net	Time	Sess.	QNI	QTC
OSSBN — 3.9725	1430/2000/2245	93	2480	724
06MN — 50.160	0100	31	276	38
OSN — 3.577	2310	31	184	91
ONN — 3.708	2230	21	84	33
BRFN — 146.46	0100	7	29	6

ONN went on daily sessions, 3.708 MHz, 2230Z effective June 1. Summit/Portage Co. AREC provided communications for American Diabetes Assn. Bike-A-Thon May 1. K8LT and K8LT are members of OSU Radio Club (W8LTH) WA8MAZ is full time employee of Ohio University. K8TUT reports several sporadic E openings on 50 MHz. QCEN, SVOARES, Cinti. FM Club, Cinti. Repeater Assn., Milford ARC, Univ. of Cinti. ARC members cooperated in communications for PETERLOON Boy Scout Jamboree May 20 thru 22. April 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 1977. Bolton Award for 25 years of service work. Medina 2-meter group aided the Medina Steam Show on May 28 & 29. Lima AREC members aided attempted rescue of drowning victim May 30. Central Ohio ARES communicated for the (Bicycle) Tour of the Scioto River Valley, with help from the Scioto Valley Radio Club, W8MJK and W8GCS are new VHF repeaters. Traffic: W8PMJ 323, W8DYL 257, W8WTS 202, W8MCR 186, W8BYV 165, W8LTA 151, W8KKI 148, W8BJGW 141, W8BOMQ 135, W8QZK 125, W8YBJ 125, K8BYK 114, N8CW 111, K8LXA 78, W8SACM 75, W8ACJ 73, W8MRL 68, W8BVL 67, W8AVY 66, N8TM 59, W8BTRK 55,



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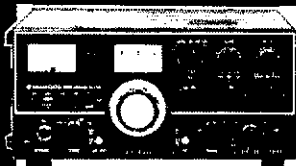
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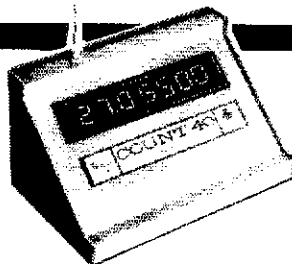
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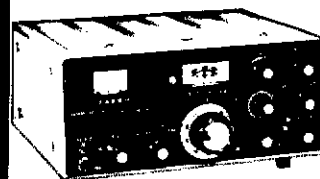
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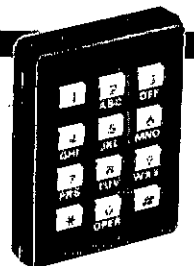
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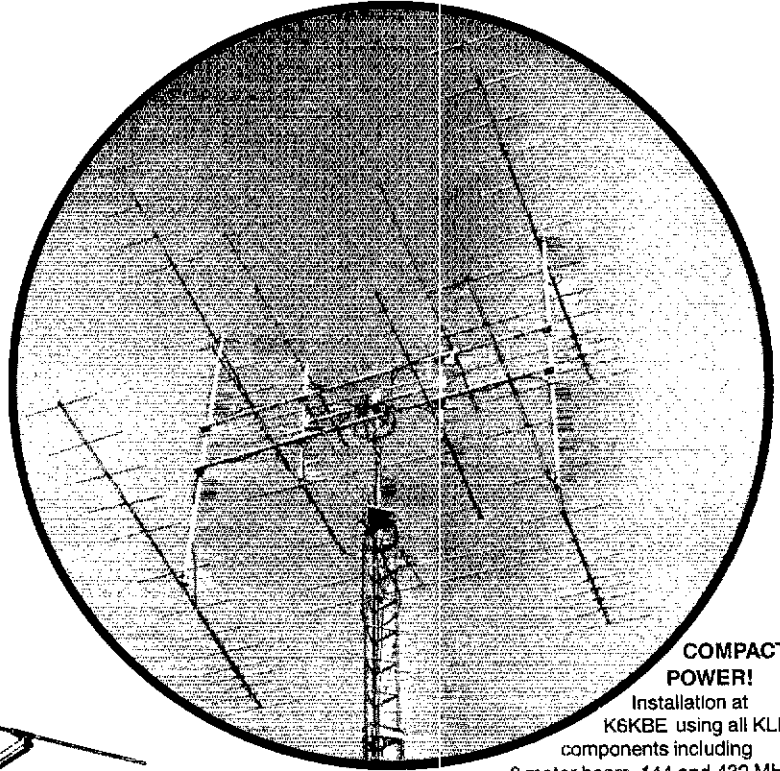
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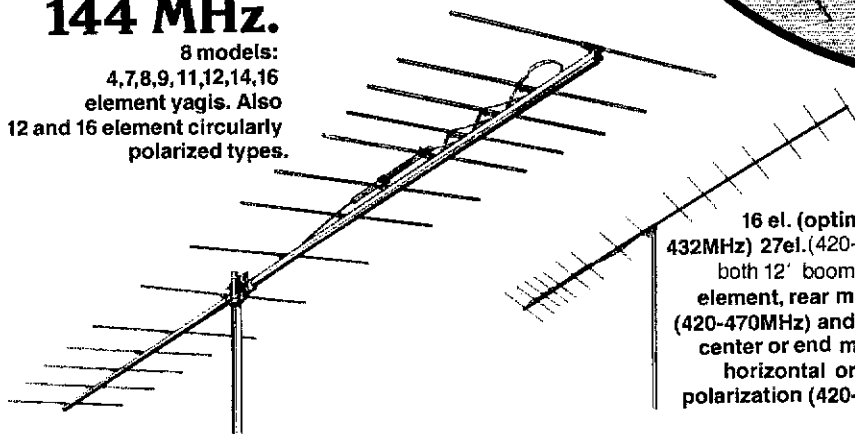


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Installation at K6KBE using all KLM components including 6 meter beam, 144 and 432 MHz arrays, KR-400 and KR-500 rotators.

144 MHz.

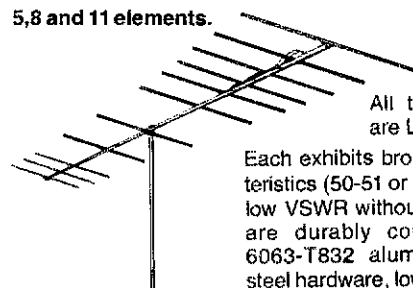
8 models: 4,7,8,9,11,12,14,16 element yagis. Also 12 and 16 element circularly polarized types.



A broad-band antenna to meet every need; each with contest winning gain and flat VSWR across the entire amateur band. For serious moon bounce (EME) and tropho work, "stack" 'em, using available KLM baluns and couplers. Built tough . . . with weather resistant 6063-T832 aluminum . . . stainless steel hardware.

50 MHz. 3 models:

5,8 and 11 elements.



All three antennas are L/P types.

Each exhibits broad band characteristics (50-51 or 50-52 MHz) and low VSWR without tuning. Beams are durably constructed with 6063-T832 aluminum stainless steel hardware, low loss insulation.

70 CM 4 models:

16 el. (optimized for 432MHz) 27el. (420-450MHz) both 12' booms. Also 6 element, rear mountable (420-470MHz) and 14 el. for center or end mounting, horizontal or vertical polarization (420-470MHz)

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STACKING FRAMES.

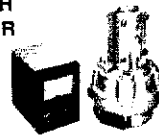
"H" frames suitable for antenna stacking are available on special order. See top photograph for a typical installation.

ELEVATION ROTATOR KR-500



Provides 180° boom rotation. Heavy duty (used on array illustrated). Rotation, 180°/1 min. Motor disc brake holds to 1750 inch/pounds. Holds booms 1.25 to 1.625" D, masts to 1.5-2.5" D. Weather resistant. Attractive direction indicator. 115VAC.

AZIMUTH ROTATOR KR-400



Medium duty, supports 400 lbs. Ideal for long booms, HF tri-banders, used in array shown. Motor disc brake holds to 1750 inch-pounds. Has limit switches. Rotation, 360°/1 min. Accommodates 1.5-2.5" D masts. Direction indicator. 115VAC. 50/60 Hz.

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WB851 52, WR1P 49, WR4LS 48, WR1Q 47, WJ1J 43, WA8COA 41, WA8VWH 38, WA8GPO 31, W8TH 31, WR0E 30, K8DL 27, WRWEG 27, WR8COS 26, WB8PIY 26, W8BKP 25, N8XX 20, W8BHL 19, W8LT 18, WBLZE 17, W88JUN 16, WA8BOV 15, N8JR 14, W8QCU 12, W8DMD 10, W8IM 10, W8VFX 10, W8RQ 9, W8APW 8, W88GGK 8, K8CKY 7, W8BRQJ 7, W8MAZ 7, K8ONA 7, WA8VEC 7, N8AA 6, K8NL 6, W8DPW 6, W88QKN 6, W8T8X 5, W8BI 4, W8BRQQ 4, K8HF 3, K8LT 3, W88BGX 2.

HUDSON DIVISION

EASTERN NEW YORK: SCM, Gary J. Feidinand; W2CS - Asst. SCM; Guy Clinger, K2AY, SEC; W8ZVUK, Asst. SEC; K2AY1Q, PAMs; W82EMU, W82EL, RMs; W82XW K2OY1S (RTTY). I regret to announce that I have resigned as SCM due in part to the pressures of time. My thanks to all who have helped during the past two years. Particularly K2AYG and W8ZVUK and the EC crew who cared enough to volunteer their time expecting nothing in return. ENY boasts the following new appointees: W82COY as OBS (VHF RTTY), W82EMU and WA2UYL as OBS, W82GQJ and W8YJR as OPS. Congrats go to new comers: WA2KN, WA2OJ, WA2OUS, WA2OUB, WA2OQF, W82OUS, W82OUT and to new Advanced Class licensee W82OBI. A returned mixer and Eureka! 50 watts more, reports WA2CJY. An ACCU-memory will be in use at WA2YYM. All are cheered to hear W82DKM back on the hospital. The Clearing House net has a new manager, W82AEK. More call sign changes: W82BKX is now W2XL, W82EKM now N2EF. Many clubs report fantastic plans for Field Day. I'm in next month for the results. Several clubs have asked for a listing of local traffic nets (or covering) ENY. Here's one: (all times are local time)

Net	Freq.	Time
NY Public Operations	3913	8:00 PM*
Empire Slow Speed	3590	6:00 PM*
New York State CW	3677	7 & 10 PM*
Hit and Bounce	7070	8:30 AM
Clearing House	3925	1:00 AM
Mike Farad	3925	1:00 PM
NY State Phone Tlc & Fm	3925	6:00 PM

* denotes National Traffic System Affiliated Net. On the traffic circuit, congrats to W8YJR on his 3rd BPL, P5HR to W8YJR, W82EMU and W2CS. Traffic: (May) W8YJR 564, W82EMU 395, WA2YYM 138, W2CS 120, W82GL 93, WA2UYL 63, W2ACQ 46, WA2CJY 29, W82EKM 23, W8JU 20, K2HNW 17, WA2PAU 17, K2OJA 9, W82GQJ 4, (Apr.) W82BW 39.

NEW YORK CITY - LONG ISLAND: SCM John H. State, W82CHY, Asst. SCM, Earl Malatky, W82WF, SEC; K2HT, RM; W82LZN, PAM; WA2ECO, VHF PAM; W82RGF. The following are traffic nets in and around the section:

Net	kHz	Time/Day	Manager
NLI*	3630	1900/2200	Dy W82LZN
NLI Phone*	3928	1:30 Dy	WA2ECO
NLS*	1800	Dy	WA2BMI
Clear House	3925	1:00 Dy	W1JX
Mic Farad	3925	1:30 M-S	W1DFT
ESS	3590	1800 Dy	K2UIR
NYSTPEN	3925	1800 Dy	WA2RSP

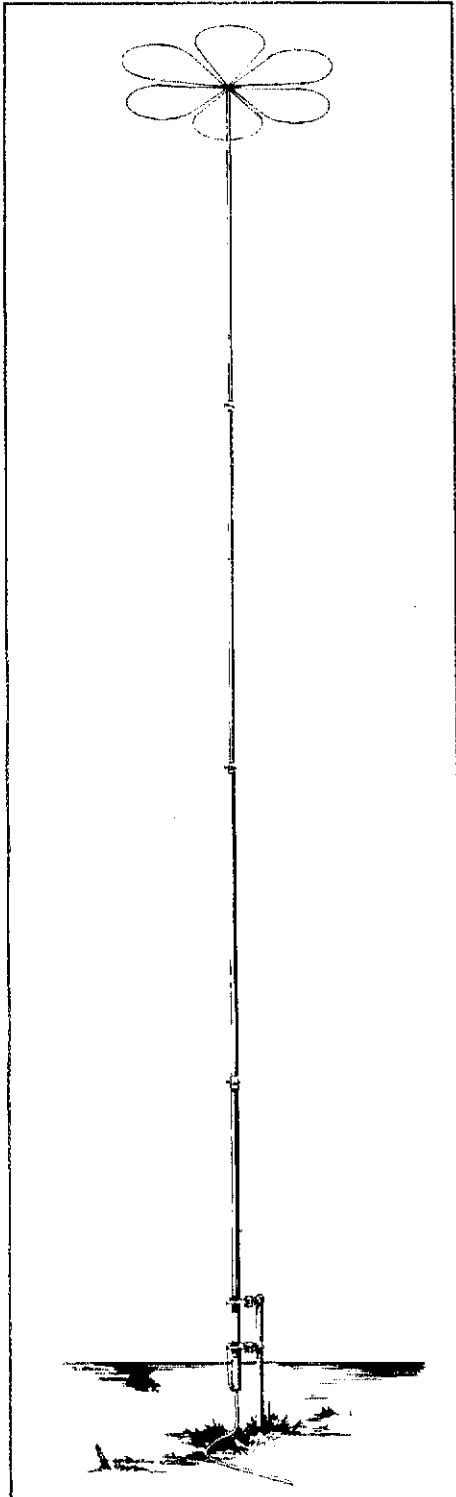
*Denotes Section Net, all times are local. It is with great pleasure and joy that W82CHY announces the birth of his 3rd harmonic, a YL, 10 lbs., 4 yrs., and yes I've been told "That's a big 10-4", and now in accordance with FCC Rules and Regs the harmonic output of this station will be reduced in accordance with good engineering practices and the fact three will be more than sufficient to keep myself and the YL busy for a long time to come. Lots of new calls around nowdays: K2Z7, WA2LX, WA2YX, WA2YYM, N2NT/W82FLF, N2AR/WA2WKH, all the "N" calls have led to a few stations remarking its starting to sound like their running a Navy CW Net. New officers for KLRA are WA2JMY, pres.; WA2BJJ, vice-pres.; WA2NDA, treas.; W82CDQ, secy.; WA2EUB, editor. On May 15 K2RA provided communications for the Brooklyn UJA Federation. Walk-A-Thon stations participating were: WA2RRN, WA2BRF, WA2EUB, WA2JMY, W82FZD, W82IWX, W2HMQ, WA2BMI, has his Advanced, W82IDP and W82IWX passed their General; welcome to new Novice in St. James area W82JAY, W2GKZ was away in CA for most of the month of May, W82ZLN now working the lower end of 2m on cw his first QSO was with W1KZ (ex-W82LDW), Bob will be leaving the section in Aug. to attend school in the Phila. area. W82NLM is now W2NL. Welcome to newly affiliated clubs: Middle Country ARC and the South Queens Boys Club ARC. WA2MXI is back in the NY area after a nice winter in FL. ARC reports that one of their members on the birth of their third harmonic, a boy. Both LIMARC and The Hall of Science had successful Flea Markets. WA2BMI is looking for more stations to check into NLS. W2MCL has a Lafayette HA-146 for 2 mtrs. Welcome to new traffic station W82HIQ in the center Manhattan area. W82BG is home from the hospital, recovering from surgery, we all wish him well. Congrats to W82KIZ who upgraded to Tech. Welcome to the section from W PA, W8RXX and his YL, W82JFA/4 is now settled down in Casselberry FL. Grumman ARC reports that one of their members now has call of N6PF and his location is about 500 miles east of the Philippines. WA2BMI made BPL. Traffic: (May) WA2BMI 422, W82LZN 145, W2HXT 120, W82IWX 104, W2MLC 60, WA2JKG 59, W2GKZ 18, W82HIQ 11, W82BTA 8, K2JFE 4, (Mar.) W2HXT 128.

NORTHERN NEW JERSEY: SCM, Louis J. Amoroso, W2ZZ

Net - Freq.	Time (PM)/Days	Sess.	QNI	QSP
Manager:				
NJN - 3695	7:00 Dy		31	347 111
WB2CST				
NJN - 3695	10:00 Dy		31	181 49
WB2CST				
NJSN - 3730	8:15 Dy			
WA2WIW				
NJPN - 3950	6:00 Dy		31	491 289
WA2SLF				
NJPN - 3950	9:00 A Su		5	78 21
WA2SLF				
PVTN - 145.7	8:00 Dy			

WA2OPIY
SEC: W82VUF, PAMs: WA2SLF and WA2OPY (VHF). RMs: W82CST and WA2WIW, New appt: W2FWY as OBS. Congratulations to W82CST, W82ASD, W82DIW and WA2DSA all making P5HR this month. W82TXL passed the Advanced and W82YXQ passed the General. On behalf of everyone in the section we wish to say a big thank you to

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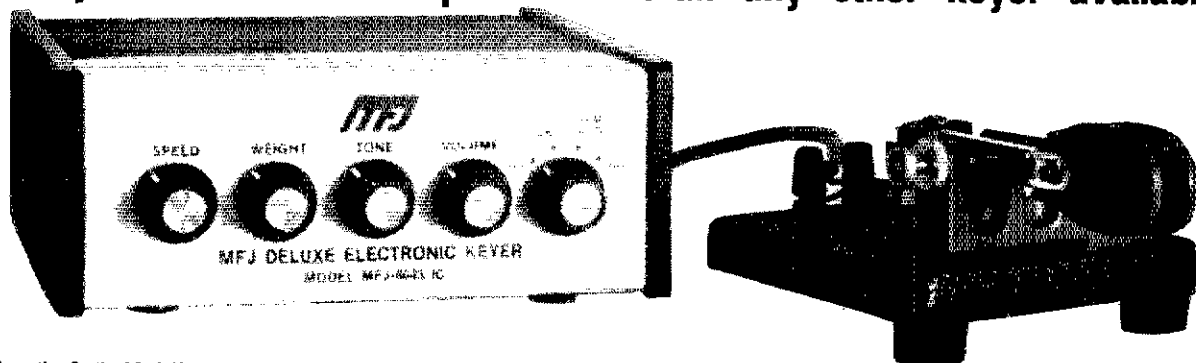


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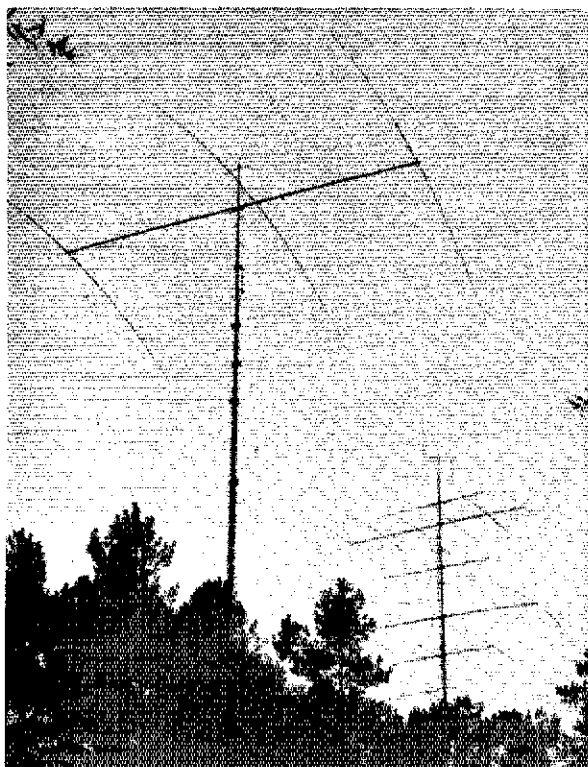
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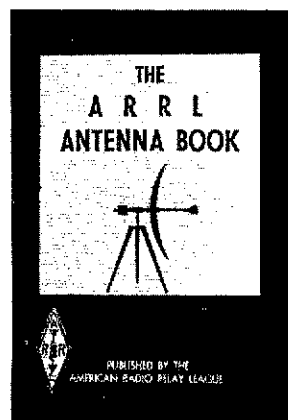
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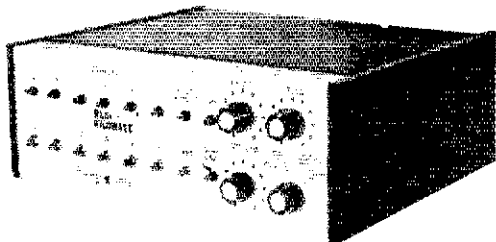
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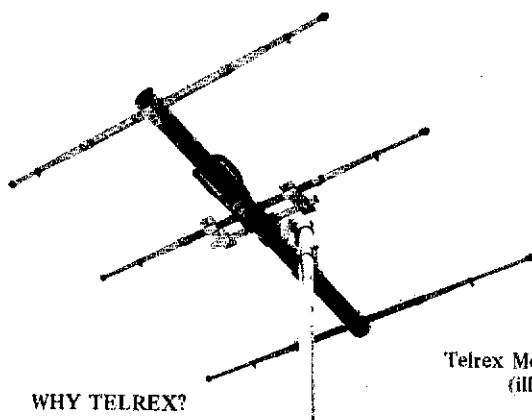
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WB2BPO who has resigned as SEC. It was a great joy and we wish him continued success. Good luck to our new SEC WB2VUF. All ECs please note and be sure to send your reports in if you expect to continue with your appointment. Some call sign changes in the section include WB2JVN now N2SW, WA2DSA is W2SC, WA2DIW is K2SF, WA25LF is W2QC, W2GCT is W2GQ, WA2HLM is N2EA, WB2FVQ is K2NJ, W2AOH is N2CS, W2GKD is N2LT, W2RLM is N2BL, WB2ERM is W2SG, WA2APG is K2RS, WB2MDR is K2MD, WB2YFC is N2LR, and WB2FNZ is W2JD. Good luck to all. I believe W2QC is our youngest two-letter call holder at 15 years of age. The group at WA2NPP reports WB2OQO is the first of six Novices who passed their tickets. This is my last report as your SCM. I would like to thank everyone for their fine cooperation. It was fun. Good luck to all and please give WA2MVQ your cooperation. Traffic: (May) WB2ASD 237, WA2NPP 217, WA2AYY 107, W2SLWE 65, WB2RMK 65, WB2DFO 60, WB2CST 55, W2CJ 38, WA2DIW 38, WB2HSA 41, WB2JRC 27, WB2EP 23, K2ZT 23, W2ZL 15, WA2MVQ 14, W2CC 13, W2VCO 8, W2GD 8, WA2WXM 7, WA2DLZ 6, WA2DSA 6, WA2JQU 5, WA2EMG 4, W2ODY 3, WB2CNF 3, WA2FU 1. (Apr.) WB2RMZ 58, WA2BSU 3. (Mar.) WB2RMK 68.

MIDWEST DIVISION

IOWA: SCM, Max R. Otto, W0LFF - SEC: W0IYW, RM: K0EVH, PAM: VHF: K0LKH, PAM: HF: WB9AVU. Congrats to WB9CQJ on receiving the ARRL Merit Certificate at Sioux City Mini-Convention, and sorry to hear he is moving to TX. Election results: Ft. Dodge ARC, WB0JOT, pres.; WA0OWE, vice-pres.; W0ZNT, secy.; WB0TKJ, treas. Sooland Repeater Assn., WB0SF 2, pres.; K0FTT, vice-pres.; WA0ANC, secy.; WB0MAG, pres.; WA0R, secy.; WB0TEM WB0QFR, board members. W0Y0Y recovering from May 2 heart attack. WB0MMT and WA0VUY organized communications for Linn County bike ride. Cedar Rapids has twenty 220 rigs operating due to efforts of K0VQM, "Amsat Users" Net on Mon. at 9 P.M. 145-150 with W0RWC NCS. Congrats to WB0SSV and WB0TCR for Advanced, and to WB0ZXU, WB0VNR, WB0QFG and WB0SFY for General. New Novices: W0DCCGK, Bedford, W00BAW Mt. Avr. Thanks to K0GP's help Humbolt has W00BEC W00BBD W00BK1 W00BPO W00BPP W00BPQ W00BPR and W0YKJ in Vincent. TLCN had a banner month. Boone repeater is on 25/85. New calls: K0FLY is W0FO and W0DAG is K0YL, 100% of Novice. W0MAY at Mt. Avr. received a license. Congrats to all and to the instructors. WB0CQD moving to SD. With thirty one involved, WBW reports 2M FM worked well during Ft. Dodge tornado. Don't forget Ham & Computerfest at Des Moines Aug. 20 and 21, and the Iowa 75M picnic at Marshalltown Aug. 28. Iowa 5M net, 1730Z, QNI 1660, QTC 160, 230Z, QNI 1, 100Z, QTC 107, QNI 1660, QNI 454, QTC 130, sess. 61. Traffic: WA0AUX 714, K0EVH 181, W0SS 132, W0YLS 102, WB0PY 58, WB0KHO 46, WB0JYF 45, W0LFF 18, W0IKT 16, WB0NS5 4, WB0KHO 3.

KANSAS: SCM, Robert M. Summers, K0BXF - SEC: W0KYL, PAMS: WA0SEV, WB0BCL, RM: W0FT/K0MRI. The Hiawatha Club recently welcomed WB6AEP into the club. He will be applying for a 9 call and be an active KANSAN on the air. Tx to W0PPB for the report. WA0TRO trying for the ARRL 600 pt. club on 8 meter. He really escaped the six meter band alive in N. Central KS. Many tx to the guys for the rep to TEN - W0FT WB0OBH WB0HBM W0HI WA2VEN WB0LKA W0RFF W0AM N0IN K0UR K5KPS and W0IX. These stations and others who tend to liaison functions should feel real proud of the Public Service effort you make. For those who would like to know more about net liaison functions - call with RM W0FT at Selden. Net reports for May '77. QKS QNI 431, QTC 183. K5 WX Net QNI 663, QTC 278, several extra hours of weather watch but no disaster reports. QKS-SS QNI 80, QTC 43 in 23 sessions. W0RFF has given up the managership of QKS-SS and new mgr. will be WB0VZ. As of the report, no new plans of time shift etc. Look for the net daily 6:30 PM 3735 kHz more or less. If you are interested in helping get in touch with Don at 1014 Pine Ridge - Wichita, KS. W0KYL says the ARS standing membership is at 789 only 5 ECs reporting this month. W0FT K0RXT K0GQK WB0JUX and W0TLG. Will hope to have Quarterly report on the Mid States Mobile Monitor Watch next month. Traffic: (May) W0FIR 172, WA2VEN 128, W0RFF 96, W0CXJ 88, K0BXF 84, W0OYH 74, W0AM 72, W0FT 72, WA0LBB 71, WB0VEZ 51, W0IX 62, W0HI 56, WB0LKA 44, N0IN 39, WB0MEO 32, WB0GPC 32, WB0BY 20, W0RT 17, W0FDJ 16, WB0HGS 14, WB0KDE 14, W0RBO 14, W0KYL 7, W0PPB 7, WA0TRO 2. (Apr.) W0KYL 5.

MISSOURI: SCM, L. G. Wilson, K0RWL - Asst. SCM: Joe Flowers, W0OTF. SEC: WB0FKY. On May 4, 1977, a series of devastating tornadoes struck west-central Missouri inflicting damages estimated from 25 to 32 million dollars. The tornadoes caused or were the direct cause of four deaths and hundreds of injuries in three communities brunt of the storms: Pleasant Hill, Higginsville and Sedalia. Early action by amateurs in the Sedalia area may be responsible for the total of no deaths and only 47 minor injuries. Again amateurs from all over MO and area radio clubs responded quickly and efficiently to the disaster. All those amateurs and clubs should be highly commended for an outstanding report. Congratulations to WA0TXV upon passing his Extra Class. Information has it W0RDR is now N0DX and WA0FMD is sporting K0BM.
Net QNI QTC Net QNI QTC
MON 143 72 MON2 110 47
MSN 84 32 MOSSN 261 286
SCEN 86 17
K0ONK now has a brand new Triton IV operational. WA0ITU reports very good 6-meter openings during the month of May. WECOMO ARC of Lee's Summit assisted the City Police in a search and investigation involving a Kansas City woman believes to have met with foul play. Traffic: (May) K0ONK 686, WB0FND 178, W0NUJ 144, W0RDR 144, WB0MEO 117, W0QUD 117, W0EPI 99, WB0NXX 74, K0RWL 51, W0QD 45, WA0FKD 36, W0EEE 35, W0SSB 35, W0BVL 32, K0SSN 31, WA0QAU 26, K0BM 26, W0BLEY 34, WB0FKY 17, WA0MFO 15, WB0VHN 5, K0AHL 2.

NEBRASKA: SCM, Claire Richard Dvas, W0JCP - K0LYO is a Silent Key. W0GFG nominated for QCWA board of directors. Several repeaters were activated during the month on weather watches. They provide valuable information to proper authorities. Lincoln ARC participated in recent CD emergency test exercise. WB0SYV interested in starting a CW Tlc Net for NE area. Interested stations should contact him. Net reports. QCWA, QNI 55; Western Neb. Net, QNI

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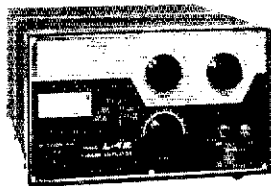
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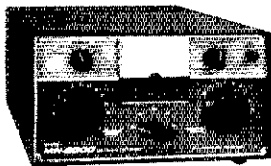
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DRAKE TX T-4XC \$599.
RX R4C \$599 160 thru 10M



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L-4B 80 thru 10M \$895.



DRAKE MN-2000
Matching Network \$240.

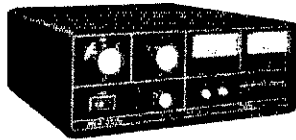


DRAKE W-4
Wattmeter
\$72.

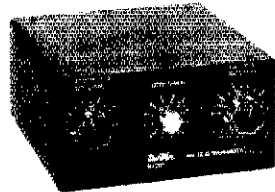
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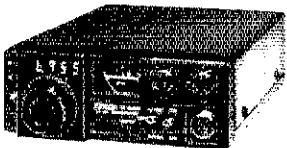


DENTRON 160-10 AT
Super Tuner \$129.50.

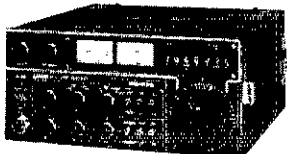
ICOM



ICOM Transceiver 2M FM
IC 22S \$299.

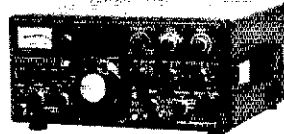


ICOM Transceiver 2M FM
IC 245 \$499.

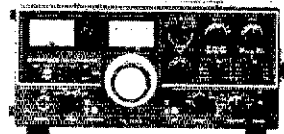


ICOM Transceiver 2M FM SSB
IC 211 \$749.

KENWOOD



KENWOOD Transceiver
TS-820S 160 thru 10M \$1048.



KENWOOD Transceiver TS-520S
160 thru 10M \$649.



KENWOOD
TX T-599D \$499.
RX R-599D \$499.



KENWOOD FM/SSB
TS-700A \$599.



KENWOOD FM/SSB
TS-600 \$659.



KENWOOD 2M FM TR-7400A \$399.

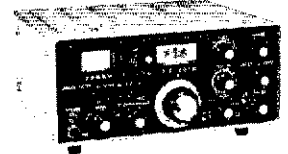


KENWOOD TR7500 2M FM
Brand new...price to be announced.

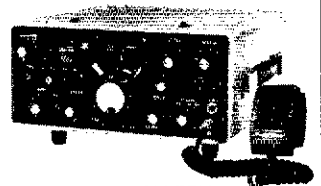


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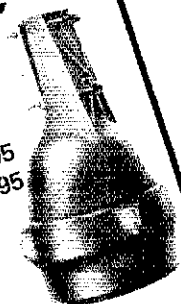


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ATLAS DMK Mobile mount \$ 29	DC-3 DC supply 75	HWA-202-1 AC supply 29
DD-5B Digital display 159	DC-4 DC supply 95	HW-2021 2m HT/TT 189
AUTOK Q-Box Filter \$ 9	ML-2 2m FM Xcvr 139	ITC Multi-2000 2m Xcvr \$399
BRIMSTONE 144 2m FM Xcvr \$375	TR-22C 2m FM Xcvr 169	ICOM IC-21A 2m FM Xcvr \$199
CLEGG/SQUIRES-SANDERS 22'er 2m AM Xcvr \$ 89	AA-22 2m amp/preamp 99	DV-21 Digital VFO 189
66'er 6m AM Xcvr 89	BYCOMM 500D 2m FM amp \$ 49	IC-230 2m synth Xcvr 289
Thor 6 m linear (RF) 59	GLB 400B Channelizer \$119	IC-3PA AC supply 59
417 AC supply/mod 59	GALAXY/GLOBE/WRL Galaxy V Xcvr \$189	IC-502 6m SSB Xcvr 189
418 DC supply/mod 35	Galaxy V Mk II Xcvr 229	IC-3PS AC supply 29
Zeus VHF Xmtr 249	Galaxy V Mk III Xcvr 229	JOHNSON 6N2 VHF transmitter \$ 79
Interceptor VHF Rcvr 169	AC-35 AC supply 69	KLM Echo II 2m SSB Xcvr \$249
Interceptor B VHF Rcvr 219	AC-400 AC supply 75	Multi-2000A 2m Xcvr 450
SS Booster 49	RV-1 Remote VFO 59	KENWOOD R-599 Ham Rcvr \$249
FM-27B 2m FM Xcvr 259	RV-550 Remote VFO 69	R-599D Ham Rcvr 379
COLLINS 75A-3 Ham Rcvr \$249	SC-35 Speaker 12	S-599 Speaker 12
75A-4 Ham Rcvr 4424	DAC-35 Deluxe console 69	T-599D Transmitter 379
75S-1 Ham Rcvr 325	G-100D DC supply 89	TS-520 Xcvr 499
75S-3 Ham Rcvr 495	AC-384 Economy AC ps 29	TV-502 2m Xcvt 189
75S-3B Ham Rcvr 795	DC-384 Economy DC ps 29	TS-520 Xcvt 499
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75S-3C Rcvr (round) 1295	R-153D Rcvr (H-Gain) 895	LINEAR SYSTEMS Adcom 250 AC supply \$ 29
75S-3D Rcvr (round) 795	GENAVE Ham-Pak \$ 19	350-12 DC supply 49
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32S-3A Xmtr (round) 1195	GTX-600 6m FM Xcvt 149	NATIONAL NCX-5 Xcvt \$279
30L-1 Linear 495	GONSET Comin IIB 2m Xcvt \$ 49	NCXA AC supply 89
30S-1 Linear 995	Comin III 2m Xcvt 69	PEARCE SIMPSON Gladding 25 2m FM ps \$129
Fla. store pick up	Comin III 6m Xcvt 69	RADIO INDUSTRIES Ludonboomer Mk II \$189
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312B-4 Station control 199	Comin IV 6m Xcvt 89	REGENCY HR-2 2m FM Xcvt \$139
KWM-2 Xcvt 595	GC-105 2m Xcvt 89	HR-2A 2m FM Xcvt 149
KWM-2/Waters rej tng 619	G-50 6m Xcvt 129	HR-2B 2m FM Xcvt 159
KWM-2/blanker 695	910A 6m SSB Xcvt 189	HR-212 2m FM Xcvt 169
KWM-2 Xcvt (round) 1195	911A AC supply 39	HR-2MS 2m FM Xcvt 179
KWM-2A Xcvt (round) 1295	HALLICRAFTERS SA-110 SW Rcvr \$ 89	HR-6 6m FM Xcvt 129
136B-2 Blanker 100	HT-44 Transmitter 159	P-109 AC supply 29
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351D-2 KWM-2 mount 75	PS-150-120 AC ps 75	80 SSTV camera 239
518F-2 AC supply 149	PS-150-12 DC ps 49	70A SSTV monitor 269
518E-1 KWM-1 DC PS 75	MR-150 Rack mt 15	80A SSTV camera 259
MP-1 DC supply 119	SR-400 Xcvt 429	60 SSTV unit 175
PM-2 Portable AC ps 95	SR-400C Cy II 475	61 Fast scan monitor 289
GC-2 Carrying case 49	P-500AC AC ps 75	SB-33 Xcvt \$159
SM-3 Microphone 75	P-500DC DC ps 75	SB-34 80-15m Xcvt 239
MM-1 Mobile mic 30	FPM-300 Xcvt 549	SB2-LA Linear 175
COMCRAFT CST-50 VHF FM Xcvt \$499	SR-2000 Xcvt/AC ps 495	SB2-CW Cadaptor 29
CPS-6 AC supply 89	P-26 AC supply 45	SB2 MIC Microphone 3
DENTRON 160-XV 160m Xcvt \$139	HAMMARLUND HQ-100 SW Rcvr \$ 99	SB-144 2m FM Xcvt 149
80-10AT Wire tuner 39	HQ-145A SW Rcvr 189	STANDARD 826M 2m FM Xcvt \$149
DRAKE 2A Ham Rcvr \$149	HQ-170C Ham Rcvr 149	Horizon II 2m FM 169
2B Ham Rcvr 179	HQ-170A/VHF Rcvr 259	TCU Control unit \$ 59
2BQ Spkr/Q-mult 25	HQ-18D SW Rcvr 259	SW-12 DC supply 59
2C Ham Rcvr 189	HQ-180AC SW Rcvr 369	400 Xcvt/410 VFO 229
2CS Speaker 15	S-100 Speaker 9	MB-80A 80m Xcvt 229
R-4 Ham Rcvr 269	HEATHKIT HR-78 SW Rcvr \$ 99	270 Cygnet Xcvt 329
R-4B Ham Rcvr 339	HR-10B Ham Rcvr 69	300B/SS16B Xcvt 419
R-4C Ham Rcvr 449	SB-300 Ham Rcvr 199	14A DC converter 39
4NB Noise blanker 49	SB-301 Ham Rcvr 229	350 Xcvt 269
MS-4 Speaker 15	SBA-300-3 6m conv 29	500 Xcvt 309
SW-4 SWL Rcvr 199	SBA-300-4 2m conv 29	500C Xcvt 349
SW-4A SWL Rcvr 225	SB-313 SWL Rcvr 249	500CX Xcvt 369
SSR-1 SW Rcvr 249	SB-600 Speaker 15	70DCX Xcvt 459
SPR-4 Rcvr/cal/nb 379	SB-634 Console 169	117C AC supply 69
SG-6 6m conv 59	SB-400 Transmitter 225	512 DC supply 69
CPS-1 Conv ps 12	HWA-7-1 AC supply 15	117XC AC supply/spkr 95
TR-3 Xcvt 299	HW-22A 20m Xcvt 85	14X DC module 39
RV-3 Remote VFO 59	SB-100 Xcvt 299	14C DC module 49
TR-4 Xcvt 389	SB-101 Xcvt 329	
TR-4C Xcvt 449	SB-102 Xcvt 369	
RV-4C Remote VFO 79	HP-13 DC supply 45	
TR-6/NB 6m Xcvt 599	HP-13B DC supply 54	
2NT Transmitter 99	HP-23 AC supply 45	
	HP-23A AC supply 49	

117X AC supply 65	TPL 502B 2m amplifier \$109	VARITRONICS FOFM-2A 2m FM Xcvt \$ 69
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ICAF Audio filter 24	FMP 2m FM Xcvt 99	FRDX-400SD Ham Rcvr 319
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250C 6m Xcvt 339	210 AC supply 19	FL-101 Transmitter 449
Mark 6B 6m Linear 495	405 Linear 119	FL-2100B Linear 349
TV-2 2m Xcvt 6m IF 189	Triton I Xcvt 369	FTV-650B 6m Xcvt 129
FM-2X 2m FM Xcvt 149	Triton II Xcvt 419	200R 2m synth Xcvt 239
FM-1210A 2m FM, ps 159	KR-40 Keyer 75	6-4-77
VX-1 VOX 19		
VX-2 VOX 29		
FP-1 Phone patch 44		

The following are NEW Close-outs, Overstock merchandise, New displays, Demos, etc. Most are factory-sealed, all carry New warranties. Limited quantity. First come, first served. Most Close-outs available at Milwaukee only. Terms of sale: Payment in full with order, Mastercharge, or BankAmericard (Visa); no trades.

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ICOM reg. NOW \$299 199		600T 80-10m Xmtr 649 349
IC-60 6m FM Xcvt \$299 199		600T USED* 649 298
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467, QTC 13; Sandhills Wx net, QNI 252, QTC 11; PM report, QNI 264, QTC 209; AREC, QNI 205, QTC 4; Nabr. Morning Net, QNI 330, QTC 7; Cornhusker Net, QNI 1364, QTC 69; Nabr. Storm net, QNI 860, QTC 103. Traffic: WOFQB 775, WOVEA 117, W0MMW 93, WA0CBJ 34, W0F0W 31, W0H0P 30, W0HTA 25, W0JWQ 22, WA0PCC 19, WA0QX 17, K0T0H 14, K0D0W 10, W0JCP 10, WA0DX 9, WA0CY 9, WA0SFA 9, W0SFA 9, W0SFA 6, WA0GHZ 5, W0B0GM 4, W0WIKP 4, W0JDUJ 2, W0XB 2, K0US 2, W0YFR 2, WA0EET 2, W0NK 1.

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 CN — 3640 1900/2200 Dy 62 261 293
 CPN — 3965 1800 MS 31 403 154
 1000 Su

VHF-2 28/88 2130 Dy 31
 High QNI: CN — W1EWF W1KV & W1RXA, CPN — W1HJ W1NQ & W1WGP, SEC W1XX moved to new QTH and available on Nets — busy (as usual) at LO Meeting. Director, OTC & Club members at another successful LO Meeting. Appointees & Clubs should make this a "must" each year! ICRC Bulletin has new name, "Time Out," an excellent Repeater Journal. Tri-City Annual Dinner Meeting, an evening of elegance with friends, held at Groton Holiday Inn. Stamford ARA had very interesting talk by K1POK on Oscar Satellites; also held a Flea Market with innovations. Shoreline ARC new officers: WA1OTB, pres.; WA1POK, 1st vice-pres.; WA1KPD, 2nd vice-pres.; WA1VDY, secy.; WA1CPB, treas.; W1EY, Chaplain; WA1WOM, Master/Arms; elected at Annual Meeting including Ham of The Year Award to WA1CPB! Traffic Nets need traffic, Net Control Stations and willing members — please extol your club members to an active part in the worthwhile phase of amateur radio. WIBDN participated as operator at NAM in Norfolk this year. KITN (ex-WA1STN) transferred within ARRL to the Tech. Dept. Congratulations to: W1RMR for Extra Class; WA1UWR Advanced; and WA1AK Generally. Very sorry to have missed the time LO Meeting this year (for the first time) will do better next year! Now is the time for Flea Markets, Auctions and Picnics — have fun! Traffic: WA1VGP 370, K1GF 259, WA1URA 156, K1XA 100, W1GVT 35, WA1TXM 26, K1DPS 18, W1KV 16, WIBDN 15, WA1UR 15, W1AW 14, WA1UWR 6, W1CUH 5, W1QV 5, W1BDI 4, W1VS 4.

EASTERN MASSACHUSETTS: SCM, Frank Baker, W1ALP — SEC: W1A0G received reports from ECS: WA1RTR WA1ZLO; W1s BAB BHD XA (H FJ); K1s NFV PAD FMM. EMRI had 643 QNIs, 353 QTC. FRIPRN had 413 QNIs, 234 QTC. K1FN had 414 PSHR in Apr. WNIW in the Navy. K1GS has old call back, N1J5 is ex-W1NXY. W1EHT a Silent Key. W1LD moving to AZ. W1U0H will be in NH 5 months, 7 in FL. New club, WB1CSP, QTE Lab. ARC in Waltham, WA1YX is Mgr. of EASN. W1NF will sked W1MZ/JMM, ex-WA1ZAK, 1 & 2. The following helped WA1XA in a Walk-A-Tion in Franklin, MA: W1JRP, PC, W1A0Z, TKD, QOB, ZGQ, W1K, W1EGV W1SSA, WA1SCI & WA1YBL going to Univ. of Mass. in Sept. WB1CTH new in Wareham, trained by K1OBL who has an invented "V" for 75. W1DA qualified for WAZ on 40 cw no. 2. WA1VKB new OPS. WA1ZLO new EC for Wellesley. K1FMM WA1QEK endorsed as ECS. WA1OAM has 140 watt linear. For 2. KITN writes that the Foxboro Co. is full time in service classes. WA1ZQT on code and on theory. New calls: WB1s DJM DJQ DUP. W1B1AR is secy. of Hingham ARC and has Drake Twins into a long wire. New officers of Charles River Wireless Soc.: K1HRV, pres.; W1LFL, vice-pres.; WA1IEB, secy.; WA1URV, treas.; WA1YWK, new OPS. Wellesley Amateur RS held "Minty Field Day" at Wellesley College. WA1VKB on 30. WA1VQR now Extra. W1IDA leaving for AZ. W1FJI says Westport EOC moving to new police station. K1PNB says code practice sent Mon.-Wed. 0230 on 3695 at 7-10-13, bulletins sent 0125 same nights. Framingham RC have a new meeting place, Park Haven Hotel, Franklin, on 3rd St. nite at 7:30. W1B2CHO from ARRL spoke at the Middlesex ARC, also WA1IDA spoke about the Chelsea Fire. WA1WIS has his Tech. CD Director in Newton. W1HIQ spoke about uses of a Volt-Ohm Meter at the Massasoit ARA. W1GBE, Raytheon Club in Sudbury still holding classes, says WA1HMS, E1BM has 146 QNI, 69 Watts. More new calls: K1R was W1ALP. W1TC was K1UMP. W1XA was WA1EFR. Whitman has a repeater on 2. WB2IVG & WB2ICV are getting married. NEEPN had QNI 74, QTC 18. Traffic: (May) WA1TEH 366, WA1VEI 330, WA2VMG 328, WA1UWF 298, K1PAD 200, K1BA 160, W1PEX 147, WA1VKB 131, WA1ZAZ 30, WA1EY 24, K1GN 124, WA1QWG 06, WA1VQR 103, WA1RVZ 77, W1MX 67, WA1YWK 64, WA1UNC 60, W1DMS 56, W1DMH 55, W1FJI 50, K1RAW 28, W1AKL 13, W1OAM 10, WA1PGY 10, WA1FE 9, K1LCQ 9, WA1QAJ 7, K1TKI 2, N1EE 1. (Apr.) K1PNB 169, WA1YUJ 29.

MAINE: SCM, Bill Mann, WA1FCM — SEC: K1EF/ WA1YUZ. New OO: W1HWL. Fine Auction/Banquet put on by Portland AWA. W1GCM sending OB Tues. 20:30 on 1070 rptr; also a new net activity on the rptr. SEC, SCM and EC K1JEP met with state CEP to discuss emerg. comms. State emerg. comms. plan being written. FCC tests in Presque Isle very successful. In Rockland area 7 new Novices expected through efforts of W1FVJ. Several clubs seeing positive results of Novice classes with many new hams in their areas. Lewiston area hams supplied comms. for Mon. Day parade. OTC and EC RACES/ARES Net on 3993 at 0915 Sun. Coming event: St. Andrews Hamfest 77, Sept. 2-3-4. PTN sess. 31, QTC 207, QNI 267, SGN sess. 26, QTC 97, QNI 1091. BYN sess. 26, QTC 35, QNI 943. Traffic: WA1FCM 312, WA2ERT71 204, W1ERW 139, W1RWG 116, K1EF 95, W1KYQ 66, W1HDC 60, WA1JHT 38, K1TZH 37, WA1RQ 23, WA1QFX 12, W1CEV 9, W1AUMX 7, W1SO 6, W1MZA 6.

NEW HAMPSHIRE: SCM, Robert C. Mitchell, W1SWX/W1NH — SEC: K1RSC, RM: WA1CEJ/ N1NH. New appointments: W1TN as OIS, OPS & OBS; K1RR as OO. Endorsements: K1SHR as OBS & OIS. Don't forget the ARRL convention in Hartford

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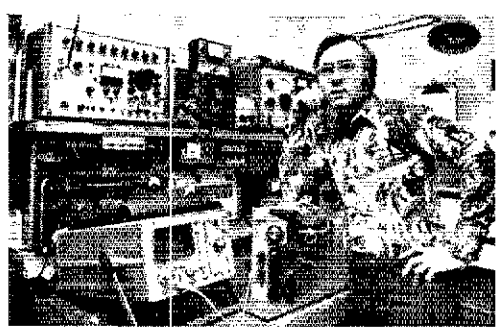
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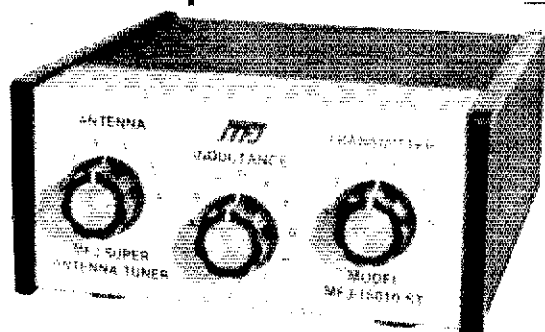
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2N4361	2N4132	2N4101	2N4101	LMC4010
2N4362	2N4133	2N4102	2N4102	LMC4011
2N4363	2N4134	2N4103	2N4103	LMC4012
2N4364	2N4135	2N4104	2N4104	LMC4013
2N4365	2N4136	2N4105	2N4105	LMC4014
2N4366	2N4137	2N4106	2N4106	LMC4015
2N4367	2N4138	2N4107	2N4107	LMC4016
2N4368	2N4139	2N4108	2N4108	LMC4017
2N4369	2N4140	2N4109	2N4109	LMC4018
2N4370	2N4141	2N4110	2N4110	LMC4019
2N4371	2N4142	2N4111	2N4111	LMC4020
2N4372	2N4143	2N4112	2N4112	LMC4021
2N4373	2N4144	2N4113	2N4113	LMC4022
2N4374	2N4145	2N4114	2N4114	LMC4023
2N4375	2N4146	2N4115	2N4115	LMC4024
2N4376	2N4147	2N4116	2N4116	LMC4025
2N4377	2N4148	2N4117	2N4117	LMC4026
2N4378	2N4149	2N4118	2N4118	LMC4027
2N4379	2N4150	2N4119	2N4119	LMC4028
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2N4381	2N4152	2N4121	2N4121	LMC4030
2N4382	2N4153	2N4122	2N4122	LMC4031
2N4383	2N4154	2N4123	2N4123	LMC4032
2N4384	2N4155	2N4124	2N4124	LMC4033
2N4385	2N4156	2N4125	2N4125	LMC4034
2N4386	2N4157	2N4126	2N4126	LMC4035
2N4387	2N4158	2N4127	2N4127	LMC4036
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2N4421	2N4192	2N4161	2N4161	LMC4070
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2N4459	2N4230	2N4199	2N4199	LMC4108
2N4460	2N4231	2N4200	2N4200	LMC4109
2N4461	2N4232	2N4201	2N4201	LMC4110
2N4462	2N4233	2N4202	2N4202	LMC4111
2N4463	2N4234	2N4203	2N4203	LMC4112
2N4464	2N4235	2N4204	2N4204	LMC4113
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2N4473	2N4244	2N4213	2N4213	LMC4122
2N4474	2N4245	2N4214	2N4214	LMC4123
2N4475	2N4246	2N4215	2N4215	LMC4124
2N4476	2N4247	2N4216	2N4216	LMC4125
2N4477	2N4248	2N4217	2N4217	LMC4126
2N4478	2N4249	2N4218	2N4218	LMC4127
2N4479	2N4250	2N4219	2N4219	LMC4128
2N4480	2N4251	2N4220	2N4220	LMC4129
2N4481	2N4252	2N4221	2N4221	LMC4130
2N4482	2N4253	2N4222	2N4222	LMC4131
2N4483	2N4254	2N4223	2N4223	LMC4132
2N4484	2N4255	2N4224	2N4224	LMC4133
2N4485	2N4256	2N4225	2N4225	LMC4134
2N4486	2N4257	2N4226	2N4226	LMC4135
2N4487	2N4258	2N4227	2N4227	LMC4136
2N4488	2N4259	2N4228	2N4228	LMC4137
2N4489	2N4260	2N4229	2N4229	LMC4138
2N4490	2N4261	2N4230	2N4230	LMC4139

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TAKE ADVANTAGE OF THIS NEW STATE-OF-THE-ART COUNTER FEATURING THE MANY BENEFITS OF CUSTOM LSI CIRCUITRY. THIS NEW TECHNOLOGY APPROACH TO INSTRUMENTATION YIELDS ENHANCED PERFORMANCE, SMALLER PHYSICAL SIZE, DRASTICALLY REDUCED POWER CONSUMPTION (PORTABLE BATTERY OPERATION IS NOW PRACTICAL), DEPENDABILITY, EASY ASSEMBLY AND REVOLUTIONARY LOWER PRICING!

SIZE:
3" High
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5 1/2" Deep

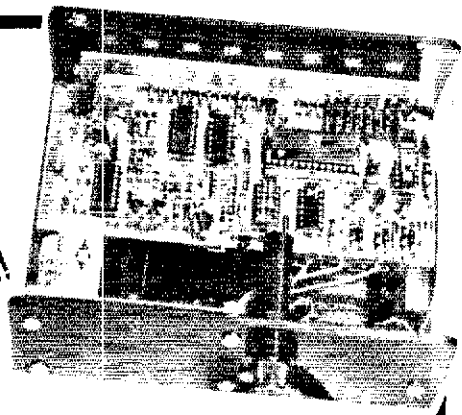
1 1/4 LBS.
COLOR:
BLACK



FACTORY DIRECT PRICES

- KIT #FC-50C 80 MHZ COUNTER WITH CABINET & P.S. \$99.85
- KIT #PSL-350 350 MHZ PRESCALER (NOT SHOWN) 23.95
- KIT #PSL-650 650 MHZ PRESCALER (NOT SHOWN) 29.95
- MODEL #FC-50WT 80 MHZ COUNTER WIRED, TESTED & CAL 165.95
- MODEL #FC-50/600WT 600 MHZ COUNTER WIRED, TESTED & CAL 199.95

KIT #FC-50C IS COMPLETE WITH PREDRILLED CHASSIS ALL HARDWARE AND STEP-BY-STEP INSTRUCTIONS. WIRED & TESTED UNITS ARE CALIBRATED AND GUARANTEED. PRESCALERS WILL FIT INSIDE COUNTER CABINET.



4" DIGITS!

FEATURES AND SPECIFICATIONS:

DISPLAY: 8 RED LED DIGITS .4" CHARACTER HEIGHT
GATE TIMES: 1 SECOND AND 1/10 SECOND [AUTO DEC. PLACEMENT]
RESOLUTION: 1 HZ AT 1 SECOND, 10 HZ AT 1/10 SECOND.
FREQUENCY RANGE: 10 HZ TO 80MHZ. (65 MHZ TYPICAL).
SENSITIVITY: 10 MV RMS TO 50 MHZ, 20 MV RMS TO 60 MHZ TYP.
INPUT IMPEDANCE: 1 MEGOHM AND 20 PF
[DIODE PROTECTED INPUT FOR OVER VOLTAGE PROTECTION.]
ACCURACY: ± 1 PPM ($\pm .0001$) AFTER CALIBRATION TYPICAL.
STABILITY: WITHIN 1 PPM PER HOUR AFTER WARM UP ($\pm .001$ XTAL)
IC PACKAGE COUNT: 8 (ALL SOCKETED)
INTERNAL POWER SUPPLY: 5.2 V DC AT 800 MA REGULATED.
INPUT POWER REQUIRED: 8-12 VDC OR 115 VAC AT 50/60 HZ.
POWER CONSUMPTION: 4 WATTS
INPUT CONNECTOR: BNC TYPE

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Great for Clocks or any LED Digital project. Clear-Red Chassis serves as Bezel to increase contrast of digital displays.

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SEE THE WORKS Clock Kit

Clear Plexiglas Stand

- 68 Big 4" digits
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- Plug transformer
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Kit #850-4 CP
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Will alternate time (8 seconds) and date (2 seconds) or may be wired for time or date display only, with other functions on demand. Has built-in oscillator for battery back-up. A loud 24 hour alarm with a repeatable 10 minute snooze alarm, alarm set & timer set indicators. Includes 110 VAC/60Hz power pack with cord and top quality components through-out.

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KITS ARE COMPLETE (LESS CABINET)
ALL 7001 KITS FIT CABINET AND ACCEPT QUARTZ CRYSTAL TIME BASE KIT # TB 1

PRINTED CIRCUIT BOARDS for CT-7001 Kits sold separately with assembly info. PC Boards are drilled Fiberglass solder plated and screened with component layout

Specify for 7001
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A complete Kit (less Cabinet) featuring: 8 - 5 1/2" digits, MM5314 IC 12/24 Hr. time, PC Boards, Transformer, Line Cord, Switches and all Parts. Ideal Fit in Cabinet II

Kit #5314-5 \$19.95 2/38.

JUMBO DIGIT CONVERSION KIT \$9.95 ea.

Convert small digit LED clock to large 5" displays. Kit includes 6 - LED's, Multiplex PC Board & Hook up info Kit #JD-1CC For Common Cathode Kit #JD-1CA For Common Anode

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AN EASY TO ASSEMBLE AND EASY TO INSTALL ALARM PROVIDING MANY FEATURES NOT NORMALLY FOUND IN THESE ALARMS HAS PROVISION FOR POS & GROUNDING SWITCHES OR SENSORS WILL PULSE HORN RELAY AT 1/2 Hz RATE OR DRIVE SIREN. KIT PROVIDES PROGRAMMABLE TIME DELAYS FOR EXIT ENTRY & ALARM PERIOD UNIT MOUNTS UNDER DASH - REMOTE SWITCH CAN BE MOUNTED WHERE DESIRED. CMOS RELIABILITY RESISTS FALSE ALARMS & PROVIDES FOR ULTRA DEPENDABLE ALARM (CANNOT BE FOULLED BY LOW PRICES) THIS IS A TOP QUALITY COMPLETE KIT WITH ALL PARTS INCLUDING DETAILED DRAWINGS AND INSTRUCTIONS OR AVAILABLE WIRED AND TESTED

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- 12/24-Hr. TIME FORMAT
- STYLISH CHARCOAL GRAY CASE OF MOLDED HIGH TEMP. PLASTIC
- BRIDGE POWER INPUT CIRCUITRY - TWO WIRE NO POLARITY HOOK-UP
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- MOUNTING BRACKET INCLUDED

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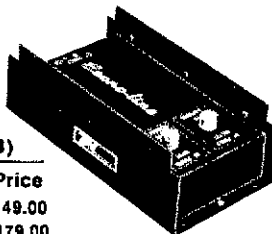
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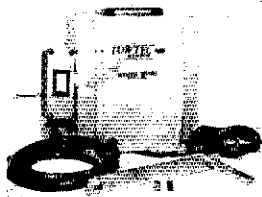
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Sept. 23rd thru 25th. The Port City ARC new officers are WIGGA, pres.; WA1UTO, vice-pres.; WIDZ, secy.; WA1PSR, treas. The D1RN rep for NH is W1J as no NTS phone net in NH. The Boston Center AR call is WAIHOE. The Hoss Traders Net held one of the best swapfests ever at Deerfield. W1GQ and crew did an excellent job of organization. W1GM's OT spare equipment was shown at the Concord Brasspounder & the Franklin Kiwanis. W1JY & WB1AOB attended the Dayton Hamfest. WA1NXR & WB1ALO hosted 5 YLs of the New England WRONE at a luncheon in Portsmouth. WA1LZV now NR1JM, Mt. Washington K201Q W1ALZL repeater assisted in rescues when injured had to be littered out. WA1OYP & KR1 moved to Bristol. W1TN has a new Autek memory keyer. W1RWV a Silent Key. W1BYS back from FL. K1GUC represented the Simadi Shrine Club at the successful Hosstrader event in Deerfield. WA1VH passed his General. The GSPN had 407 check-ins, 8 traffic. Traffic: K1BCS 553, K1INH 56, W1TN 49, WA1YT 47, W1EHT 8, WA1PEL 9, W1NH 7, WAIHOE 6.

VERMONT: SCM, R. L. Scott, W1RNA — Amateur conferred membership in the VT Century Club since Jan. '77. W1RNA K2BO W2RLL & WA3ZRY, BARC, Field Day — Aug. 13-14 at Charlotte. W2VP of NYS now living in Rutland, VT. WA1PSK is now K1CQ. On request from Civil Defense, W1BRG organized 2 F1ers W1BKZ, W1HRG, K1CEJ, K1NKK, K1NKK, WA1VD, WA1REL, WA1SV, & WB2JSJ to furnish communications for the Burlington Bicentennial Memorial Day Parade. Credits to W155A W1LV, W1HRG and their Jp. Ops. for getting W1A1EA back in fine voice. GMN 26/541/85; Carrier 26/517/94; V1 SSB 31/414/58; VT Fone 5/99/19; VT RFD 5/86/20. Tfc. handlers are shy on reporting their activities. Traffic: K1BQB 95, W1RNA 29.

WESTERN MASSACHUSETTS: SCM, Percy C. Noble, W1BVR — On May 18th five members Worc. Co. AREC Leominster CD participated in simulated hospital emergency drills. Operators were W1UD W1TTI, K1JHC, K1WMN, W1BYH, WA1OUZ in Westfield. WA1LNF home from M.I.T. and again very active on WMN & 1RN. HCRA held annual meeting & banquet electing the following officers: WA1SNJ, pres.; WA1PUX, vice-pres.; WA1ZEV, treas.; W1B1CJH, secy. WA1ME (W1MPN) (Mon.-Fri. 4-4:30 PM 3935) sessions 22, total WMN 204, GTC 6 dist. 42. W1DWV for WMN: sessions 31, QNI 207, trf. 116, 22 different stations. WA1DNB for WMEN sessions 5, QNI 265 (including 186 thru 2 mtr repeaters via liaison). WMEN (Sun. 8:30 AM 3935) WMN (daily 7:00 PM 3562). Traffic: WA1MJE 213, W1JUD 17, W1BVR 88, W1TMM 81, W1DWV 78, W1KX 46, K1A1OUZ 44, WA1OUZ 29, W1ZPB 10, W1DYO 9, W1JTL 6, WA1OPN 5, WA1LNF 4.

NORTHWESTERN DIVISION

ALASKA: SCM, Roy Davie, KL7CUK — We are pleased to announce a new club in AK. It is the Matanuska Amateur Radio Assn. holding its meeting in Palmer and Wasilla. They are in the process of affiliating with ARRL. KL7CFX reports he expects to do considerable work on VHF this summer. KL7HOV, PAM for ASN is keeping the net in good shape. The Fairbanks Club reports several new General and Novices in that area. The Anchorage Club is planning a large outing for F.D. KL7DS believes he set a first for US station to work Russia via Oscar 7. Pete, anxiously awaiting the QSL card. We are looking forward to President Dannah and Director Thurston to visit AK in July. Don't forget the AREC net every Thurs. at 8:00 P.M. on 146.52 MHz. Don't forget the National GCWA and Northwest ARRL convention in Seattle July 29 and 30th. Let's all support the largest get together in a long time in the Northwest. Traffic: KL7CUK 9, KL7HMM 6, KL7FID 1.

IDAHO: SCM, Dale A. Brock, WA7EWV — SLC, W1JMH, PAM: WA7HOS, RM: N7DH.
Net — Freq. Time QNI GTC Manager
FARM — 3,935 0200 Dy 1154 54 W7TQJ
RACES — 3,99 1415 M-F 191 161 W7KDE
IMN — 3,520 M-F 191 161 W7GHT
New calls are RM N7DIB, ex-WA9KRR/7, and N7DIB
ex-W7SUY. Congrats to WB7OOU, Genesee; he went from Novice to Extra in six months. W7GGV reports the annual Boise-Twin Falls picnic will be July 17 at the 3-Island Park in Glens Ferry. I will be aboard my sailboat in the San Juan and Gulf Islands through part of July and Aug so all traffic reports must be handled through the traffic nets. I'll be running 1 watt CW and checking into the nets if I can be heard. New appointments are: W7NSW, QBS; WA7NRP, EC for Cassia Co., and W7LIM WB7OOU, QRSS. Traffic: W7GHT 260, W7GBO 58, W7LIM 19, WB7OOU 9.

MONTANA: SCM, Robert Leo, W7LR — W7DE continued ARRL bulletins on MTN. K7JZO helped WA7PDC put up new beam. K7JZO QSO 6-meter SSB Omaha. W7HAH back from KH6 trip. W7PX awarded MTN chapter reports W71SD Evergreen Chapter. Fishtrap ARC reactivated. WB7OXL reports Missoula Heligate ARC orig. mssgs. at Scoutorama. IMN Apr. 21 sessions, GTC 65, QNI 188. IMN May 22 sessions, GTC 101, QNI 193. IMN meets 3635 QZ. MTN meets 3910 002. WA7ZRA used Bozeman 2-meter repeater to alert Sheriff on two traffic accidents, one with 4 injuries. K7LDZ now N7DIB. WA7HED, now K7NIM W7LR visited Butte ARC. They showed resuscitation movie, and Oscar slides. Traffic: (May) W7OYF 6, W7LR 4, W7DB 2, W7HAH 1. (Mar.) K7CHY 29.

OREGON: SCM, Dwight J. Albright, W7HLE — Assn. SCM: Leland McIntosh, WA7UJL. SEC: W7LBH, RM (CW): K7OUF. RM (ph) WA7GFE. Lots of traffic this month. OSN, 3585, QNI 174, GTC 110, Net Mgr. K7IWD. AREC, 3993.5, QNI 473, GTC 9, Net Mgr. WA7NEQ. BSN, 3908, QNI 523, GTC 49, Net Mgr. WA7SSO; WCN, no. 702, Net Mgr.: WA7UJO. While in Portland, WA7SSO was interviewed. When not hamming busy taking care of KATU-CH. 2 TV News sends greetings to all who knew him in Southern OR. The Fort Vancouver hamfair was well attended. W7PGY & K7WW gave ARRL reports. WA7GFE has been selected for RM (phone) and K7OUF is RM (cw). Thanks to K7RQZ who is retiring from PAM, good bye. News PAM is expected. The southern OR hamfests staged a demonstration for the CB. 2 TV News having 75 meters, 20 meters and 2 meters going at the same time. The Club call W7DEK got a work out. No problem working the nets. Our SEC in hospital for operation, hope all is well by now. E.L.T. program to be presented July 18th in Medford at the Courthouse. For All flyers cap and hats invited to attend. Traffic: (May) K7NTS K714, W7SSO 395, K7IWD 116, WA7UJO 71, W7DAN 52, W7WIN 42, WB7AAK 19, W7LT 18, WA4HRG/7 14, WA7ZAP 13, WA7GBO 2, WB7CBA 1. (Apr.) W7VSE 135, W7DAN 90, W7TZO 2.

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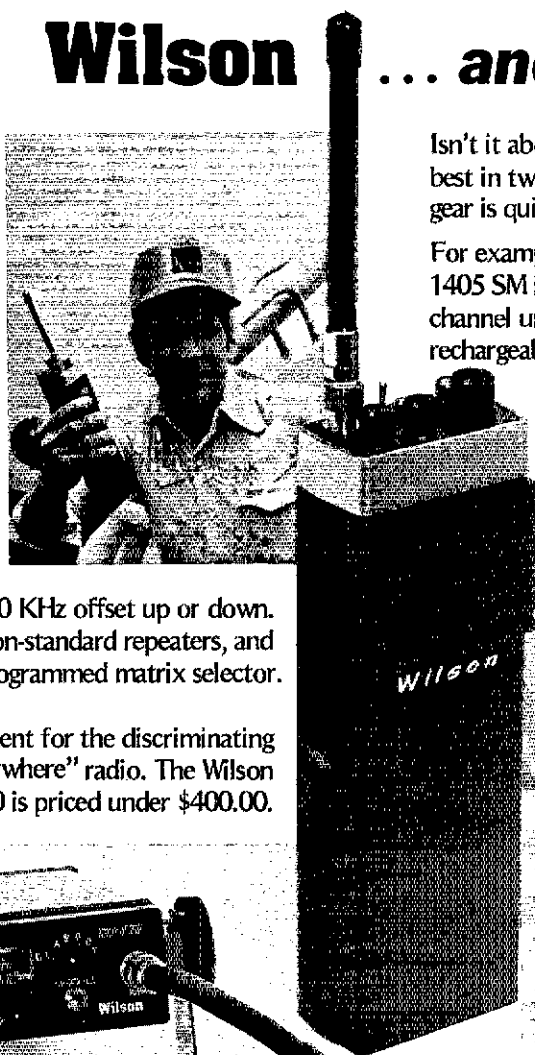
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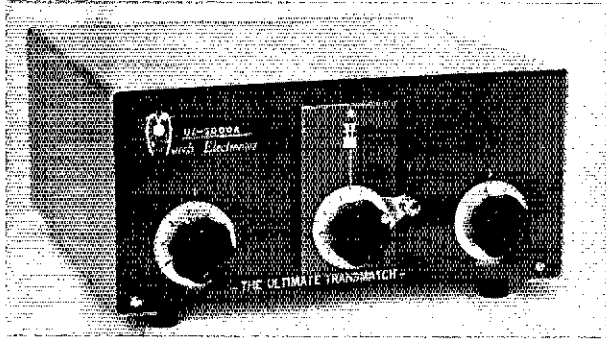
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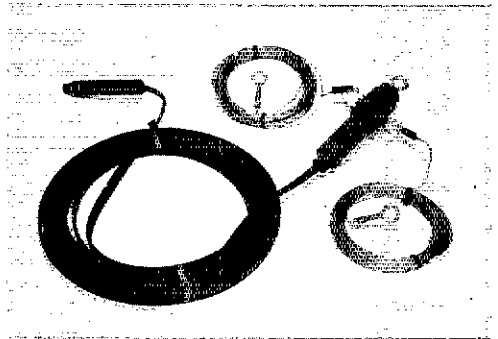
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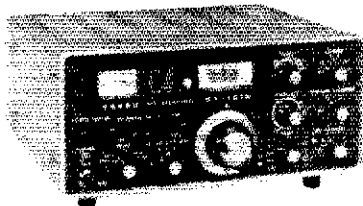
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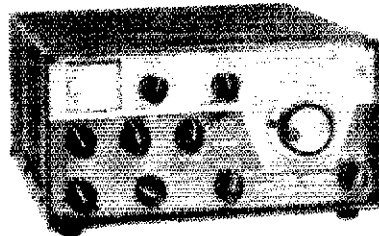
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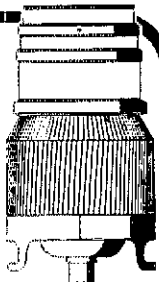
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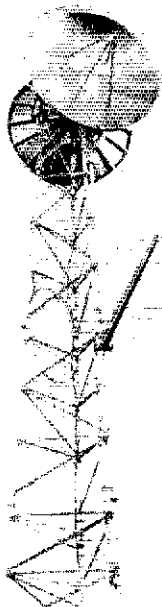
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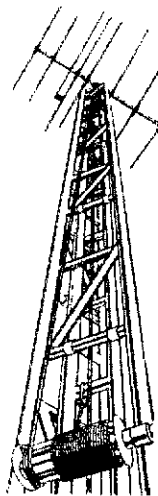
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DIRECTOR

WASHINGTON: SCM, Mary E. Lewis, W7QGP — SEC: K7VAS, RM: K7OZA, PAM: K7YR, VHF PAM: K7SWE.
Nets — Freq. Time QNI QTC Sess.
NTN — 3970 11:30 1649 56 31
W7PFD
WARTS 3970 18:00 2160 55 31
W7QGP — 3945 18:30 738 44 31
NW55B
WA7RCR
ARES 3930 9:00 SU 63 1 5
K7VAS
Update of calls K7GGD now K7MF, WA7LQQ-K7JB, W7KWT-N7RC and K7YRQ-K7YR. W7JIE reports IW 306 work, a leased Commercial Xmttr had problems and from W reports and coas from W7JIE were found and repaired. WB7CGA is NCS for WSN on Tue. and RN7 Rep. WSN Sat. WB7QBV had 27 public svcs msgs., 2 tic calls — 1 non-injury accident and 1 emergency (reversed the Vashon Ferry to pickup a critically ill patient K7CBL's son. Ferry was met by police and medical units at Seattle side. Patient dining FMI). May month in WA: Traffic: K7DXX 598, W7AP5 65, N7RC 54, W7GB 50, WA7RDD 49, W7BUN 44, W7LG 42, WA7LQV 34, W7PWP 30, WB7CGA 27, WA7DKA 25, W7IEU 20, W7AIB 7, W7BCS 7, WB7FGC 4, WA7GVB 3.

PACIFIC DIVISION

EAST BAY: SCM, Charles R. Breeding, K6UWR — Asst. SCMs: W6ZL, W6ZAGV/W6. SEC: W6IHH. May was the month for some new club officers. Northern Calif. Contest Club, N6BT, pres.; WB6LPK, vice-pres.; W6MSE, secy-treas.; N6RQ, N6VJ, and K6JFK, board. South Bay, AR Assn., WB6KQJ, pres.; WB6ZFL, vice-pres.; WB6JDS, secy.; WA6SVJ, treas. Best to all. W6RGG gave a talk to the Hayward RC on his OO work. Also W6RGG has been appointed Radio Officer for the Alameda County RACES. New appointments in the Section are N6VV, K6ARE DOs and WA6JVZ OPS. W6CF, SCM of the Section gave a fine talk on traffic handling at the meeting. South Bay AR Assn. I would like to thank the members of the East Bay RC for their warm welcome to me at their May meeting. Remember your SCM is always glad to visit your club. Under the fine leadership of W6ZL, the Armed Forces Day operation at NPG was once again a smashing success. WA6JVZ has up a new tower with a TH6DX and a new TS-422. The Oakland RC has started a new membership drive. ORC meets on the first Fri. 8 PM, at the Oakland RC Cross Bldg. Remember the Pacific Division Convention Oct. 15 and 16 in San Mateo. Traffic: K6OE 299, K6HW 289, N6CY 152, W6JXK 94, WB6VEU 12, K6PMG 4.

NEVADA: SCM, Leonard M. Norman, W7PBV — SEC: K7ZAU, WA7HHY of the famous Lame Dog Mine was host to a group of Radio Amateurs, those known to attend southern NV were WB7DX, W7MMW, W7MRS, W7PRM, WA7RPZ, and W7VY. SNARS group in Reno will host a BBQ hamfest in Aug. Clark County RACES Board of Directors are W7OK, chmn.; K7ZOK, vice-chmn.; WA7MKI, secy-treas.; W7BES, act. WB7OKY reports some OO activity. WA7MKI now Extra Class. W7PM has new call, K6Z25. W6WFP worked ISLBYN on G. WA7RPZ Pres. of NV Airstream Assn. in NV is off for a 2 month Airstream rally. WB7DAA caught by wedding bells. WB7PRH Novice to Tech. W7QO is starting night courses in Code & Theory at Carson City Community College. WB7OKY now W7SK. Traffic: W7LX 177, W7SK 4.

PACIFIC: SCM, Pat Corrigan, KH6GGW — SEC: KH6CKJ, RM: KH6JAC. Congrats to KH6FNB & KH6IPN on getting Extra. Also KH6HKK on her new call, KH6GZ. The radio dealer has new solid state equipment both VHF and UHF and new duplexer/ant. FCC office is in New Prince Kuhio Fed. Bldg. We hope every member will cast a ballot in the upcoming Division election. This is your chance to have a voice in selecting who will represent YOUR interests in ARRL. HF conditions very good this summer. KH6SO MHz had several openings in Pac. in May & June with KH6JJ, GRU, IAA taking advantage. In Sept. Mono. ARC will have swapfest and transmitter hunt. SAROC, Hawaii will be first week in Nov. at the Kuliama Hotel from first reports. Many microcomputers showing up in KH6 with some interesting amateur applications. Traffic: KH6IJE 74.

SACRAMENTO VALLEY: SCM, Norman Wilson, N6JV — SEC: W6SMU. The North Hills Radio Club's Sacramento Area Ham Swap was a big success with K6VT auctioning off many a boat anchor. K6S3 hosted a well attended picnic for the Northern Calif. Contest Club on June 4. K6IKC hosts the meetings of the Susanville Radio Club on the 1st Fri. of each month. Their radio classes have recently added 25 new hams to that area. A Novice/General class will be offered by the Grant Adult Ed. Center and McClellan (W7A) starting Sept. 6. WA7ITE is the new trustee of the RAMS chapter. WR6AD, The El Dorado Co. ARC has donated a set of ARRL publications to the El Dorado Co. Library. There is no room for a passenger in WA6HAF's truck after the addition of two 100 watt Motrac VHF rigs. N6JV had the pleasure of speaking before the Sierra Pacific Amateur Klub. Traffic: W6RSP 201, W6DEF 34, K6RPN 21.

SAN FRANCISCO: SCM, Rusty Epps, N6SF/W6OAT — Kudos to SF radio station K6BS for its June 8th editorial strongly supporting hams in their battle to keep call-letter license plates available without an exorbitant price increase in fees. Humboldt ARC invited contributors, considerable time and effort helping conduct an auction which raised \$21,750 to keep F reka's Public Broadcasting System station, K6ET, on the air for another year. SFRC net meets Wed. at 8:00 PM on 146.49 MHz tm simplex. Even with our drought, W6FAL's waterwheel still generates enough power to keep his station on the air. WB6AIN, new N6V, has a new fulltop location in San Francisco's Golden Gate Heights. WB6RW is now K6Z. W6OAT is N6SF. WB6ITN received a new Sony ICF-5900W general coverage receiver as his graduation present. With sadness we note the passing of W6NGV. Traffic: K6TP 138, W6NLL 130, W6RNL 130, W6IPL 109, K6PB 27, WB6ITN 22.

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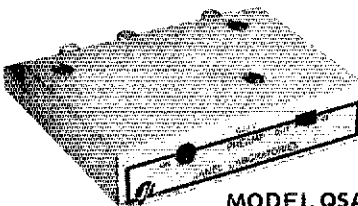
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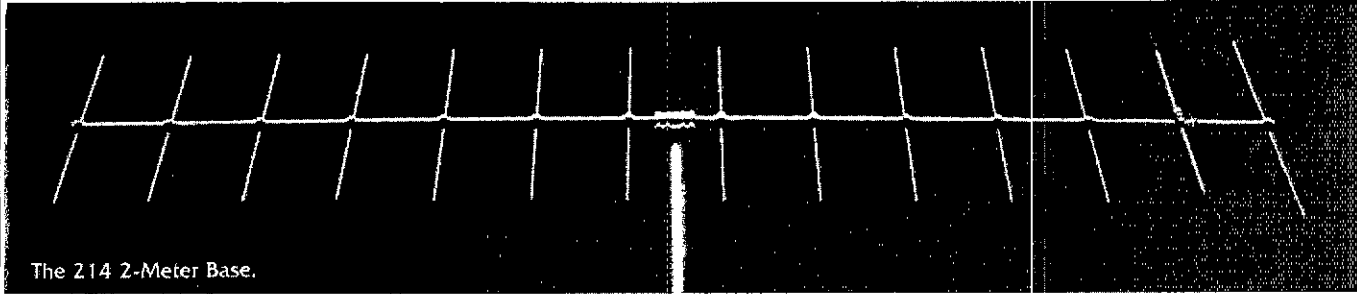
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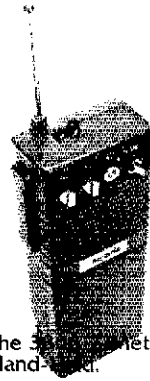
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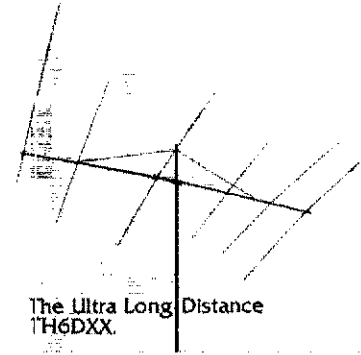
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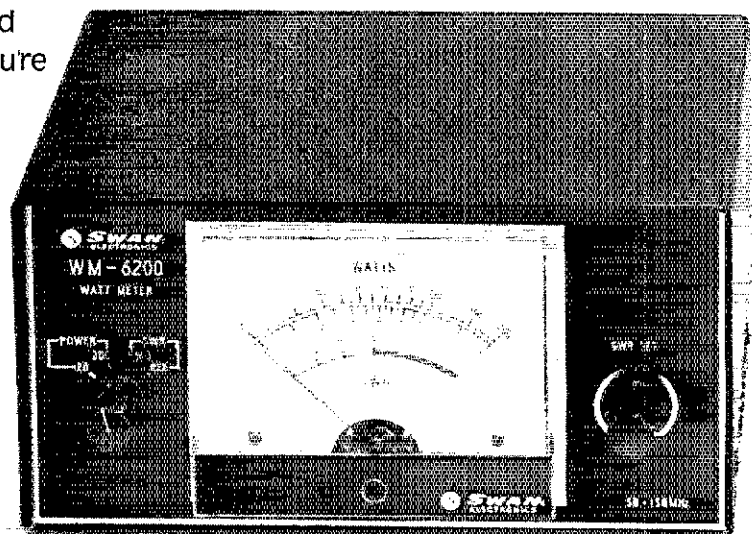


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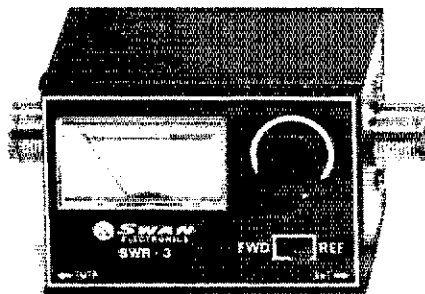


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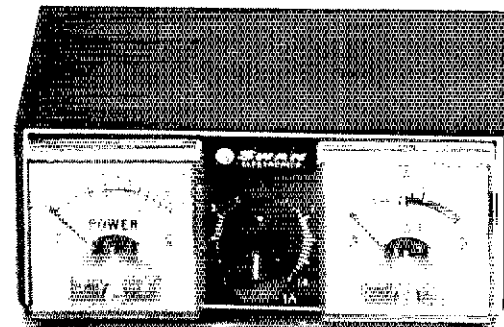
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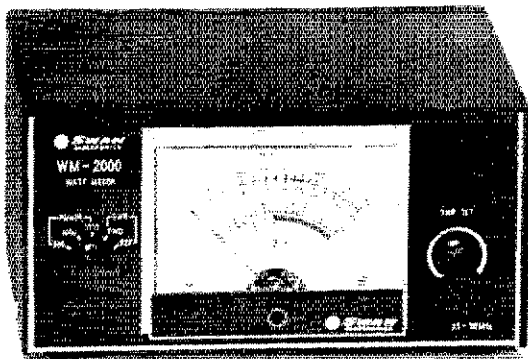
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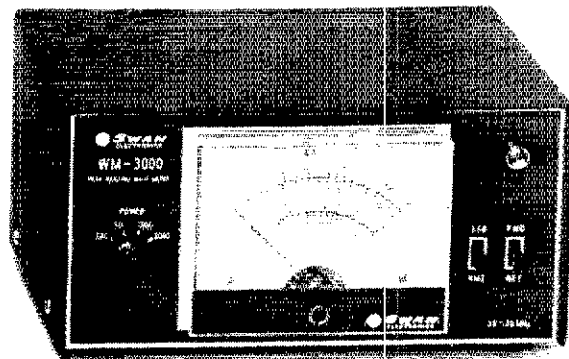
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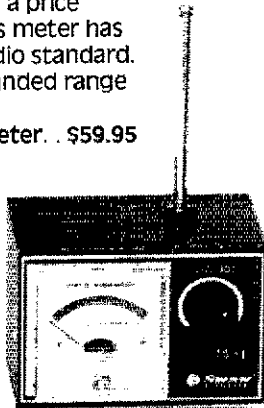
SWR bridge bridges the price barrier. This little jewel gives you relative forward power and SWR on two 100 microampere meters at a remarkably low price. Rear mounted coax connectors for easy, neat installation. Capable handling 1000-watt signals on frequencies from 3.5 to 150 MHz. With low insertion loss, it's great for mobile operations, too. SWR-1A Relative Power Meter and SWR Bridge . . . \$25.95



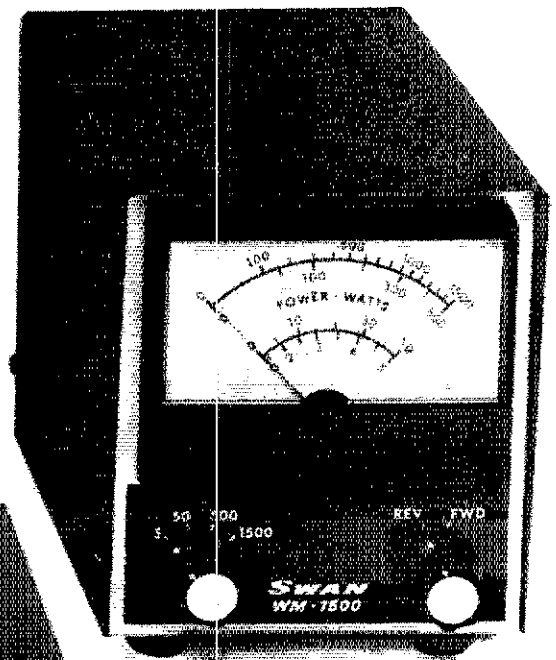
All-the-law-allows in-line wattmeter. With three scales to 2000 watts, new flat-frequency-response directional coupler for maximum accuracy and a price anybody can afford, this meter has become an amateur radio standard. 3.5 to 30 MHz with expanded range SWR scale.
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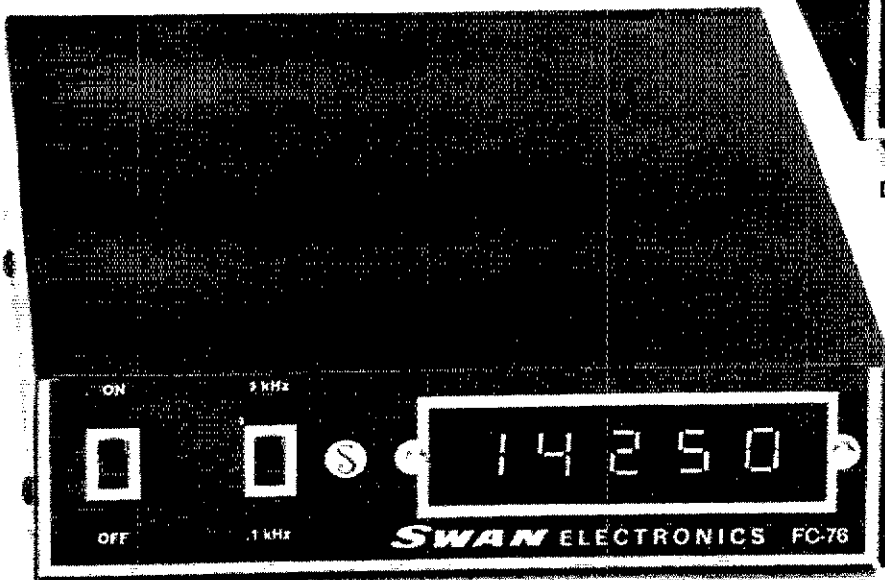
This wattmeter tells the truth about SSB. True peak envelope power of your voice modulated signal is what you want to know most about your SSB transmission, and that's where our WM3000 shines. Flat response forward or reflected power from 3.5 to 30 MHz on scales to 2000 watts in RMS or PEAK at the flip of a switch. **WM3000 Peak/RMS Wattmeter \$79.95**



Sniffs out radiated power wherever it is. This little unit is so compact it could measure relative radiated power in your pocket. Telescoping antenna and a frequency range of 1.5 MHz all the way to 200 MHz.
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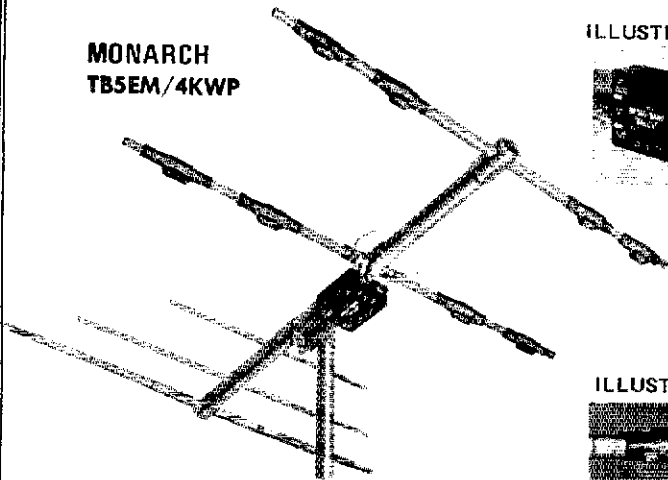
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SAN JOAQUIN VALLEY: SCM, Charles McConne W6DPD - SEC: W4HNO. I thank all amateurs who voted in the recent SCM election. The Porterville AR has been reactivated. Meetings are the first Tue, at the Porterville Public Library. WA6FEI, pres.; WB6DO vice-pres.; K6YRY, secy-treas. WA6CNC moving to Lodi. WA6LOR was the first visitor at the opening of 811 ITU. K6XJ WXCP WB6LBR W65MS WB6QCV and WB6JND K6HJL on a meta. WA6WJL has TS20. WA6IQZ has a phone patch. K6YK and WA6CPP are helping the Yasmie Foundation volunteer process QSLs. W6SF has 100 countries worked. K6PBT working for DXCC. K6ACA and WB6JV share a TS20. W6JUK/7 visited in the Fresno area. WA6TVG is now N6JUR. WB6MGG has new tower and beam. WA6ND has new tower. WA6SDI is up achieving General and to WB6YPS on Advance. WA6RXI and WA6JDB made NCN Honor Roll to May. Let's try to have all counties in the Section active for the CA QSO Party during the first weekend of Oct. Traffic: (May) WA6IQZ 14, WA6JDB 12, WA6JV 2, (Apr.) WA6YAB 5, WA6JV 1, (Mar.) WA6YAB 6.

SANTA CLARA VALLEY: SCM, Jim Maxwell, W6RC - WA6RXI has resigned as SEC-SCV. We all owe him thanks for the effort he has put out in our behalf over his many years of service. WA6TUF has programme pointing and ranging equations into an HP2000, an aid in achieving new Oscar triumphs. TUF also reports that a Russian Oscarnik is rumored as being ready for an Oct. launch. W6EJ is working DX at close range while in vacation in England. Recent call swaps include W6KHS, WA6FKZ and K6RXZ, now W6L, K6XC and K6WC, respectively. The weekly SCCAR net has Q5Yed from their 15M frequency to 28.62 MHz. The Wed. 7 PM starting time for the net remain unchanged. W6JGS is sawing away on DXCC between chats on his new ICOW 225. SCCARS's next licensing class started July 2 in San Jose. W6ZL has the details. W6SP (Space Program) is breathless but still smiling after a flurry of club requests for his outstanding amateur space presentation. Clubs who have missed him might consider snagging him while he's still hot. The Central Calif. Radio Council (CCRC) now sports 15 member clubs. Those clubs still out should query pres. WA6CTV for info. K6TP, secy of the Northern CA Net, still turning out a superb monthly net bulletin. An SASE to his Calbook QTI will bring a sample rushing to your door. The Mar. NCN honor roll (contained in the NCN bulletin) included SCVARS N6AJ, W6GQD, WB6HT, W6KZ, W6RFF, WB45A/B, K6YSC and K6YK. Honor roll listing is reserved for those who check into NCN sessions 20 times or more per month - congrats to all! WA6TUF and K6DTX both report operation of a new Bay Area TV repeater: 437.25 MHz in, 426.00 out with audio on 145.98 FM simplex. Traffic: W6YB 116, WB6JGS 49, W6KZJ 34, W6WV 21, N6AU 15, WB6HT 3.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Chuck Brydges, W4WX2 - SEC: W4EHF. PAM: W4OFO. VHF PAM: K4GHR. RM: K4MC. Since this will be one of my last reports want to express my gratitude and thanks to all of you for your efforts and reports regarding organized Amateur Radio in NC. Over the past six years YOU were the reason for my moderate accomplishments. YOU with your individual talents make it happen. Due to heavy family and business schedules something has to give. Please be looking out for a new SCM appointee who will serve until the normal election cycle in early 1978. Again my sincere thanks for your support in the past. Tar Heel Emergency Net (THEEN) for 15 QNI and QTC 20, the new W4OFO Central NC Tie Net (CNCTNI) on 13/73 Salisbury had QNI 639, QTC 57, tnx WB4VIM. The annual League Planning Forum (used to be League Officials Mtg.) for the Roanoke Division was held in Burlington in mid-May and many fine resolutions were processed for the Division Director W4ACY to carry to the Board of Directors Meeting. ARRL. Kudos to the Alamance ARC for hosting the League Planning Forum and this group also finished a dozen Novices thanks to K4NV and WB4VHB. Traffic: (May) W4EAT 293, W4FNM 148, K4FTB 137, W4OFO 125, W4APL 121, K4MC 123, W4MXG 88, K4VHO 73, K4FBG 72, K4EZH 47, W4OQS 44, W4SRD 42, W4WKS 27, W4WX2 23, WB4QXT 31, K4EG 19, WB4TOP 19, W4EHF 18, W4OQS 18, W4WVR 15, WB4VHE b. (Apr.) K4FBG 128, W4ATCR 27. (Mar.) W4ATCR 9.

SOUTH CAROLINA: SCM, Tom Lutkin, WA4DAX - Asst. SCM: Garry Barnette, WA4MDP. SEC: WB4TNS. RM: WB4CAK. PAM: W4MTK. Amateur Radio Week in SC was a success with activities in many cities including Columbia and Charleston. I will be presenting award for winners of FD at the Rock Hill Hamfest. K4ZN qualified for QO and QTC and made Honor Roll in FMT. Don't forget to get in your application for Amateur license plates this month. New 10-11 chapter formed in Charleston with WB4QJT at helm. Excellent newspaper articles this month on ham radio and operators WB4SPK of Spartanburg and K4ACP of Charleston. W4CE, reports resurrection of Palmetto ARC in Gibbstown. W4VU also plans to be active next year. WA4NIE off to AK and will be looking for SC stations on 20 mtrs. XYL and I attended League Planning Forum in Burlington NC this month. Ne reports: SCSSBN QNI 1363, QTC 184, PX QNI 284, QTC 101, Anderson 2 Mtr QNI 489, QTC 9. Traffic: WB4ARJ 680, K4ZN 501, W4AKX2 132, W4ANK 107, W4NTQ 99, W4DBX 82, W4FMZ 62, W4MTH 59, K4FRX 54, WB4CAK 44, WB4DBK 42, W4OXC 41, W4DZG 40, K4GQG 38, WB4JNE 24, W4EVV 14, W4DRF 10, W4BJE 8, W44LTZ 8, WB4BZA 6.

VIRGINIA: SCM, Robert L. Follmar, N4RF - SEC: WB4ZNB. PAM: W4VWV. Asst. PAM: W4VJU. RM: VY: N: K4BKX; VSN: WA4EPJ; 4RN W45HJ, K4BKX's new roster out soon & new delta loop wrking OK on 80 & 40. WA4UUX trying out longwire and catching gud DX on 40. WB4DBX 502 exams slowed tic but graduated June 5. Think K4GR now satisfied with his microcomp. W4JQ asks "where has all the tic gone?" W4THM rpts spring got to him going fishing a few days, made trip to SC and in general looking for N4FM has new 80-mtr ant, wrks fine. W4NWM rpts condx pretty gud, much static but got the mgs thru. He is working on a new coax ant for 2 mtr mobiles. W4EAZ says fair DX on 40, and 80 giving up the ghost for summer. Has new tempo 1. W44AJF wrking on a pulsating calibrator and using lots of little ICs. Also digital car clock wrks gud. N4LE pts W4KFC spoke to combined mtg of VARA/BARC and W4RS in Richmond on ARRL-FCC preparations for WARC '79. W4ODL still fighting (he says) a losing ant. battle. WA4RDI rpts exams and new job taking his time - in

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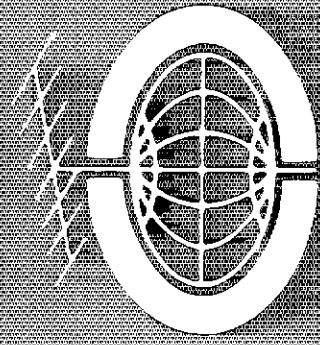
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Europe for July. NOVARC preparing for VA State Conv. on Sept. 17/18. W4YE now QSL mgr. for EP2VW (K4EZL). Also wrking W4/WA/WB4QSL bureaus as a volunteer, FB bud! WA3KPK will be attending VPI for next 2 yrs. W4KXE, EC of Page Co. rpts visit of K4KFC and nice "syball". W4VYG busy with Coast Guard Aux. vacation at Buggs Island Lake & wrking on new ant. system. WA4NYZ sez dance band taking toll on net activities. WB4QEB moved bk into section, FB. WB4DRC says people on 28/88 appreciate hearing bulletins. W4KX been QNLing the nets but no ttc this month. W4UJJ feeling btr these days and getting vy busy at ofc sgn. QO WA4UJ submitted 12 of 73 observations and participated in Armed Forces Day FMT with 7.6 ppm, nice gng. WB4OXD constructing new op bldg. & op positions. New op house will include 2 Drake C lines; also awaiting new N4?? call, hi. New EC K4SPS looking forward to wrking with an efficient well-organized grp. K4ZVS got new Clegg FM-28 2 mtr to use as OC. Apology to W4KFC for by-passing his Apr. rpt (it got buried in the rush). He reported visiting Springfield-Annandale ARC, Valley AM. Rdo Assn. & Culpeper AM. Rdo Assn. & took part in CD parties. Recd wrd from Hq. of the affiliation of the following 4 radio clubs. Arlington & Farquhar ARCs, Culpeper AR Assn. & Jr. Ar Operators of Virginia (Richmond). Welcome to the fold! Club papers recd.: AMRAD; NOVARC; LAARC; VA Microwave Soc.; HARRA; Portsmouth ARC. All papers nicely prepared. BPL: WA4EPJ. Traffic: (May) K4BKX 445, WA4EPJ 361, WA4UUX 360, WB4DBK 234, WB4PNY 139, K4GR 133, W4LXB 105, W4UJ 93, WB4ZNB 85, N4RF 78, K4JM 76, W4TMN 60, WA4AJF 56, N4FM 46, K4WIK 45, WA4QJ 42, WA4YUJ 42, W4NWM 35, WB4WK 33, WA4EZA 32, WASUS 32, WB4DQZ 31, WA4AJF 28, N4LE 27, N4DW 25, W4OOL 23, WA4RDI 18, WA4CLK 17, W4YE 17, WA4STO 11, WB4UUY 11, WA4KKP 10, K4KA 8, W4KXE 8, WA4NOB 7, W4VYG 7, W4MK 6, WA4NYZ 6, WA4WQG 4, WB4QEB 2, WB4DRC 1. (Apr.) W4KFC 6.

WEST VIRGINIA: SCM, Donald B. Morris, W8JM — I regret to report K8HID WBWUV and W8OJI as Silent Keys. KFC ARC now ARRL affiliated with WB8YMJ, pres.; WB8G, vice-pres.; WB8BK, secy-treas.; WB8YUH and WB8SZD, prog-pub. WA8KXI now K8KT, WB8DQX is K8YL, K8NKK is W8GH, WA8IMY is K8DM, K8ZPR is N8JP. New officers Opequon Radio Soc., WB8HOG, pres.; WB8QPU, vice-pres.; K8QYG, secy-treas.; WD8EGW, news editor. New Generals: K8CYW K8LSN, Jackson County ARC Hamfest Cedar Lakes, Aug. 14th. Monongalia Wireless Assn. Hamfest, Westover Park, Morgantown, Sept. 4th and Bluefield ARC Hamfest, Bluefield, Aug. 28th.

Net - Freq.	Time(Z)	Ck-in	Tfc	Sess.
CW - 3565	2300 Dy	125	8	8
Novice - 3730	2300 Dy	125	107	30
Phone - 3990	1600 Dy	515	44	31
Phone - 3990	2200 Dy	897	152	31
Hillbilly - 14290	1600 Su	143	35	5

Traffic: WB8TDA 74, WB8DQX 60, WB8TJN 56, WB8CKX 27, WB8IIL 25, W8JM 25, WB8YMJ 21, WB8QYN 12, W8JWX 11, K8GEW 11, W8SKL 10, W8BRUZ 10, K8JQ 9, K8MY 9, WB8Y 8, K8ZDY 8, WB8Y 8, W8LFW 4, WB8ZMX 4, WB8SAW 4, WB8RD 3, WB8CTC 3, WB8IHA 3, WB8TEE 3, W8ZNH 3, K8HID 2, W8HAZ 2, W8LYV 2, K8MZM 2.

ROCKY MOUNTAIN DIVISION

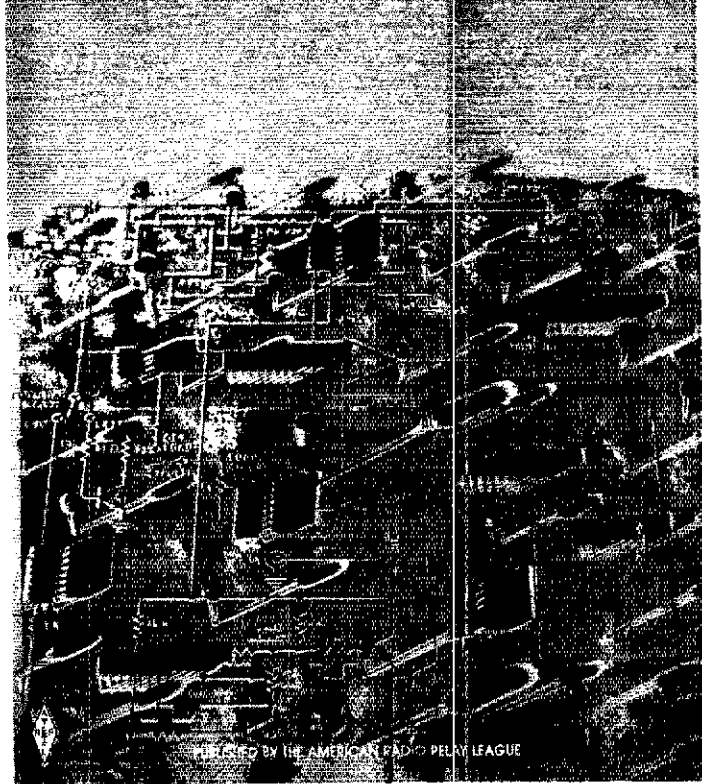
COLORADO SCM, Clyde O. Penney, WA0HLQ — SEC. K9FLQ, RM, KPTER, PAMS: K9CNV, WA0YGO, K9FK provided communications through WR0ABF for "Gateway to the Rockies" parade, with assistance from K9FLQ W9HXO K9OHU WA0OYI K9SKI WA0VGP WA0VSS W8ACD WB0UMZ WB0KZV WB0WDN. Congratulations to the Ski Country ARC which has voted to become ARRL affiliated, with W9FCG, pres.; K9TIV, vice-pres. WB0NLW, secy. K9OTU presented excellent talk on Amateur Radio to the Rotary Club, Kiwanis Club, Elks Club and Search and Rescue Group, all of South Fork Area. Congratulations to WB0MCL who passed his General Class exam in May. Net ttc for May: Hi Noon QNI 1169, QTC 63, Informals 138, QNF 1230 30 sessions, combine QNF 1243, QTC 194, informals 301, QNF 1590. Traffic: (May) W0WYX 2085, K0YFK 871, K0ZSQ 721, W0EJD 304, WB0QOT 304, WB0IBS 286, WB0TAQ 200, WB0BAL 138, WB0PVT 74, W0IW 72, W0ETT 70, K0OTU 70, K0TIV 56, K0WZN 54, WB0MCL 53, W0LAE 44, WB0QPQ 30, W0MFD 29, WB0LZO 27, W0LLE 12, W0CNV 10, W0VED 10, W0HLQ 5, W0GO 2. (Apr.) W0LQ 158, WA0YNP 104, K0WZN 58, W0REX 41, W0PT 31, K0SPR 2, W0GO 1.

NEW MEXICO: SCM, Joe T. Knight, W5PDY — PR: W5GNR, SEC: W5ALR, PAMS: W5PNY K5IKL, RM: K5KPS. Southwest Net (SWN) meets daily on 3585 kHz, at 1915 local time and handled 180 mgs, with 238 stations reporting in. New Mexico Roadrunner Net (NMRRN) meets daily on 3940 kHz at 1300 local time. Breakfast Club Net meets daily at 3940 kHz at 0700 local time. With deep regret we report the passing of WA5JNC, Breakfast Club NCS for many years. Pecos Valley ARC graduated eleven Novice ops. Sierra ARS handled fifty mgs, during T or C Fiesta. Sure miss W5RE who retired to enjoy FL sunshine. Traffic: W5UH 329, W5JOV 290, W5LED 245, WB5LZF 188, K5MAT 160, W5ENL 132, W5KH 114, K5KPS 103, W5Y 54, K5XL 30, WA5OHI 14, W5YQ 10, W5WV 7, WA5MIY 2, K5NM 2.

UTAH: SCM, Ervin Greene, W7EU — This will be my last entry as SCM. Thanks to all who have been such a great help during my 2-1/2 years in office. Hope you give W7GPN as much help and welcome him as our SCM. W7OXC reports receiving QSLs for working military stations crossband on 53 Armed Forces Day. John reports a total of 579 minutes was spent on BUN this last month with 923 total check-ins. W7UTM now has a Rinco Ranger for 220 MHz. K7WYT returned to Ogden for the summer. W7CYH WA7MEL K7UT and others worked K7SAD from his assignment base on Christmas Island keeping him in contact with home. UARC starting a summer class for General Class license. UARC ladies Aux. supplied spaghetti feed at Field Day to nourish the operators. A special thanks to Jackie Jacobs, who not only put up with the hassle of her husband being FD chmn, but headed the ladies Aux. efforts to make FD a success. Meteor scatter stations are being heard in UT with increasing frequency due to more multi-mode rigs. Skip conditions have been on the upswing with UT VHF stations being heard in TX NM and AZ. Autostart on RTTY well established. Traffic: K7HLR

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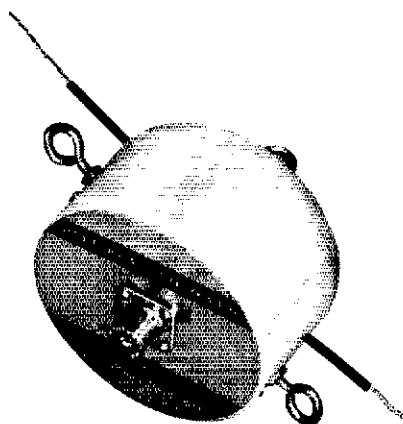
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117, WA7MEL 87, WA7KAJ 52, WA7JRC 44, W7OCX 27, W7EU 20, W7UTM 12.

WYOMING: SCM, Chester C. Stanwarty, W7SDA - Asst. SCM; Tom Graham, W7KHH. SEC: WA7NHP RM: K7K5A. The Sheridan Amateur Radio League was reactivated with 24 members of that number 18 are ARRL members. New Novices in Rawlins are WB7RPI and WB7RYO with 12 more prospects taking Novice exams June 2, WB7RMZ and WD8BYU new Novices in Gillette. New General Class WB7DBS Buffalo and WB7BDJ Rawlins. New Advanced Class WA7TBB Buffalo and WA7WFC Casper. WA7ZZY will be operating portable @ at summer school in Chadron, NE. W7TZK and six SD amateurs from Spearfish, S.D., Deadwood and Lead furnished communications for local bike-a-thon. K7SLM reports Wyo Cowboy Net held 21 sessions, 537 QNI, 7 QTC Traffic: K7VWA 436, W7TZK 361, W7SQT 334.

SOUTHEASTERN DIVISION

ALABAMA: SCM, Jim Brashear, WB4EKJ - Don't forget the closing date for nomination of SCM; see "Operating News" July and Aug. QST. K4HJM reports W4MHO returned from his trip out West; club interest high and some license upgrading and even "Cuz" is behaving nicely! WB4CXD reports 20 hours in May Wx Watch. The Tuscaloosa ARC repeater (WR4AEH 22.782) now equipped with autopatch. K4JK got 3.8 ppm in last freq. check and although he is still operating his roto-tiller, says he did not do anything extra stupid this month. WA4BDW PR Officer for Birmingham ARC and ARRL PR Asst. now has call N4KC. W4RQS has additional call of N4MD. New officers of Huntsville ARC are: WA45IG; pres, K41KR, vice-pres, W4WJK, secy-treas, W8QZL, asst. secy-treas, The DeKalb County ARC has been re-formed and sponsored and built a 2-meter repeater (WR4BAV) and holding a weekly net 147.87-147.27 Fri. nights at 7:30 PM. Their club meets 4th Tue. each month; WA4SMW is pres. and W4RNX is VP. North AL Hamfest on Aug. 2, Calhoun Jr. College in Decatur. Thanks to W4NDH, WA4RAJ, WA4AF0 and W4FOA for help on DRN5. Traffic: (May) WA4JDH 687, WB4EKJ 445, N4MD 436, WA4RAJ 72, K4AOZ 58, K4LY 46, N4FP 39, WB4RCF 34, WB4KSL 32, WD4AXA 28, K4UMD 19, WB4TVY 15, WA4RMP 8, K4HJM 6, WA4ZDW 6, W4EF 4, WB4CXD 2. (Apr.) W4EF 4, WB4CXD 3.

GEORGIA: SCM, A. H. Stakely, K4WC - SEC: K4YRL. PAM: K4JNL. RM: W4SHL. Congrats to W4FOE on getting the Public Service Award from ARRL. Thanks to W4NDH, WA4RAJ, WA4AF0 and W4FOA for help on DRN5. Traffic: (May) WA4JDH 687, WB4EKJ 445, N4MD 436, WA4RAJ 72, K4AOZ 58, K4LY 46, N4FP 39, WB4RCF 34, WB4KSL 32, WD4AXA 28, K4UMD 19, WB4TVY 15, WA4RMP 8, K4HJM 6, WA4ZDW 6, W4EF 4, WB4CXD 2. (Apr.) W4EF 4, WB4CXD 3.

NORTHERN FLORIDA: SCM, Frank M. Butler, Jr., W4RH - SEC: WA4WBM. RM: N4WA. PAM: WA4TNC/75; WA4XM/40, WB4BSZ/VHF.

Net - Freq. Time (2)/Days QNI QTC/Manager

N4FP - 3950 2200 Dy 1121 227W/44TNC

QFN - 3691 0200 Dy - - - - - W4MEE

QFNS - 3715 0000 Dy - - - - - WB4GHU

New appts.: WA4ZSK as EC, Nassau Co., K4JRJ as

QBS; WA4FKE & WB4EYA as OPS; K4MZK &

WA4FKE as OPS. Traffic handling up this month - 5

GB4FKE as OPS. Traffic handling up this month - 5

earned by WA4FGG, WB4RIS & WB4TZR. New calls:

WB4YTX now K4YX; W4JWG now N4DC; WA4UFW

now N4UF. New Port Richey 2m repeater had its

duplexer stolen! Deland and Lake Monroe clubs have

friendly competition going. WB4YTW teaching

General class for LM club; WA4JRD runs the Novice

class. W4RD and WB4EKK upgraded to

General; WA4JRD and W4SMC. K4KFP now

historian for Daytona Beach ARA. WD4GUZ working

15m with a TS-520. WIUX/4 in Holly Hill. QO

K4MZK had time scores in last two FMTs. W4JL gave

talk at NOFARS on rig debugging; NOFARS now

running message contest. WB4RIS, ex-Calif. PAM;

trying RTTY and cw. W4BYT now N4LX. W4LOX in

Monticello; WB4LNG active on N4PN. WA4WCG won

Tallahassee ARC "bunny" hunt. Marianne 07/67

repeater back on the air, now with autopatch.

WB4IXK/WA4MUM looking for 2m RTTY activity on

147.03 MHz. Ft. Walton hams converting CB rigs to

10m - a net meets Sun. on 29,965 kHz, with

K4JEM/W4MMW as NCS. WB4NP got a new TS-600

in time for biggest 6-meter opening of the year - 19

states and 92 contacts in one day! Traffic: (May) WA4TXM 1077, WB4QBB 511, WA4EYV 384, WA4WBM 372, WB4TZR 321, WB4NLU 306, W4ILE 293, WA4DEM 188, WB4GHU 184, N4DY 178, W4JL 152, WA4CF 127, WB4EKA 123, WB4HRG 107, WB4FKE 105, W4KIX 79, WB4UKX 59, WB4DTS 48, W4LDM 56, W4MGO 50, K4RZM 49, N455 45, WB4VDL 47, W4RH 39, WB4NJI 37, WA4TNC 36, K4DDY 30, WA4FGG 24, W4IA 19, WB4FJV 18, K4DER 18, WA4EYU 12, K4RNS 10, WB4TVJ 9, WB4XP 9, WB4YKV 9, WB4LNO 7, WB4JUR 6, K4KY 5, WB4RIS 4. (Apr.) WA4STZ 39, WB4UKX 19, WB4JUR 7, K4YX 1.

SOUTHERN FLORIDA: SCM, Woodrow Huddleston, K4SCL - SEC: WB4ALH. Asst. SEC: W4WYR. RM: W4MEE. PAMs: WB4AID, WB4NBE. New appointments this month K45IA OPS, WA4PFK ORS-II (Tech). Endorsements N4ET ORS, OPS. Net certificates issued: SPARC: W4CSH, WA4FNK, K4GBR, W4GFL, WA4KIC, K4RNR, K4NAN, W4BQAT, WA4RLV, K4SCL, K4TH, WB4ZPL, W4BAPL, W4MEE is trying out a new electronic keyer and

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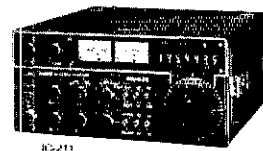


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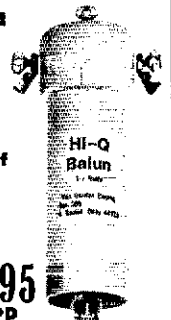


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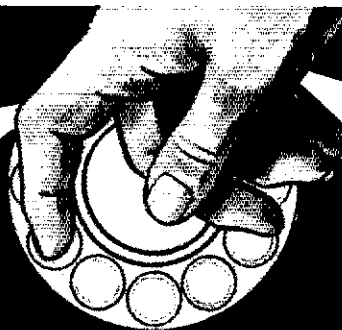
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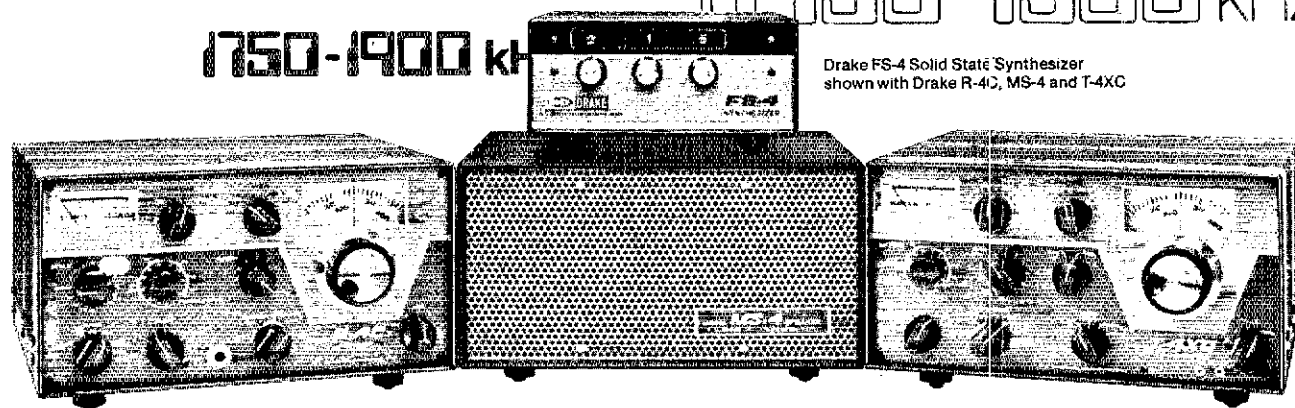
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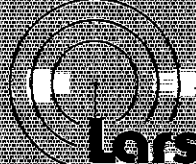
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digital readout on his Triton IV. WB4NAZ passed his General test May 5th. WB4PIB reports Manassas Emergency Net going fine each Tue. at 7:30 PM on 146.46 MHz. W2PF/4 received his 60-year award at QCWA Chapter meeting Apr. 29th. W4DVO has taken over management of Gator Net, W4CH having resigned. WB4GHU will be manager of QFN beginning July 1st. K4DRH just returned from EA6. W4DVO advises that after 50 years of participation, Tampa Amateur Radio Club will not be in State Fair this year. Fair Officials are asking \$600 exhibitor's fee! wonder if the Fair Officials read Gov. Askew's glowing compliments in his declaration making June 19-26 1977 "Amateur Radio Week" in FL. With June 1st ushering in the 1977 "Hurricane Season" we have many Radio Amateurs testing their emergency power and completing readiness for the season. We hope it is all for naught, but if the need arises perhaps we will be a little better prepared than before. Traffic: (May) W4MEE 848, W4JVP 506, K4TH 426, K4SCL 347, W4EH 215, W4DVO 207, WA4NBE 191, WB4VYV 191, WA4WDM 170, WA4GYR 138, WB4AID 134, W4ZHU 124, W4NTE 120, K4SIL 91, W4NFK 87, W4WYR 83, WB4ALH 77, W4IRA 75, K4SGR 72, K4NAN 67, W4PFK 59, W4GPL 58, WB4NJU 53, W4QM 49, K4BLM 46, W4SMK 44, W4QQV 42, W4GDK 38, WA4HDH 29, K4EUK 27, K4SJA 23, WA4EIC 22, WB4PIB 22, W4BNE 19, W4TAS 16, W4ZL 15, W4BK 13, WB4NAZ 12, WB4FLV 10, W4TJM 6, W2PF/4 4. (Apr.) WB4ALH 70, W4LYT 57.

WEST INDIES: SCM, David Novoa, KP4BDL - The Puerto Rico W/ Net is on every day at 1045Z or 3997 kHz with KP4CX, new YL Club has been organized. They are very active for info contact pres. KP4CL. New Novices are KP4s FDJ FDK and FEW. The Radio Club started new courses for ham licenses under the direction of acting pres. KP4EGO. KP4EBQ back from Virgin Gorda where he operates at KP4FCN. KP4EO works with FCC monitoring station KP4FCC call sign has been issued to a Novice in Canovanas. New QO in Rio Piedra is KP4DJL. Sorry to report that KP4EPE son of KP4 CSO and CSM became a Silent Key. Our sympathy with this ham family. Traffic: KP4EHF 50, KP4EMP 6, KP4RK 3.

SOUTHWESTERN DIVISION

ARIZONA: SCM, Marshall Lincoln, W7DQS - RM: W7EP, PAMs: W7KQE W7UQQ, W87DYC scheduled a talk at the Scottsdale ARC on "getting your station on the air" for beginners. W87QNM is now treas. of QRP club, replacing WB7ZHU who had other pressing commitments. The Arizona Repeater Assn. continues to urge users of their 34/94 repeater to move to another repeater or direct frequency if possible after establishing contact if they plan a lengthy conversation so they will free the long-range 34/94 repeater for others. W87BV was in charge of this year's Memorial Day weekend continuous monitoring by the Huapalapa ARC of the Kingham 16/76 repeater for emergency traffic. W47VTM is now W7UV. W7CAAQ is the new RACES call of the Mohave County Emergency Services organization. W7YS reports 180 Japanese cities confirmed. W7AMM is back in AZ after 10 years in the Middle East and Europe, where he worked for DAJJU. W7HFR has been appointed as another asst. dir. in AZ by W6KW, Southwestern Division ARRL director. K7CC reports the recently-organized Metropolitan ARC in Tucson has 10 ARRL Life Members; how many does your club have? Cactus Net 364. AILEN 48. Traffic: W7HFR 11, W7HFR 52, W7UQQ 48, W7KQE 32, W7CAG 12, K7NTG 10, K7NMQ 9, K7GLA 8, W7WEB 7, K7NTG 6, W7RQ 5, W7AMM 4, W7JKM 4, W7DQS 3.

LOS ANGELES: SCM, Eugene H. Violino, W6INH - RM: W6PKA. This year's LERC Convention was a huge success. More displays, more swap tables, speakers and events. Our congrats to W6DDB and Club members for a great job. Many prizes and goodies. This convention not only entertaining but educational, if you missed it, be sure to make it next year. Over 2700 attended with 185 attending the banquet. It is with much regret that I report the passing of W6KUS. Merle was very active in the San Fernando Valley RC, and one of the mainstays of the club. This is a great loss to the local Amateur community. He was always ready to give a helping hand to anyone who needed it. K6YQJ submitted a valid petition nomination for the SCM spot. hope that you members will support him as much as possible, he is active on all modes of operating. W6YBR recently assisted in a serious freeway accident by radioing for the police and an ambulance. Fast response apparently saved a life of two. Good work! W6CWA with the United RC of San Pedro at the LERC affair with the club displaying one of the club projects frequency counter. Seventy-eight old timers of the SOWP group met for a wonderful luncheon, MC's W6VH and W6VI outdid themselves to have the meeting such a success. Thanks to Charles' XYL for her untiring work, in helping to put the luncheon together. W6SGZ recently took a trip to Conn. while back east visited W1AW and had an eye-ball QSO with our boss WINJM. Summer vacations are now coming and we need all the spare help on the SCN and RN-6 nets we can muster. Traffic: W6OUD 237, W6INH 224, W6EOE 159, W6QAE 105, K6EA 28, W6BWG 24, K6CL 17, W6NKE 8, W6SGZ 3.

ORANGE: SCM, Wm. Heitritter, WB6AKR - Asst. SCM: John F. Cashen, K6KNC, SEC: W6AGB. RMs: W6ASTA WB6AKR, PAM: W6CPB, ECs: W6BARK K6GGS W6LKN K6KNC WA6YWS, K6AFQ reports 16 new Novices from his class in Blythe at Palo Verde Community College including W6GAIN of Eagle Mountain. The Desert Waves ARC was organized by K6AFQ with plans to put the Palo Verde Valley on the ARRL FD map in the two station class. Anza Valley ARC reports WR6AZX repeater operational in Pine Cove on 146.685/085, and the Novice class has produced: W6GFK2, W6ZAF, W6ZAG, W6ZAH, W6ZAF, W6ZAF, W6ZAF, W6ZAF, W6ZAF has upgraded to General. W6KFX, W6ZAF, W6ZAF to Technician. W6ZAF has an Icom IC-225. The following provided communications for the American Cancer Society Bike-a-Thon: K6MXL, W6VZO, W6LYC, W6JUG, W6LWQ, W6LSP, W6ADJ, W6YHC, W6JJS, W6AGD, W6FAH, W6BARK, K6TWK, W6JESU, W6SCT, W6MUP, K6UJO, W6MOK, W6DBX, W6DAG, W6BLR, K6KNO, W6SFP, W6PUS, W6HKW, W6LUXE, W6RE, W6WCJ, W6KKB, W6GPP, W6SVJ, W6IWS, W6VWJ, W6IBR, W6QWJ, W6UCS, W6SKE, W6QWO, W6LVR, W6COX, W6GCI. New officers of the Desert RATS (Palm Springs): W6FKP, pres.; W6TAG, vice-pres.; W6MGB, treas. Coachella

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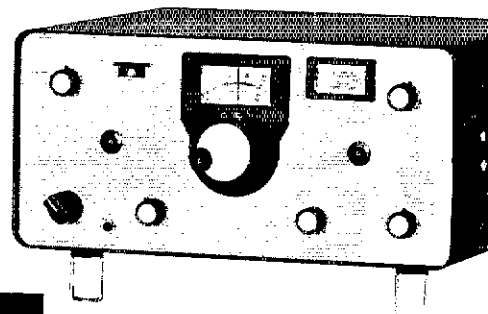
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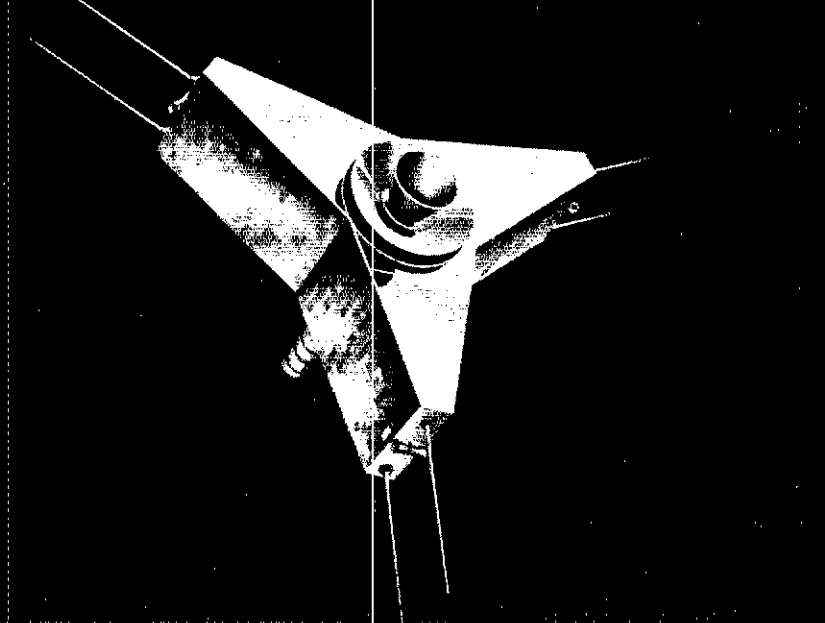
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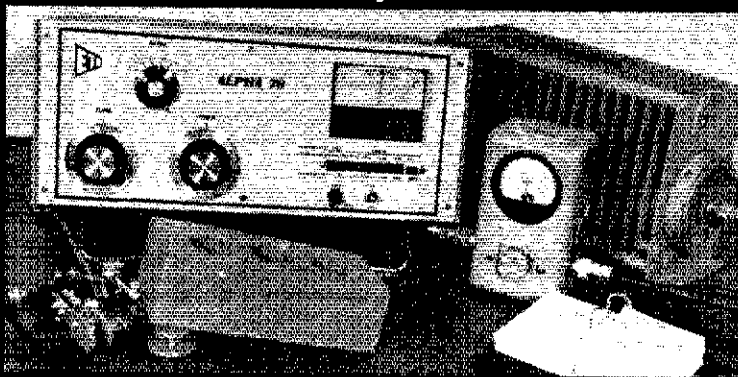
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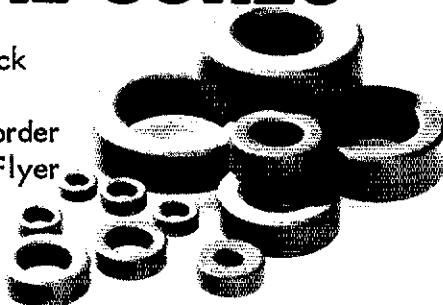
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Valley High School has a six-element Telrex beam on Tri-ex 5K Needle Tower mounted by the KYL of Silent Key K6HSW. WA6YWS reports new ARC formed in Bishop: WB6DSQ, pres. WB6ZY CB liaison, WB6RG Red Cross Liaison. Emergency Preparedness established as primary objective of the Bishop ARC. WB6DSQ has been appointed Asst. EC for Inyo Co. WB6RG is Red Cross chmn. W6TIO (ex-WB6QIE) reports 25 new hams from his class at Saddleback College. SCN (Southern Calif. Net) will start a training net July 1. This net will meet daily on 3598 kHz at 8:30 P.M. with CW operating speed to be around 13 wpm. WA6BZZ recently passed her General and has been very active on NEN. Traffic: WB6EG 557, WA6TVA 90, W6RE 46, WA8WDZ/6 19, W6CPB 18, WA6YWS 6, WA6DBX 3, W6BUK 2.

SAN DIEGO: SCM, Arthur R. Smith, W6INI — Only 13 months until the ARRL National Convention in San Diego, Sept. 29-30, 1978. South Bay Amateur Radio Soc. put on outstanding display at South Bay Plaza Shopping Center. Forest Falls picnic & meeting of SCN was huge success. A second session of SCN is planned for 2030 local on 3598 kHz. Net speed 13 wpm. Control stations needed as well as participants. Here's a good chance for beginners. Call sign changes: W6RS to N6C, W6RM to N6RD. Volunteers wanted for Calif. Dept. of Forestry Red Flag Alert Program. During periods of high fire hazard, amateurs will assist in surveillance program for early detection of fires, as well as prevention. Contact for info: WA6UFY 448-0324, WA6HJJ 222-5265, or W6INI 273-1120. For info on licensing class starting in Sept. call N6RU 277-4404. With the transfer of WA6PLZ to Clythe, CA, San Diego has lost an ardent supporter. His licensing classes and on-the-air code practice has brought many new faces into amateur radio. Good luck, Lyman. K6NA took part in Kingman Reef DXpedition in June. S.D. Repeater Assn. is latest addition to ARRL's affiliated club family. Palomar ARC's annual picnic Aug. 24, at Oak Park, Fallbrook. Traffic: WB6FTY 335, WB6PFI 281, WA6UAZ 159, WB6GF 71, W6SIF 34, N6AT 26, W6DEY 26, K6PM 6, WA6UFY 6.

SANTA BARBARA: SCM, D. Paul Gagnon, N6MA — WB6WCW has new ICOM 215. N6NB building a new Cabover Kilowatt for Mountaintopping. WA6WVC back on the air after 2 years with an SB 104 and 4-1000. K6CFJ says hello to all from his new antenna farm in TX. K6DFE has relocated in Orange Cty. SBARC officers: K6BPF pres., WA6GZ vice-pres., WB6HQZ, WA6TUO, W6POU, vice-pres.; W6LNW, treas.; WB6JXJ, secy. Bunker Ramo ARC WB6OBQ officers are W6TLG, pres.; R. Bailey, vice-pres.; WB6PLG, treas.; WB6KNT, trustee. WA6TMQ is chmn. Eng. in charge of Japan American ARS. The LB FCC-ENR, N6MA spoke at CVARC in T.O. W6ITW harmonic. WB6WOH, WB6LTT/3 reports harmonic is WB6TCS and he is enjoying his antenna farm. WB6PCB went from Novice to Advanced. Novice class taught by WA6TMQ and W6PNM graduated 23. Class by WB6HF graduated 8. WB6TUD now Tech. WB6ZBE now General. WB6LW graduated. W6LBJ are new Novices. KH6IGU active on RN6/SCN com. Circuit Section ARS net on 3935 at 1000 Sun. Is growing thanks to WA6BLS. Novice Practice Net meets Fri-thru Tue. at 2030 on 2146, WA6TMQ NCS. TRI-LARC net meets on WR6AFI at 2030 Mon. K6XO worked 4UJ for No. 248. Moorpark College class by K6HF graduated. Nov. 1977. GLEN assisted a T18 maritime mobile rescue 300 miles out by coordinating for the Coast Guard. K6GHU recovered from hip surgery. W6GEB elected to the National Academy of Engineering for work on LASERS and Electrooptics. WA6OHX, K6S25, WB6YKC and WB6DPL had a "Westercharge" party while the QMs attended the SB VHF Conference. WA6LW, W6ITW, WA6VBS 36, K6WI 34, N6MA 36. Traffic: K6WI 141, WA6VBS 77, WA6MBZ 46, KH6IGU 42, N6MA 38.

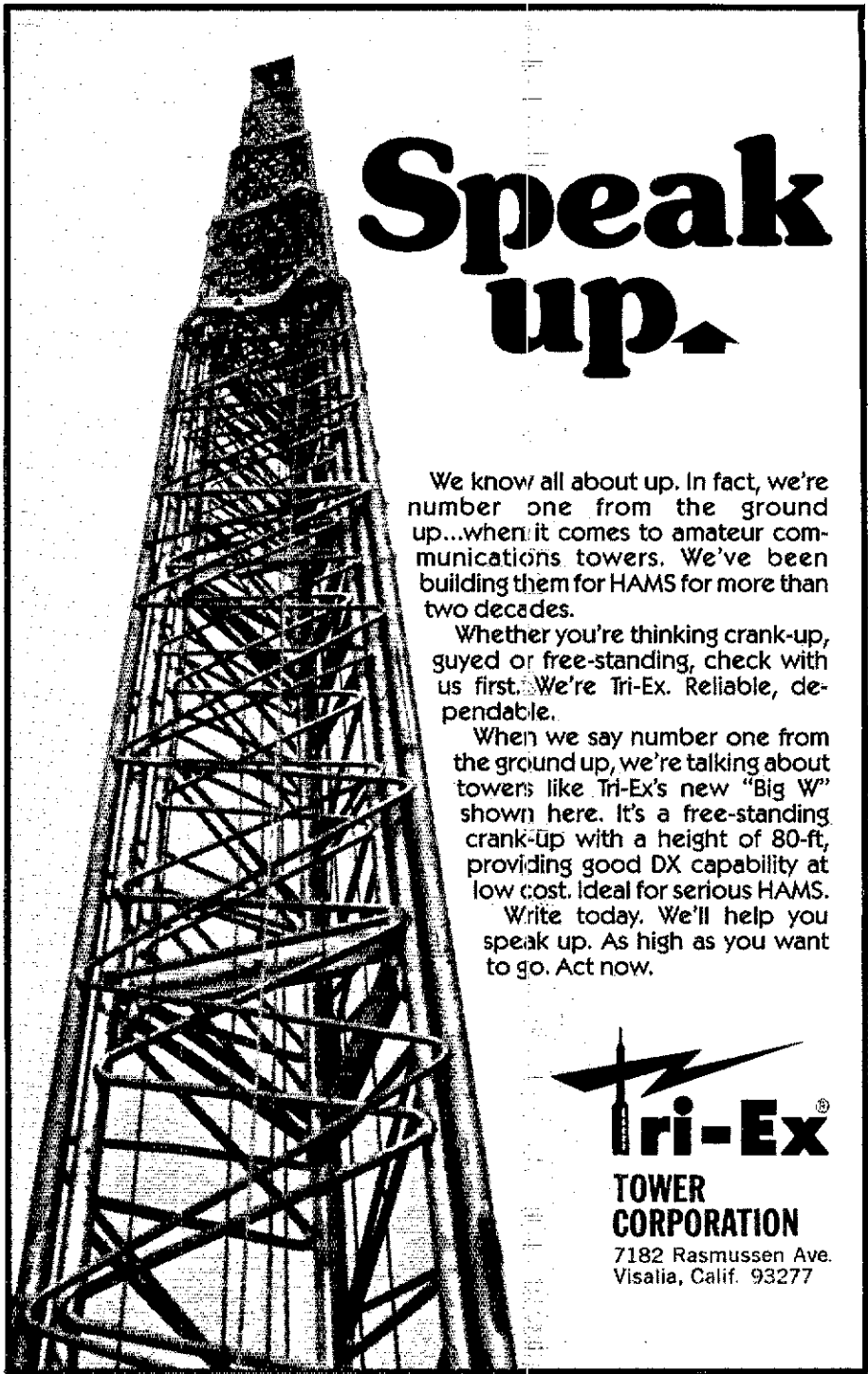
WEST GULF DIVISION:

NORTHERN TEXAS: SCM, Ted Heitcheer, W5EJ — Asst. SCM; Ruth Chance, K5YL. EC: W5DWL. RM: W5LA. W5YK received fine tribute in Mexia News for Memorial Library Book and licensing material to second edition of DARC Blue Book. A monumental work with more than 3000 active amateurs in Texas-Oklahoma registered. More than 200 attended the Old Timers Nite in Apr. Red River Valley ARC graduated a class of Novices with help of W5CTM W5AKZA W5BEV, and others. Irving Amateur Radio Club established RACES Net officers, headed by W5UUX. Cooperation with local police department has been obtained in setting up. W5LA reports not much interest in slow-speed CW traffic net. LTD ARS reports new members W5S: DQX DQY DQZ DRA & DRB. W5BTAP has home-brew 70 ft. tower. W5LA in Army Reserve trip, till end of June. WA5ZNY reports 31 have decided to renew the old W5R. Police RC of Dallas — to be named City Employees of Dallas ARC (CEDARS). Hurst ARC held Field Day at Howell Inst. Rec. Center at Eagle Mountain — ought to get a top score with that site. Hurst has a record of providing outstanding assistance to people everywhere — visit their club, see what happens. Had nice visit with new Club — Sabine Valley ARC, near Ft. Worth systems in McKinney. A fine gang, oriented to emergency work and ready to go. SWOT held first meeting during May. Election of officers saw K5ASZ elected chmn. W5JTA pushing for all to back the Amstat program, membership at nearly 200 at this time. The KC Club in Fort Worth has a new General Class working with K5XK instructing. All are happy with the ARRL Novice instructional material. W5OE is a new call in the area, congrats to Jim. W5HFH ramrodding CD Hospital exercise in connection with DFW SET. Club used W5TI for Field Day. RWK had Field Day at UTD this year as Class SA group. Membership over 110 and growing. RWK cooperating with SW Vintage Radio Club placed time display in Richardson Public Library, equipment and publications well received. W5LR receives material for SCM and transmits regularly. W5RBO working to get Grayson County active in skywarn, emergency service. Have you tried using message service provided by traffic nets? Try it — you'll find better service than mailing, and it is reliable. Traffic nets are best ever and they'll eat your traffic faster than an hippopotamus eating bull rushes! Traffic: W5DWL 52, W5LWB 22, W5YK 6, W5MTN 3.

OKLAHOMA: SCM, Leonard Holtz, WA5FN — Asst. SCM: Ray Miller, W5REC. SEC: W5MLT. May traffic count again quite a bit compared to this time last year. It will feel we could have more operations. We are missing a good opportunity to display our prowess as traffic handlers. Also to demonstrate our capabilities to the public. How many of our new

amateurs are getting the proper ground-work in the fundamentals of Public Service Operating? We have a number of people holding OPS/ORS appointments, who will help you to learn the fundamentals of traffic handling. There are other things available too; weather watching and reporting. We can perform many useful functions which will help our Public Image and do our Public Service "Good Deed!" One of our groups is making plans to provide traffic info. for a local radio station. This is good; but I feel we must be careful and "watch the commercial aspect" of this service. This was written early, so if your traffic or other report is not included, will get it next month. Traffic: WB5NKC 234, W5REC 188, WBSNKD 169, W5RB 141, K5TEY 120, W5SABL 88, W5SELG 42, W5A2S 40, W55UG 35, W55PVL 28, W5FSN 27, W5RFX 27, W5SOCZ 26, W55OSN 16, W5FKL 14, W55VXL 11, W55OUV 6, W55FTU 6, W55OYU 2, W B U C M 2 W55UCM 2.

SOUTHERN TEXAS: SCM, Arthur R. Ross, W5KR — SEC; W5TQP, RM; K5RG, PAM; W55NUM, OVS reporting; W55FFD NSZZ W5VAH K5MUK. OVS reporting; W55GCP N5AF, PAM W55NUM has new Rohn tower topped with TH6. W55BWM and W55DDI upgraded to Advanced. W55UJN has new tower. W55QZV has new 2-mtr rig. W55TRL proudly shows QSL from JH3DPB. W55CJX upgraded to General. FCC attended a meeting of Houston ARC, gave exams for all classes of amateur licenses; about fifty took the exams. W55QDW became WA4ZHU for awhile, now back at TX U awaiting new call. Ham hobbies: W55DHK is antique car buff but lives 50 miles from nowhere and specializes in rebuilding Rolls-Royces; K5Z51 is a back-packer and marathon runner; W55UBM enjoys woodwork and tractor driving; W55OXQ is an expert rose grower; W55RKK likes back-packing and white-water kayaking; W55HBL is rock hound; W55LJRY is paramedic. W55CYX is a Novice licensee; licensed in 1952 and let it lapse; he is only Novice in Corpus Christi CCWA. W55RPH is pres. of the new CC QCVWA chapter. CC ARC has installed a 2-mtr transceiver at Natl Wx Svc office. OVS N5AF has worked 18 stns in Houston on 223.5 MHz simplex in six weeks. K5WA claims 514,125 points for Apr. fone CD party! Traffic: (May) W5KLV 462, W5VEA 250, W55NUM 158, W55RKK 150, W55GVO 72, W55JYH 41, W5TQP 25, W55BW 16, W55BO 14, W5KR 14, K5MUK 14, K5RJK 13, W55NN 12, W55RVT 6, W55LTW 4, K5RVF 2. (Apr.) W55RKK 230, W55RVT 10, W55LTW 7, K5WA 5.



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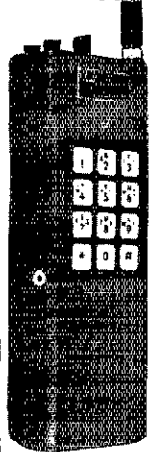
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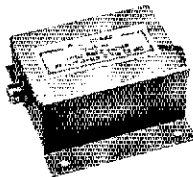
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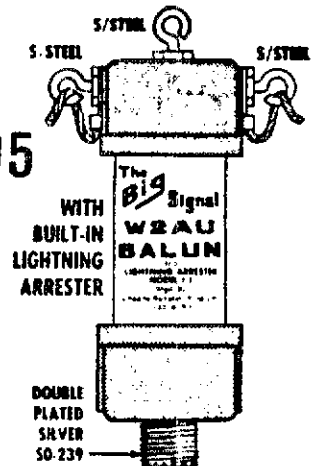
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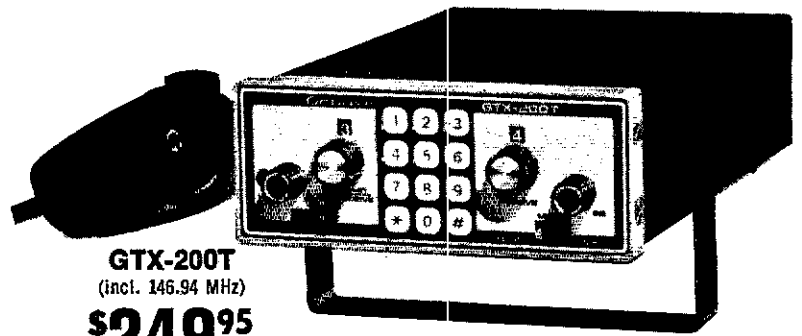
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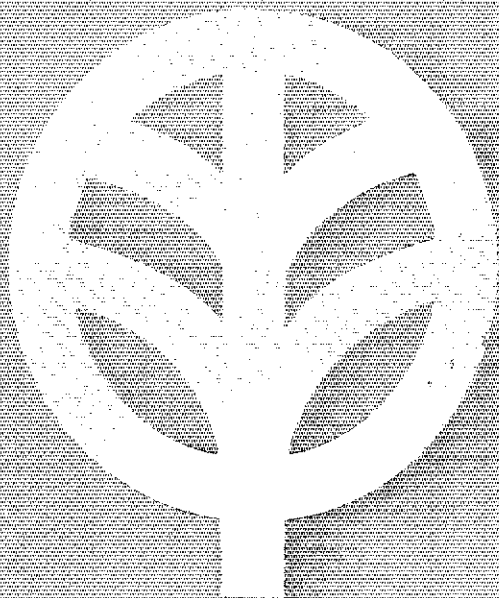
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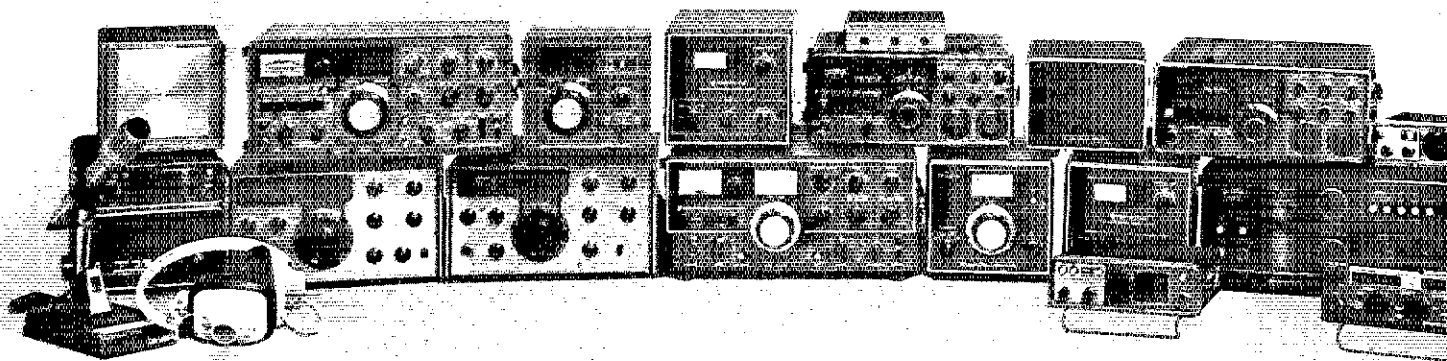
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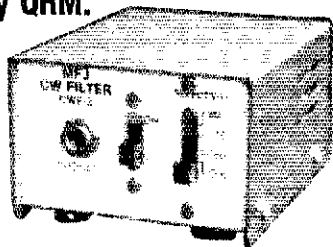
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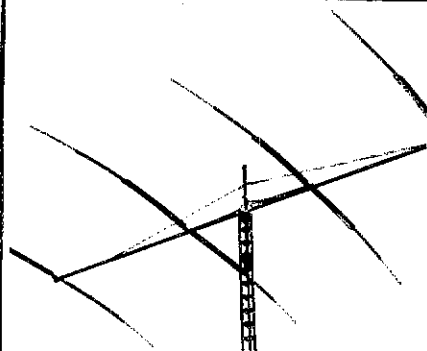
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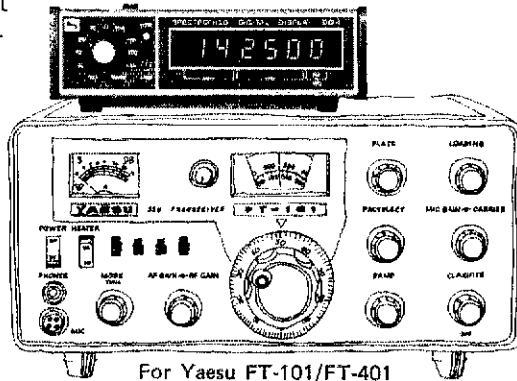
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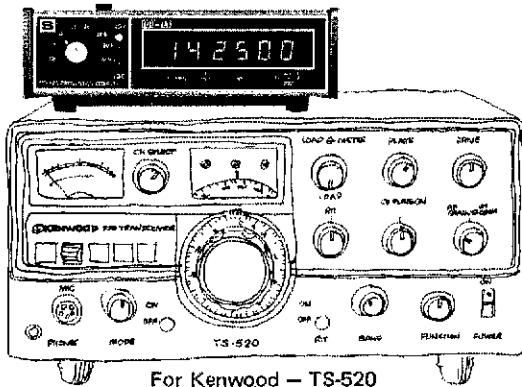
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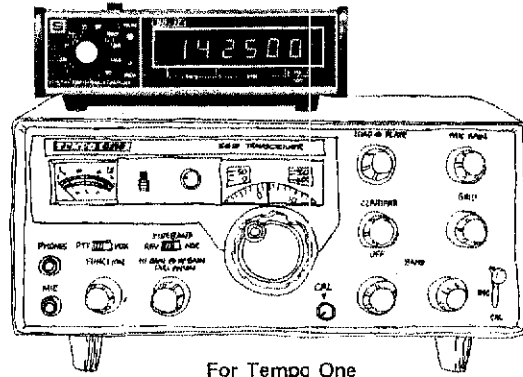
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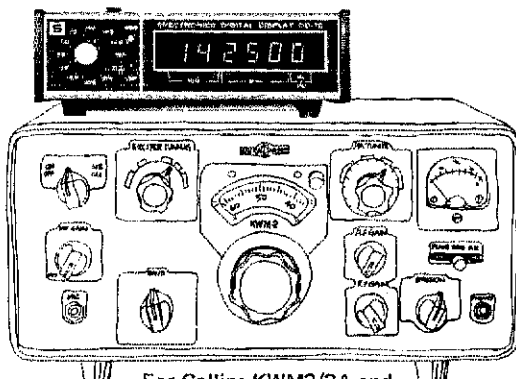
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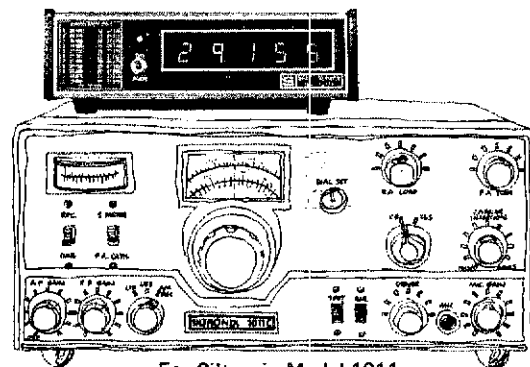
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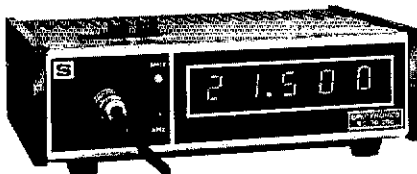
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QUADSTOWERS QUADSTOWERS QUADSTOWERS

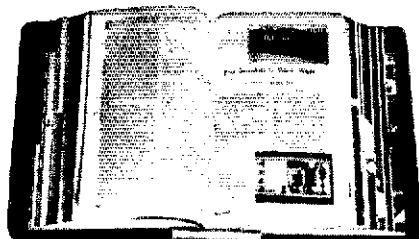
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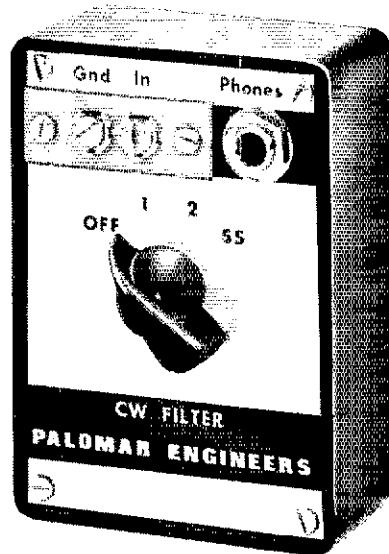


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Does not ring or sound "tinny".
Multiple low Q filters add up to
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Switch position 1 gives "wide
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wide skirts). Removes hum and
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Switch position 2 gives
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bandwidth, steep skirts). Selects the
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Greatly improves reception in
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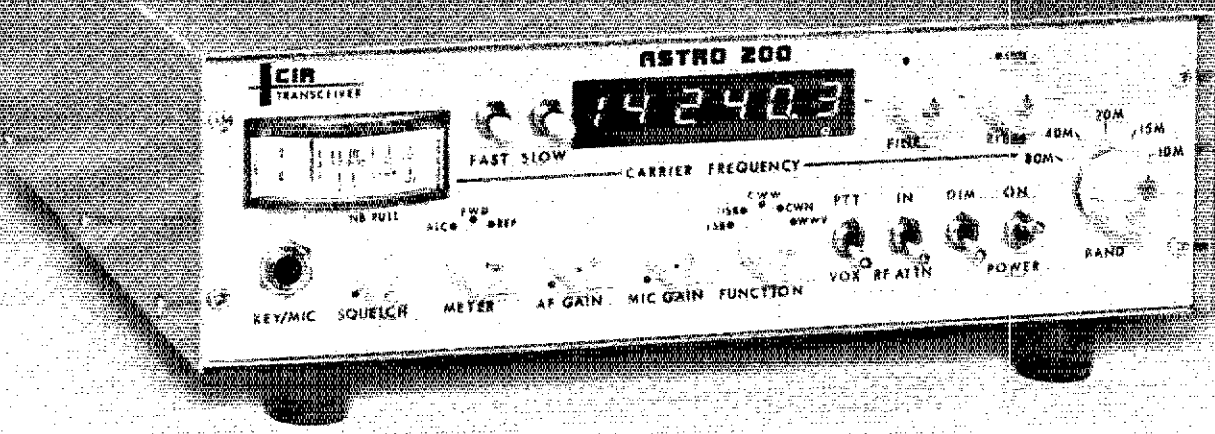
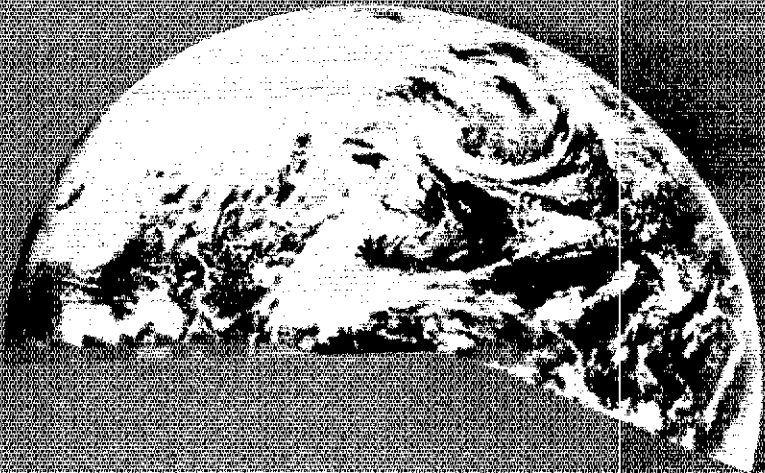
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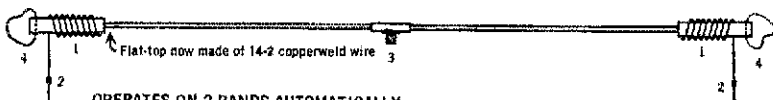
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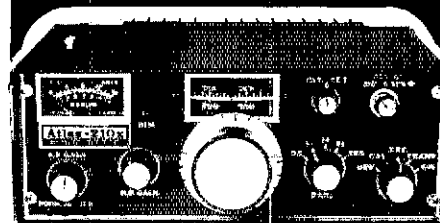


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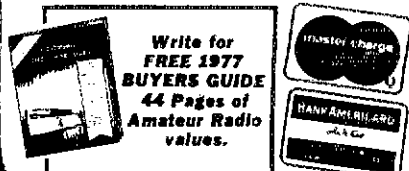
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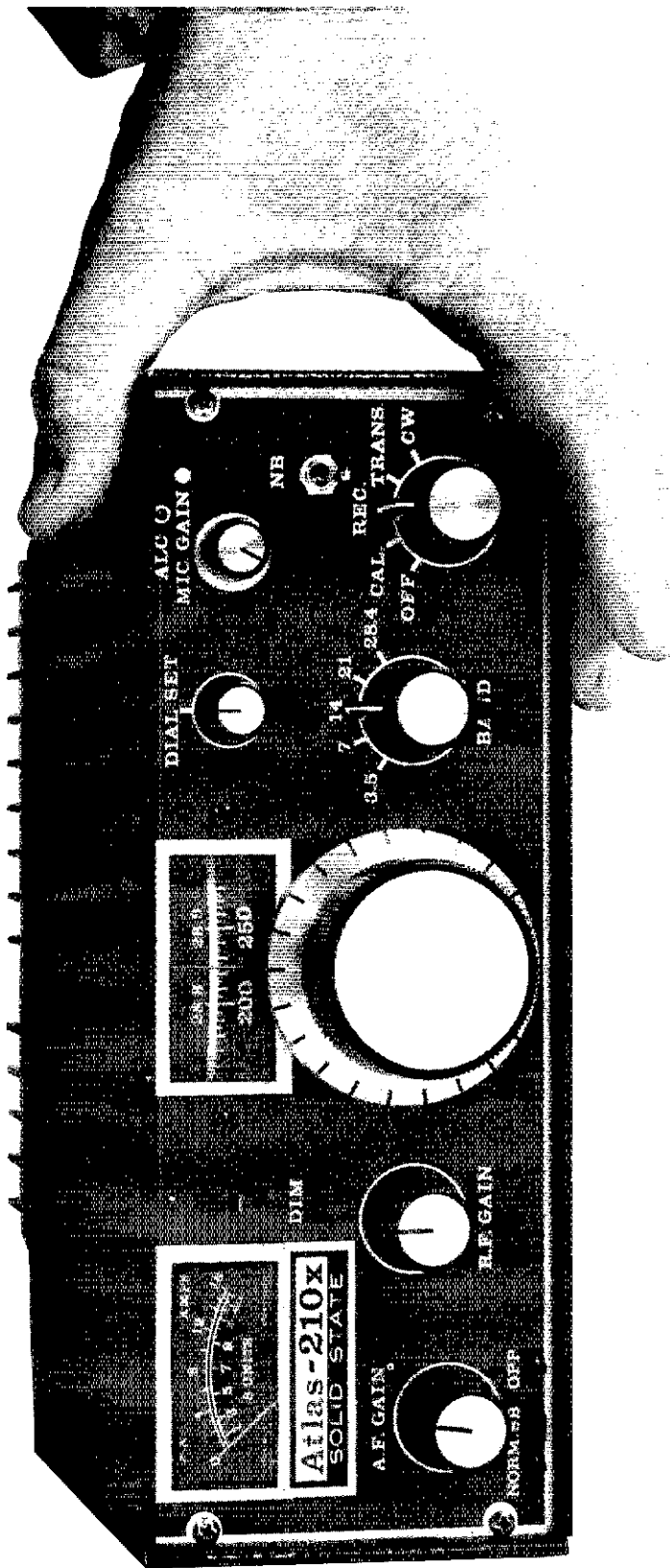
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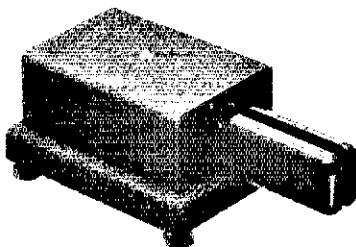


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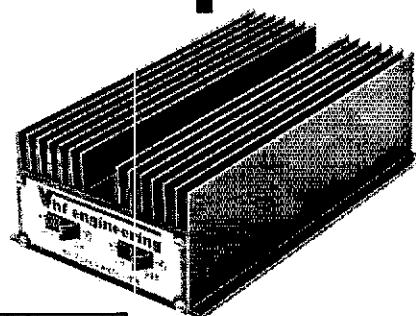
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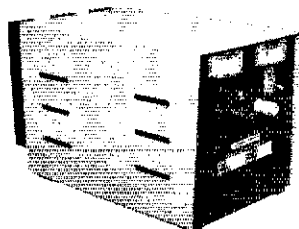
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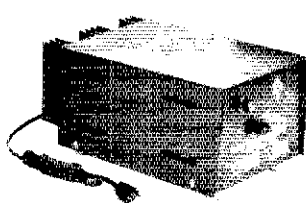


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 BLC 10/70 BLD 2/60 BLE 30/80
 BLC 2/70 BLD 10/60 BLE 10/80

Voltage Output: adjustable between 10-15V
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 Ripple: 50 mV at 20 amps
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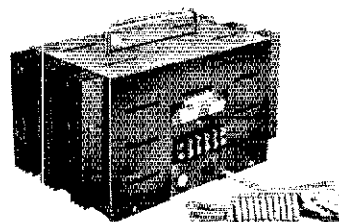


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Voltage Output: adjustable between 12-14V
 Load Regulation: 2% from no load to 10 amps
 Current Output:
 15 amps intermittent (50% duty cycle)
 Ripple: 50 mV at 10 amps
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Output Voltage: Adjustable, 11-15 VDC
 Output Current: 30 amps (50% duty cycle)
 Regulation: Better than 2 percent
 Output Ripple: 50MV pk-pk maximum
 Temperature Range: 0°-60° C operating
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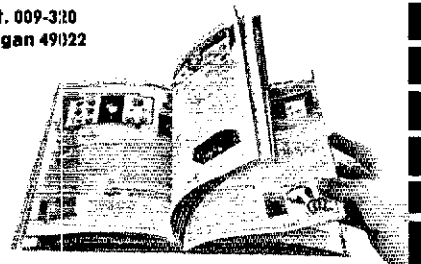
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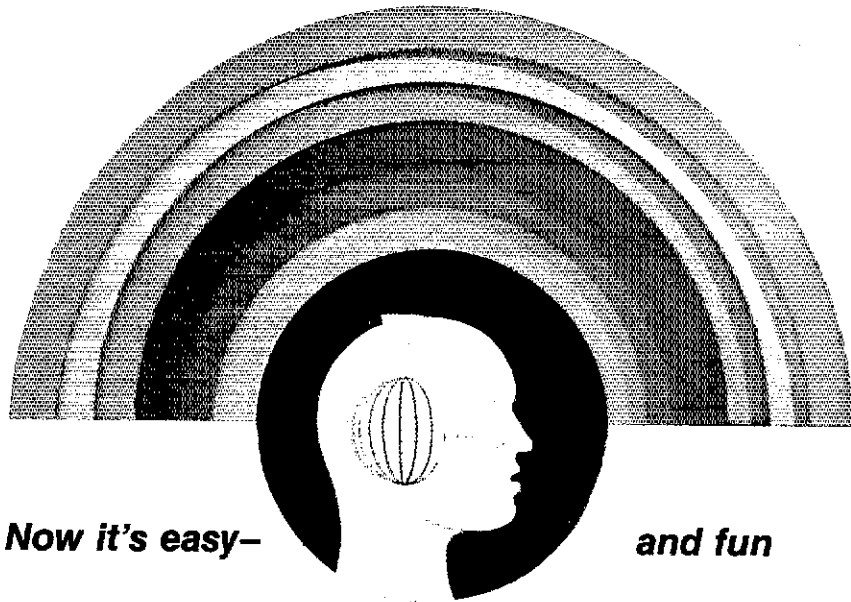
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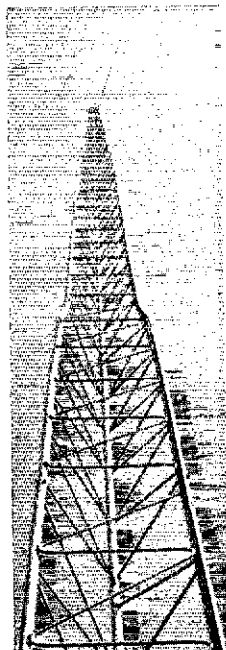
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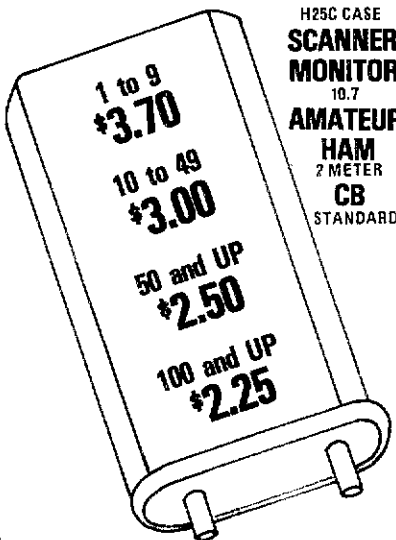
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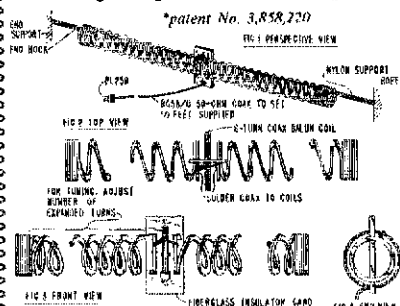
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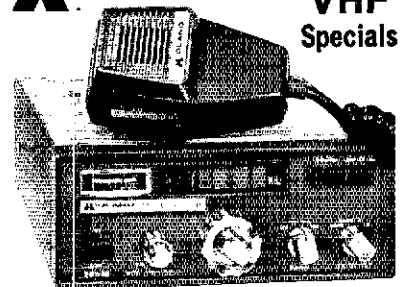
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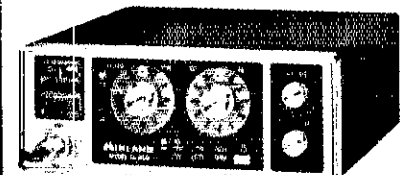
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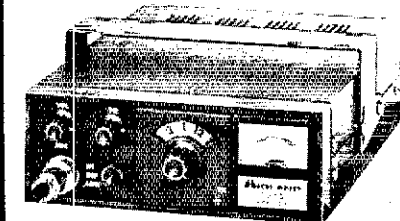
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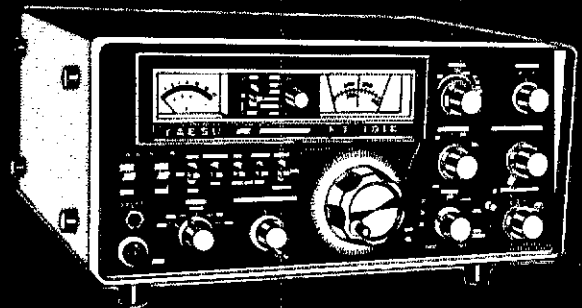
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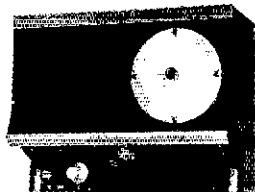
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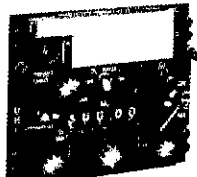
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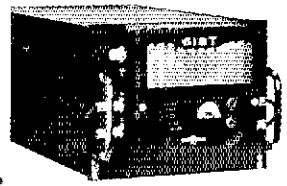
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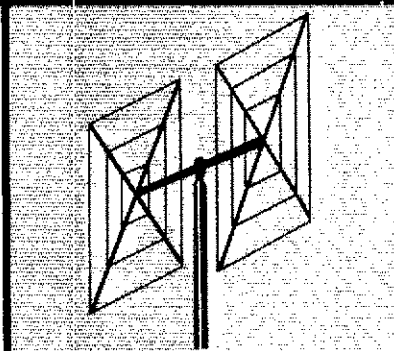
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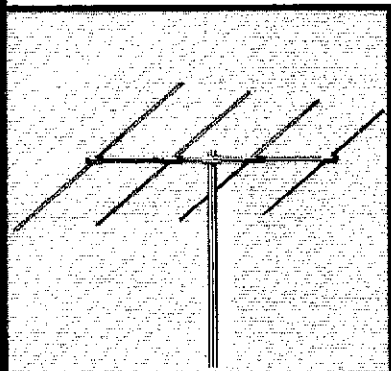


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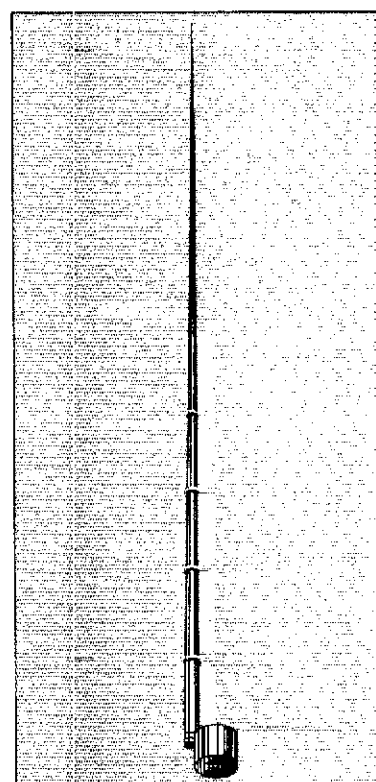
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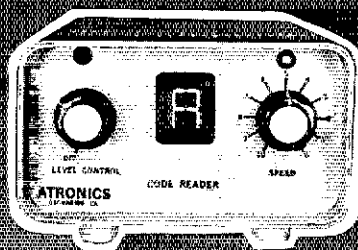
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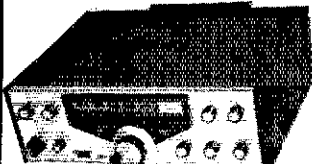
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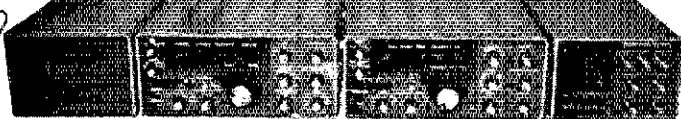
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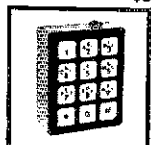
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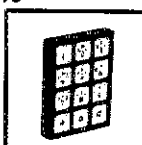
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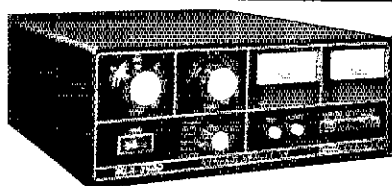
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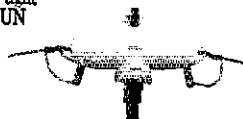
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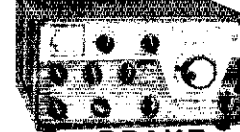
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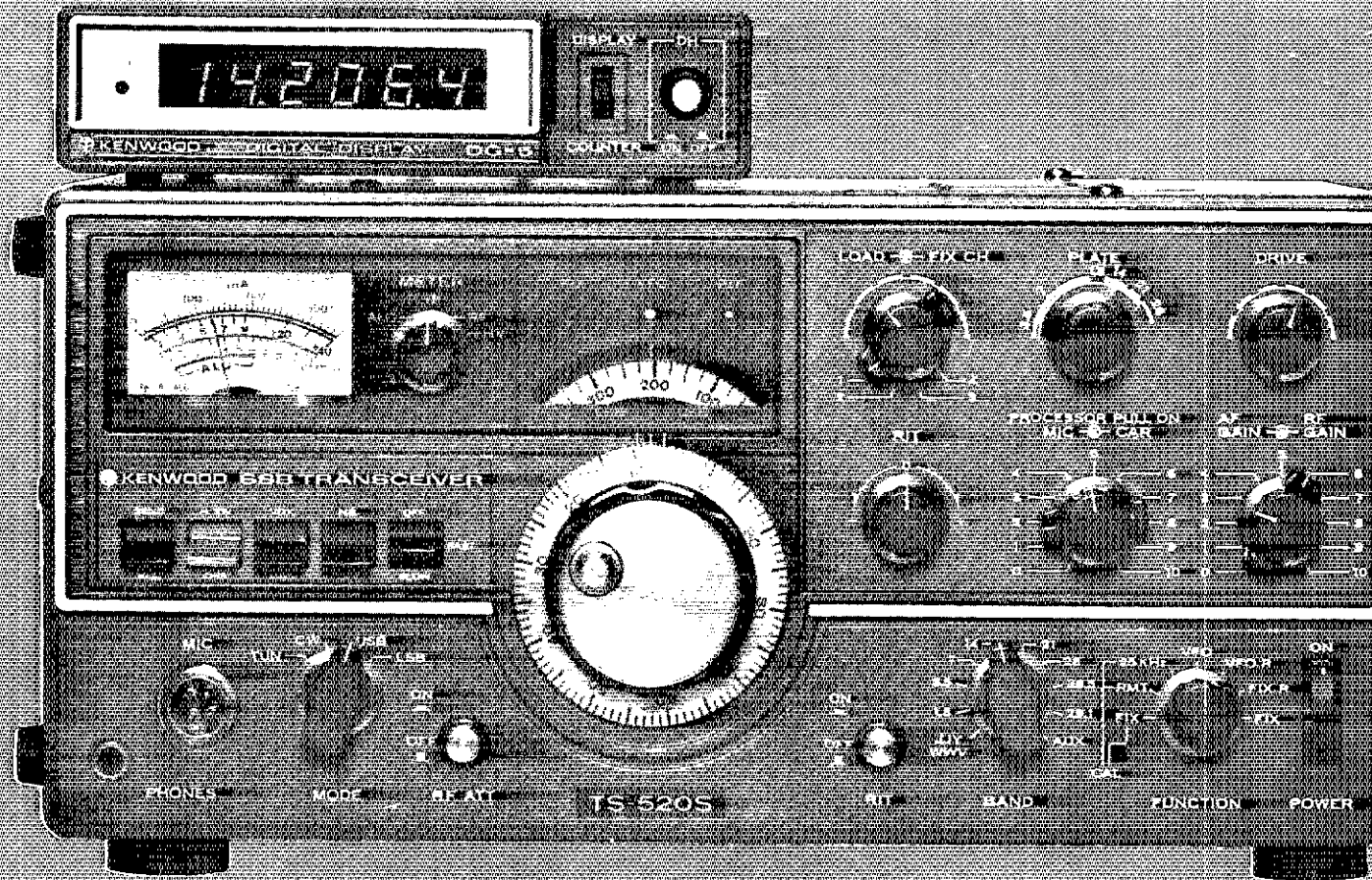
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Specifications

Amateur Bands: 160-10 meters plus WWV (receive only)

Modes: USB, LSB, CW

Antenna Impedance: 50-75 Ohms

Frequency Stability: Within ± 1

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Tubes & Semiconductors:

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Diodes 101

Power Requirements: 120/220 V AC, 50/60 Hz, 13.8 V DC (with optional DS-1A)

Power Consumption: Transmit: 280 Watts Receive: 26 Watts (with heater off)

Dimension: 333(13 $\frac{1}{4}$) W x 153 (6-0)

H x 335(13-3/16) D mm(inch)

Weight: 16.0 kg(35.2 lbs)

TRANSMITTER

RF Input Power: SSB: 200 Watts PEP CW: 160 Watts DC

Carrier Suppression: Better than -40 dB

Sideband Suppression: Better than -50 dB

Spurious Radiation: Better than 40 dB

Microphone Impedance: 50k Ohms

AF Response: 400 to 2,600 Hz

RECEIVER

Sensitivity: 0.25 μ V for 10 dB

(S+N)/N

Selectivity: SSB: 2.4 kHz/-6 dB, 4.4 kHz/-60 dB

Selectivity: CW: 0.5 kHz/-6 dB, 1.5 kHz/-60 dB (with optional

CW-520 filter)

Image Ratio: Better than 50 dB

IF Rejection: Better than 50 dB

AF Output Power: 1.0 Watt (8 Ohm load, with less than 10% distortion)

AF Output Impedance: 4 to 16 Ohms

DG-5

SPECIFICATIONS

Measuring Range: 100 Hz to 40 MHz

Input Impedance: 5 k Ohms

Gate Time: 0.1 Sec.

Input Sensitivity: 100 Hz to 40

MHz: ... 200 mV rms or over, 10

kHz to 10 MHz: 50 mV or over

Measuring Accuracy: Internal time

base accuracy ± 0.1 count

Time Base: 10 MHz

Operating Temperature: -10° to

50° C/14° to 122° F

Power Requirement: Supplied

from TS-520S or 12 to 16 VDC

(nominal 13.8 VDC)

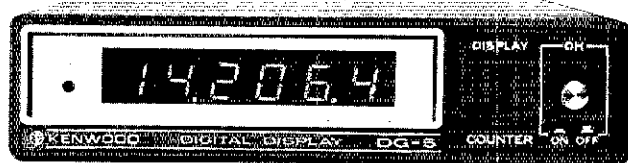
Dimensions: 167(6-9/16) W x

43(1-11/16) H x 268(10-9/16) D

mm(inch)

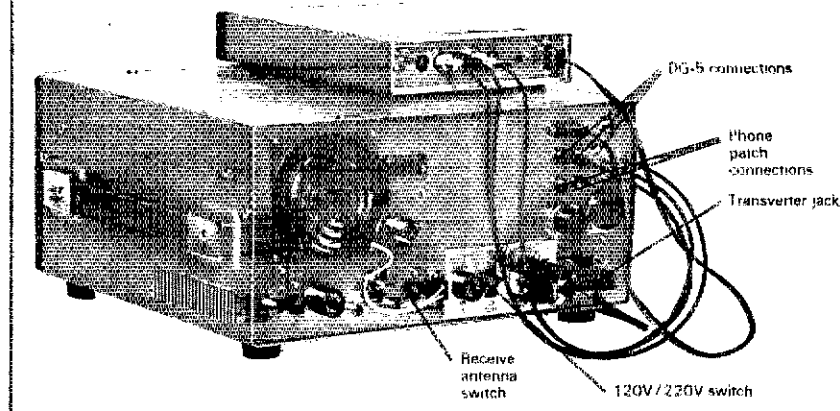
Weight: 1.3 kg(2.9 lbs)

DG-5 (optional)



The luxury of digital readout is available on the TS-520S by connecting the new DG-5 readout (option). More than just the average readout circuit, this counter mixes the carrier, VFO, and heterodyne frequencies to give you your exact frequency. This handsomely-styled accessory can be set almost anywhere in your shack for easy to read operation... or set it on the dashboard during mobile operation for safety and convenience. Six bold digits display your operating frequency while you transmit and receive. Complete with DH (display hold) switch for frequency memory and 2 position intensity selector. The DG-5 can also be used as a normal frequency counter up to 40 MHz at the touch of a switch. (Input cable provided.)

NOTE: TS-520 owners can use the DG-5 with a DK-520 adapter kit.



KENWOOD'S NEW TS-520S

AND DG-5 DIGITAL FREQUENCY DISPLAY

A NEW STANDARD IN ECONOMY TRANSCEIVERS

The NEW TS-520S combines all of the fine, field-proven characteristics of the original TS-520 together with many of the ideas, comments, and suggestions for improvement from amateurs worldwide. Kenwood's ultimate objectives . . . to make quality equipment available at reasonable prices.

FULL COVERAGE TRANSCEIVER

The new TS-520S provides full coverage on all amateur bands from 1.8 to 29.7 MHz. Kenwood gives you 160 meter capability, WWV on 15,000 MHz., and an auxiliary band position for maximum flexibility. And with the addition of the TV-502 and TV-506 transverters, your TS-520S can cover 160 meters to 2 meters on SSB and CW. **DIGITAL DISPLAY DG-5** (option)

The new Kenwood DG-5 provides easy, accurate readout of your operating frequency while transmitting and receiving.

OUTSTANDING RECEIVER SENSITIVITY AND MINIMUM CROSS MODULATION

The new TS-520S incorporates a 3SK-35 dual gate MOSFET for outstanding cross modulation and spurious response characteristics. The 3SK35 has a low noise figure (3.5 dB typ.) and high gain (18 dB typ.) for excellent sensitivity.

NEW IMPROVED SPEECH PROCESSOR

A new audio compression amplifier gives you extra punch in the pile ups and when the going gets rough.

VERNIER TUNING FOR FINAL PLATE CONTROL

A new vernier tuning mechanism allows

easy and accurate adjustment of the plate control during tune-up.

FINAL AMPLIFIER

The new TS-520S 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.

HIGHLY EFFECTIVE NOISE BLANKER

An effective noise blanking circuit developed by Kenwood that virtually eliminates ignition noise is built-in to the TS-520S.

RF ATTENUATOR

The new TS-520S has a built-in 20 dB attenuator that can be activated by a push button switch conveniently located on the front panel.

VFO-520 — NEW REMOTE VFO

The VFO-520 remote VFO has been designed to match the styling of the TS-520S and provide maximum operating flexibility on the band selected on your TS-520S.

AC POWER SUPPLY

The TS-520S is completely self-contained with a rugged AC power supply built-in. The addition of the DS-1A DC-DC converter (option) allows for mobile operation of the TS-520S.

EASY CONNECTION PHONE PATCH

The TS-520S has 2 convenient RCA phono jacks on the rear panel for PHONE PATCH IN and PHONE PATCH OUT.

CW-520 — CW FILTER (OPTION)

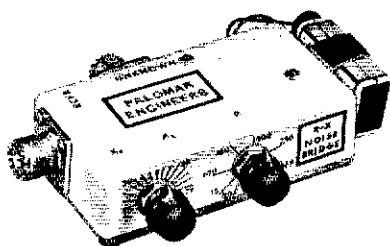
The CW-520 500 Hz filter can be easily installed and will provide improved operation on CW.

AMPLIFIED TYPE AGC CIRCUIT

The AGC circuit has 3 positions (OFF, FAST, SLOW) to enable the TS-520S to be operated in the optimum condition at all times whether operating CW or SSB.

The TS-520S retains all of the features of the original TS-520 that made it tops in its class: RIT control • 8-pole crystal filter • Built-in 25 KHz calibrator • Front panel carrier level control • Semi-break-in CW with sidetone • VOX / PTT / MOX • TUNE position for low power tune up • Built-in speaker • Built-in Cooling Fan • Provisions for 4 fixed frequency channels • Heater switch.

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- ✓ Adjust it to your operating frequency quickly and easily.

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The price is \$49.95 and we deliver postpaid anywhere in U.S. and Canada. California residents add sales tax.

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Clubs/Hamfests

QCWA Quarter Century Wireless Association is an international non-profit organization founded 1947. Any Amateur Radio Operator licensed 25 or more years is eligible for membership. Members receive a membership card book and quarterly news. Write for information. Q.C.W.A. Inc., 1409 Cooper Drive, Irving TX 75061.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't, police, etc. invited to join Society of Wireless Pioneers - W7GAQ/6 Box 530, Santa Rosa CA 95402.

FREE sample copy Long Island DX Assn. bulletin. Latest DX news, Business size 4.5x5.5 to the L.I. DX Assn., P. O. Box 73, Westbury NY 11590.

EDITING a club paper? Need public relations help? You should belong to the Amateur Radio News Service. For information write: Doris Dennstaedt, W4JREN, 303 N. Hammonds Ferry Rd., Linthicum Heights MD 21090.

MEMPHIS is beautiful in October! The Memphis ARRL-sponsored Hamfest, bigger and better than the 4,500 who attended last year, will be held at State Technical Institute, Interstate 40 at Macon Road, on Saturday and Sunday, October 1 and 2. Demonstrations, displays, MARS meetings, flea market, ladies flea market, too! Hospitality room, informal dinners, XYL entertainment. Dealers and Distributors welcome. Contact Harry Simpson W4SCF PO Box 27015, Memphis, TN 38127 for further information.

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 NY 14469.

CANTON OH, August 7th, the third annual Hall of Fame hamfest at Stark County fairgrounds. Free camping starting Friday night August 5th. ARRL, flea market, distributors. All inside in case of rain. Contact WA8SHP, Box 3 Sandyville, OH 44671. 216-866-3714.

BETTER Than ever-1977 Golden Spread Hamfest, flea market, Holiday Inn West, Amarillo, TX Aug. 12, 13, 14. Six tech sessions, commercial exhibitors. Family recreation. Two Hospitality Hours. \$3. advance, \$4. at door. For info and packet, Golden Spread Hamfest, Box 10221, Amarillo, TX 79106.

HAMFESTERS 43rd Annual Hamfest and Picnic. Sunday August 14, 1977. Santa Fe Park, 91st and Wolf Road, Willow Springs, Illinois, Southwest of Chicago. Exhibits for OM's and XYL's, famous swappers row. Tickets at gate \$2., advance \$1.50. For advance tickets send check or money order to Bob Hayes W9IKW 18931 Cedar Ave., Country Club Hills, IL 60477.

PEORIA Hamfest - September 18, Peoria, IL, same place as last year. For further details see September Hamfest Calendar or write Bruce Funston K9PWR, 304 Indian Circle, East Peoria, IL 61611. Advance tickets \$1.50, door tickets \$2.

MELBOURNE, Florida, September 10-11. The 12th annual Melbourne Hamfest Saturday and Sunday, from 9 A.M. to 5 P.M. in the airconditioned Melbourne Civic Auditorium on Hibiscus Boulevard. Donation \$2.50 per person. Full program includes forums, meetings, auction, swap tables, commercial exhibits, awards etc. Contact K4HPT, 2749 Herford Road, Melbourne, FL 32935 for swap table reservations. FCC exams Saturday. Form 610 must be filed with FCC, Room 919, 51 S.W. First Avenue, Miami, FL 33130, not later than August 31, 1977. Talk-in on 25.85 and 52.52. Sponsored by Platinum Coast Amateur Radio Society. For more info write P.O. Box 1004, Melbourne, FL 32901.

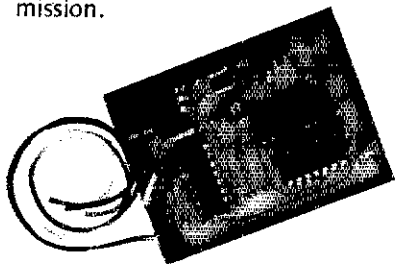
CHICAGO's Radio Expo '77, September 17 and 18. Manufacturers' exhibits, seminars on amateur radio and microprocessors. QCWA banquet Friday night at Mundelein Holiday Inn. Indoor/outdoor flea market open for set up Friday evening. Tickets \$2 advance, \$3 at gate. Radio Expo, P. O. Box 1014, Arlington Heights, IL 60006.

The 36th Annual Findlay hamfest will be held Sept. 11 at the Riverside Park, Findlay, Ohio. Advance tickets are \$1.50 and \$2 at the gate. For tickets and additional information send a S.A.S.E. to Clark Foltz, W4VN, 122 W. Hobart, Findlay, OH 45840.

ELMIRA, New York, annual hamfest Sat., Sept. 24 Chemung Co. Fairgrounds. Flea market, dealer displays, tech talks. Talk-in 10/70 and 146.52. Advance tickets \$2 at gate \$2.50. Write WA2SMM, 320 West Ave., Elmira, NY 14904.

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22ND Annual York County Hamfest Sept. 4th. Rain or shine 9:00 A.M. to 4:30 P.M. Registration \$3, XYLs and children free. No charge for tailgaters. New location US50 Drag-C-Way at York Airport, Thomasville, 10 miles west of York, on U.S. 30. Talk-ins 146.37-97, 52-52, 147.93-33. Fly into site. Saturday night campers welcome. Full service cafeteria, clean rest rooms, electric on grounds. Display tables under roof \$2 charge. By advance reservation only. Contact LeRoy Frey K3PBR 170 S. Albemarle St., York, PA 17403, 717-854-1203.

HAMFEST Lima, Ohio October 9. The Northwest Ohio ARC 3rd annual hamfest at the Allen County Fairgrounds. Two large buildings, tables and table space available. Dealers welcome. For information and reservations write N.O.A.R.C. P. O. Box 211 Lima, OH 45802. Phone 640-1433 or 991-2716.

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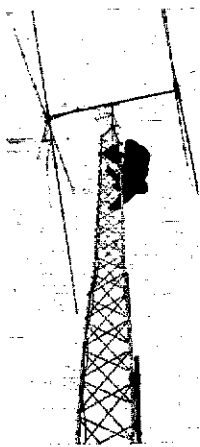
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ATLAS Motorola FM and SSB Marine Radio. Motorola Pagers bought and sold. W5BCO, Ralph Hicks, P. O. Box 15633 Tulsa OK 74112. 918-266-2525.

TORIGS — Five 88MHz for \$3.50 P.P. U.S. and Canada only. M.L. Buchanan P. O. Box 74 Soquel CA 95073.

DXRs: Operate my FL-101, RF-101, FL-2100B, tower, antennas. Enjoy Montserrat, "Emerald Isle of the Caribbean" with pool and auto, \$225/wk. "Annie", 720 Parker, Ontonagon, MI 49953. 906-884-2336.

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WANTED — Hallicrafter receivers & parts — any condition — for private collection, also want complete set of Rider's manuals. Write C. Dachis 4500 Russell Drive, Austin TX 78745.

FOR SALE: Utica 650 six meter transceiver and VFO \$80 WB3EZ5 301-997-0995.

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YAESU, Dentron, ICOM, Swan, Cushcraft, Larsen, VHF Eng., KLM and the list is still growing. For an EZ deal from the EZ dealer call, see or write W6E Z, Bob Smith Electronics, 12 South 21st Street, Fort Dodge, IA 50501. 515-576-3886.

HYGAIN TH 6DXX 185 14AVQ/WB \$55. Triton IV \$630 You ship. All New. WB3BSI.

MANUALS for most ham gear made 1937/1970. List \$1.00 postpaid. W9JJK, H. L., Inc. Box Q864, Council Bluffs, IA 51501.

CASH for any Collins unit, 618T, 490T, modules, parts, accessories. Air Ground Electronics, P. O. Box 416, Kearny, NJ 07032.

WANTED: IRE, 27.33 inc. W6EE.

BOMAR 2m crystal certificates \$3.75 ea., 10 or more \$3.50 ea. plus .25 per order P and H. Robert Hanson, WB2DHL, P. O. Box 413 Oswego NY 13126.

SOUTH and Central American amateurs: Why make expensive trips for rigs, antennas and parts, or buy from expensive friends going to the States? We will airship anything from the USA, to the major airport of your capitol, or ship small items parcel post directly to you for a small fee. Write air mail today, and tell me what you want. W5QWS 612 Jasmine, McAllen TX 78501.

WANTED: Pre-1925 QST magazines. W6GU, 529 Kevin Way, Placentia, CA 92670.

WANTED: Heath SB 104: Complete or partially assembled — need not work for rebuilding. Write W5JRM, 8910 Leader St., Houston, TX 77036 or PH: 713-777-9821.

WANT 3 element 15 meter beam and rotator. R-391 receiver. Thompson Box 186 Gorham NH.

HOSS-TRADER Ed says "We refuse to be undersold!" If you didn't buy it from the Hoss you paid too much. Shop around for the best price then telephone the Hoss fast. New Demo Atlas 210X transceiver, \$519.; New Drake TR-4C, \$519. New Display Swan 700C, \$519.; Demo 1-4XC, \$489. New Rehn 50' Foldover Tower. Prepaid \$439.; Display Atlas 350XL, \$749. Used Ham-1 Rotor, \$99. Used Atlas 210X, \$459. Display Moseley TA-33 Beam, \$159. Hoss-Trader Specials: New Dentron 2000 watt linears on sale, \$489. New Display L-4B linear, \$749. Closeout on new Collins equipment, make offer. Moody Electronics Company, P. O. Box 506, DeWitt, Arkansas 72042, Tel.: 501-946-2820.

FOR SALE: Heath station monitor 5B-614 new perfect \$170. W7OUW 503-759-3184.

WANTED: 455 kHz cw and ssb filters; R390A if strip. W8FDR 139E Candlewyck, Apt. 312 Kalamazoo MI 49001 616-349-5601.

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COMPUTER MMD-1, E. & L.'s answer to understanding computers, complete with E&L book, 5 all month modules and IC's used in testing. Professionally wired \$430. William O'Rourke, 102 E. 23rd., Scituate, NJ 09381.

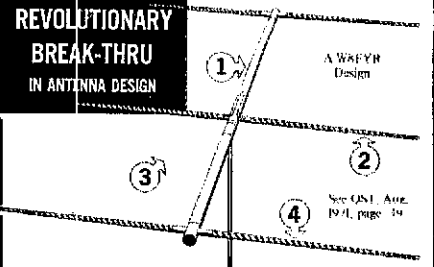
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WANTED: Inverter. Input 28-36V DC; output 110V 60 cycles 150 watts or larger. W9SMG Sorenson 1600 Braden, Chariton IA 50049 515-774-8300.

SB-200 Line new \$300. W7RGZ, Box 1662, Globe, AZ 85501, 602-425-2409.

WANTED: Late model Collins 51 SL. Fred Wiedenroth, Madison Lake, MN 56063.

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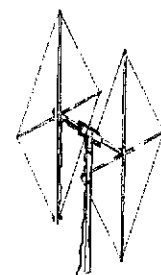
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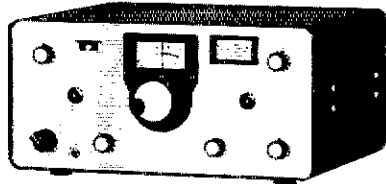
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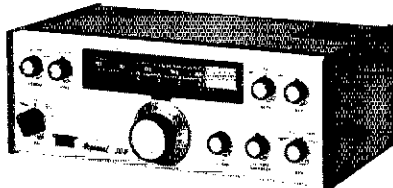
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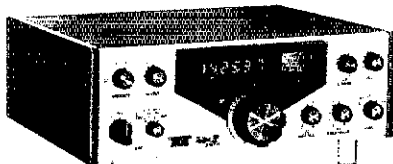
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- 271 15m Xtal..... 5.00
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- 509 Argonaut 80-10m 5w Xcvr..... 359.00
- 206 Crystal calibrator..... 29.00
- 208 External CW filter..... 29.00
- 210 AC power supply..... 30.00
- 210/E 110/220vac ps..... 92.00
- 215P Microphone w/plug..... 29.50
- 405 80-10m 50w linear..... 159.00
- 251 AC ps for 405 & 509..... 85.00
- 251/E 110/220vac ps..... 92.00



- 540 Triton IV 80-10m Xcvr..... 699.00
- 544 Triton IV Digital..... 869.00
- 252G 18A 110vac power supply..... 109.00
- 252G As above, w/VOX & speaker..... 139.00
- 252G/E 18A 110/230v supply..... 116.00
- 252G/E As above, w/VOX, spkr..... 146.00
- 240 160m converter..... 97.00
- 241 Xtal oscillator..... 29.00
- 242 External VFO..... 169.00
- 244 Digital display..... 197.00
- 245 150 Hz CW filter..... 25.00
- 249 Noise blanker..... 29.00
- 207 Ammeter..... 14.00
- Ten meter Xtal..... each 5.00
- 1102 Snap-up legs..... pair 1.00



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BLUEFIELD, W. VA. Hamfest August 28th. Indoor and outdoor flea market space. Indoor flea market tables for dealers \$5., individuals \$3. Outdoor flea market space available, \$2. For more information contact WA4ONC, Jerry, 333 Circle Drive, Bluefield, VA 24605.

NEW Hygain TH6DX \$190., new 14AVQ. \$55. Supina, 525 Ridge, State College, PA.

SUPER Swan station. Perfect -- Mint 600T transmitter, 600 watts, 600R custom receiver, with 5S/7B, CW filter, blanker, i.c. audio notcher, speaker/phone patch, Swan desk mic, books, and cables. Currently on the air. Superb. \$925 Jeff, K1YLV, 203-281-6038.

Realistic DX-150A 5w Receiver. Excellent. \$95. Jeff, K1YLV, 203-281-6038.

GREEN center insulator Balun, see May QST page 166.

WANTED: SB-301, SB-401, forsalvage. K0MNA, Bill Downs, 4805 Sullivan, Wichita KS 67204, 316-838-5385.

SACRIFICING excess hard to find parts... list S.a.s.e. W3PRU, RD no. 2, Glen Rock, PA 17327.

WHOLESALE prices -- on Antenna Specialists, Mosley, Hy-Gain antennas. S.a.s.e. brings quotation. Ask about our century sale. TALED Electronics Pinetreehill Road Newtown, CT 06470.

SURPLUS Relays, right angles drives, reconditioned test equipment -- others -- List Olive Branch Sales, P. O. Box 191, Q, Fairmount, IL. 61841.

FOUNDATION For Amateur Radio annual Hamfest Sunday 16 October 1977 at Gaithersburg Maryland Fairgrounds.

WANT Pre-1923 Marconi, DeForest, Grebe, Paragon, Murdoch, Amrad and similar gear and parts, spark gear, Loose coils, crystal sets. Advise Condition & price. Mike White, 118 Countryview Drive, Naperville, IL 60540.

ENGRAVED nametags -- 1 1/2" X 2 1/2" -- \$3. QTH added -- \$1.50, Black blue, red, green, walnut. White letters. Beveled locking pin. Other colors available. Tag-it Co. Box 2062, Indianapolis, IN 46206.

WANTED Gonsel RF550A Console K2EG1.

ARCOS -- Amateur Radio Components Service. Parts and assemblies for transmitting converters and power amplifiers for CISCAR and wh-uhh, Eimac tubes and parts. Catalog for S.a.s.e. Fred Merry (W2GN) 35 Highland Drive, P. O. Box 546, East Greenbush, NY 12061.

TRANSMITTING tubes, HV and filament xmtrs, rotary inductors, transmitting capacitors. Send stamp for flyer. T. Marinich Electronics, 102 Bell St., Weirton WVA 26062.

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RUBBER stamps \$2.75 includes postage. NJ residents add tax. Clinton Hoar, W2LUD, 32 Cumberland Ave., Verona NJ 07044.

WANTED: Radios, parts, books, magazines of the 1920s, W6ME, 4178 Chasin St., Oceanside, CA, 92054.

VERY interesting! Next 4 big issues \$1. Ham Trader Yellow Sheets, Sycamore IL 60178.

NOVICE needs VFO: Heath HG-106, Hallicrafters HA-5, Ten-Tec Model 200, suitable. Write WD5CWN, William Lincoln, 2106 Sprucewood Drive, Baton Rouge, LA 70816.

COMPLETE Drake C-Line, T-4XC, AC-3, MS-4, R-4C, N.B., 1500 and 500 filters, 8 extra crystals, Magnum SW. Package price \$1050 plus UPS. Bernard Vatz, 11210 Mountaintop Dr., Huntsville, AL., 35803, 205-881-5327.

ICOM230 -- ICOM IC-5P pwr. supply -- ICOM Touch Tone Handset, KLM PA-10-140 amplifier plus Larsen Magnetic Mtg. antenna all for \$495. firm. Sold only as a package. Clegg 2 meter FM DX with Clegg. 031 a power supply \$495. firm. Red. Merry (W2GN) in original cartons. Cliff -- W9EKD, 5927 Primrose Avenue, Indianapolis, IN 46220 317-255-4860.

SELL Hustler MO-2 mast, 15, 20, 40 and 75M resonators, bumper mount complete. \$55. W9LBS 8100 Pine Creek Drive, Evansville, IN 47710.

SALE: Heath SB-102 transceiver and HP-23A power supply. Excellent condition, \$395, or trade for aircraft radio equipment. A. R. McQuate K3HQZ, 14 Farmersville Rd., Leola PA 17540.

WANTED: 200 Hz filter for Collins 75S3B receiver, will pay \$100. Jim Cain, K1JN, RFD 5, Box 23, East Hampton, CT 06424.

TRANSFORMERS rewound, Jess Price, W4CLJ, 507 Raehn, Orlando FL 32806.

NOVICES: Need help for General or Advance Ticket? Complete recorded audio-visual theory instruction. Easy, no electronic background necessary. Write for free information. Amateur License Instruction, PO Box 6015, Norfolk VA 23508.

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KENWOOD QR-666 general coverage receiver. Like new \$175. K2MRU, 201-291-2166.

R&W 6100 ssb xmttr \$250, Heath SB-610 \$75. Both mint. w/manuals W3HJG, 301-292-1602.

WANTED, old spring mounted microphone K4NBN Del Popwell 1946 Sweetbriar Jacksonville, FL 32217.

WANTED: Hallicrafters HT-20 or HT-30 xmitters, any condition. Rcvrs SX-88, SX-96, SX-99, SX-100, SX101, any condition. Also Tuning knobs, s-meters. What have U? Eugene Santill, W3ETF 2415 Marthia St., Aliquippa PA 15001.

HEATHKIT HW-101 w/cw filter, power supply, speaker. E.V. 235 R. Mike Rich, WA2MNR 212-595-5802, 310 W 77th St., NY NY 10024.

SELL SB-102 with cw filter HP23B P.S. and SB-600 spkr \$345. Hy-Gain TH3 JR Tri-Band beam with balun \$45, Hy-Gain model 270 2 mtr ant. \$20. Hustler mobile whip with 15 mtr., 40 mtr and 80 mtr resonators \$20. W. H. Wiley W6OWD 415-728-7136.

ALPHA-77 \$1595, Signal/One CX7B \$1595. Both immaculate, warranty. New demo Alpha - 77SD. Payne Radio, K4ID 615-384-2224.

MOSELY A-203-C 20 meter monobander beam antenna. Excellent condition \$50. Newtronics Hustler 4-BTV vertical antenna, 10, 15, 20, 40, \$25. Pick up only on both - K1PNL 99 Harvest Lane Bristol CT 06010 203-582-3255.

WANTED: Schematic or manual for RMCA VLF rcvr mod AR-810, W5MD, 1533 Outrigger Dr., Baton Rouge, LA 70816.

WANTED: Electronic TR switch for break-in cw (E. F. Johnson) WAZRUD.

TEKTRONIX Scope type 531, with 53/54C Dual Trace, and 3754B wide-band plug-in calibrated amplifiers, two P6006 probes, manual, new CRT - like new condition \$450. Also DuMont type 303 scope \$25. Prefer pickup buyers, K1KON, 3 Beechwood Road, Norwalk CT 06854.

DON AND BOB'S summer's end goodies; call quote TS700A, Tempco 202, 152205, 152205, FT101E, E10-Alpha 1K7400A - sealed cartons, Belden 8 wire rotor cable 14c/ft; Belden 8214 RG8 foam coax 23c/ft; RG8 regular 19c/ft; Belden 14ga copper stranded antenna wire 5.1/100ft; 22ga plastic covered longwire, radials 3.50/1000-Mft; Cetron 572B 25.2 Telex headsets; Janel preamps; Midland 23-136 dualmeter relative power/ssw 21.95; PL259 49c UG175 19c Uhf double female L. Bird 43 wattmeters; Mallory 2.5A/1000PIV epoxy diode 19c. Prices tob Houston, subject to change without notice. Send letterhead for dealer listing, Madison Electronics Supply, Inc., 1508 McKinney, Houston, TX 77002. 713-658-0268.

SALE: Collins S-Line - wings - Ano. 1 75S1, 32S1, 30L1, 312B-4, 516F2, earphones, cables, manuals, in use. picture available. \$2,495. Marge K4RNS 904-672-2288, Ormond Beach, FL 32074.

SELLING all my ham equipment. Yaesu 101E with fan and cw filter, 101B speaker, and FL2100B amplifier \$900; Yaesu 620B with marker unit \$300; all like new, used very little. Also many other items send s.a.s.e. Philip Schwebler, W9GCG, 4536 N. 50 St., Milwaukee, WI 53218.

WANTED: Collins 3051 choke (8H 500mA), 4uf 3kv capacitor, 15 uf 5 kv capacitor, PL172, socket, Bert Kelly, H.V. transformer, 4CX 1000 socket - W4FCL - 404-863-9374.

LATE R-4C mint \$425. WABRXL, 216-757-1891.

SELL: Lafayette HA-350, good \$95; HQ129X, Fair, \$50. W2IMS, Box 215, Ironton, NJ 07845.

SELL Deluxe MFJ speech processor LSP-520BX11 2 months old \$47. includes shipping. Palomar 3 kw pep batun 1:1 \$10 David Schwartz 1183 Southeast St., Amherst, MA 01002.

MOSLEY MA3 10-15-20 trap. Heath SBA-100-1 mount, 5W12-A mobile supply \$85. DL9WZ/W1, 5 San Mateo Dr., Chelmsford MA 01824.

SELL, Henry T-2000, Mint, Manual and cables, zero hours air time \$800. Send s.a.s.e. WB7DBT.

WANTED: Motorola HT200 in 160MC band WA7ZOO 406-543-7006.

HAM in Iraq (Middle-East) seeks technical assistance write via Henry Kotowski Box 6036 S-16306 Spanga Sweden.

SB-610, \$90; Murch UT-2000A with 1kw balun, \$120. W2GNN NJ 609-799-2865.

SELL: Swan 250C, 6 meters ssb, NS-1, 117X cps, mint, \$325. WA1UWX, Box 145, N. Hatfield, MA 01066.

DRAKE TR-4, immaculate condition, high serial number, no p/s. \$395 prepaid ConUS. K5YV1, 405-262-6303.

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DRAKE L4B, Atlas 210X, Echo II Janel 0-2 converter WBOY, box 320, Mentor, OH 44060.

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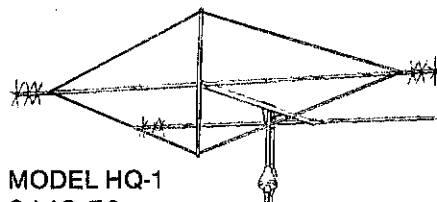
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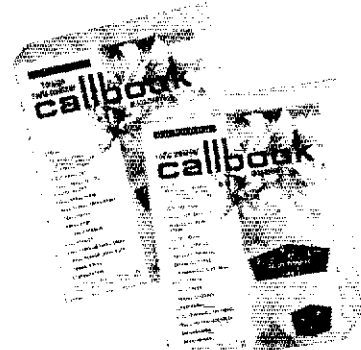
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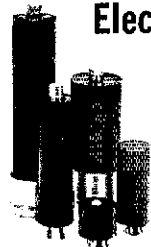
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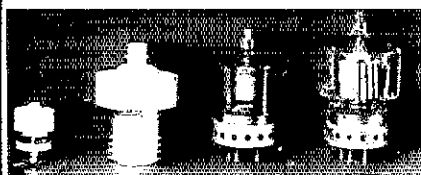
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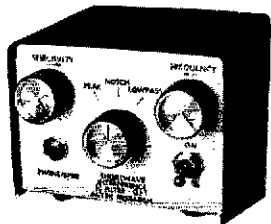
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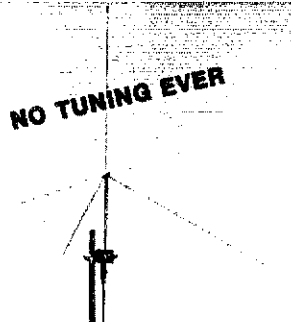
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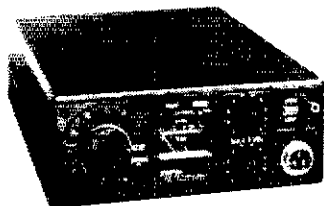


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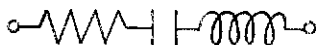
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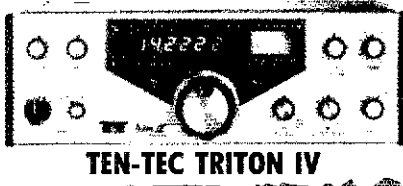
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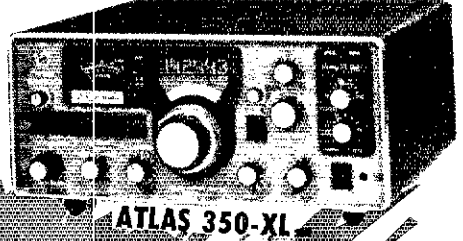
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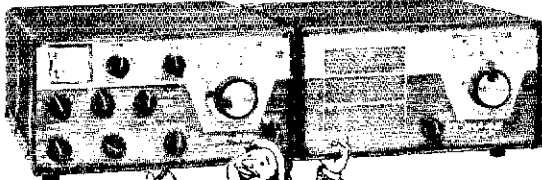


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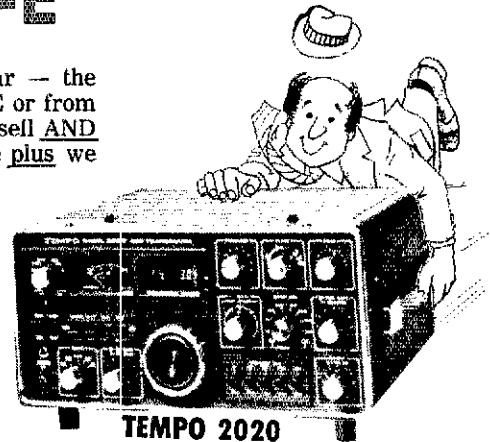
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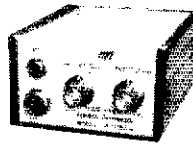
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• Built-in Key • Dot memory • Iambic operation with external squeeze key • 8 to 50 WPM • Sidetone and speaker • Speed, volume, tone, weight controls • Ultra reliable solid state keying +300 volts max. • 4 position switch for TUNE, OFF, ON, SIDETONE OFF • Uses 4 penlight cells • 2-3/16 x 3-1/4 x 4 inches



\$ 39⁹⁵

NEW

MFJ-16010 Antenna Tuner

Now you can operate all band — 160 thru 10 Meters — with a single random wire and run your full transmitter power output — up to 200 watts RF power OUTPUT.

• Small enough to carry in your hip pocket, 2-3/16 x 3-1/4 x 4 inches • Matches low and high impedances by interchanging input and output • SO-239 coaxial connectors • Unique wide range, high performance, 12 position tapped inductor. Uses two stacked toroid cores

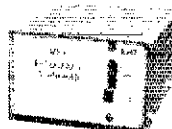


\$ 29⁹⁵

SBF-2BX SSB Filter

Dramatically improves readability.

• Optimizes your audio to reduce sideband splatter, remove low and high pitched QRM, hiss, static crashes, background noise, 60 and 120 Hz hum • Reduces fatigue during contest, DX, and ragchewing • Plugs between phones and receiver or connect between audio stage for speaker operation • Selectable bandwidth IC active audio filter • Uses 9 volt battery • 2-3/16 x 3-1/4 x 4 inches



\$ 27⁹⁵

MFJ-200BX Frequency Standard

Provides strong, precise markers every 100, 50, or 25 KHz well into VHF region.

• Exclusive circuitry suppresses all unwanted markers • Markers are gated for positive identification. CMOS IC's with transistor output. • No direct connection necessary • Uses 9 volt battery • Adjustable trimmer for zero beating to WWV • Switch selects 100, 50, 25 KHz or OFF • 2-3/16 x 3-1/4 x 4 inches



\$ 49⁹⁵

MFJ-1030BX Receiver Preselector

Clearly copy weak unreadable signals (increases signal 3 to 5 "S" units).

• More than 20 dB low noise gain • Separate input and output tuning controls give maximum gain and RF selectivity to significantly reject out-of-band signals and reduce image responses • Dual gate MOS FET for low noise, strong signal handling abilities • Completely stable • Optimized for 10 thru 30 MHz • 9 V battery • 2-1/8 x 3-5/8 x 5-9/16 inches



\$ 27⁹⁵

MFJ-40T QRP Transmitter

Work the world with 5 watts on 40 Meter CW.

• No tuning • Matches 50 ohm load • Clean output with low harmonic content • Power amplifier transistor protected against burnout • Switch selects 3 crystals or VFO input • 12 VDC • 2-3/16 x 3-1/4 x 4 inches

MFJ-40V, Companion VFO \$27.95

MFJ-12DC, IC Regulated Power Supply, 1 amp, 12 VDC \$27.95



\$ 15⁹⁵

NEW

CPO-555 Code Oscillator

For the Newcomer to learn the Morse code.

For the Old Timer to polish his list.

For the Code Instructor to teach his classes.

• Send crisp clear code with plenty of volume for classroom use • Self contained speaker, volume, tone controls, aluminum cabinet • 9 V battery • Top quality U.S. construction • Uses 555 IC timer • 2-3/16 x 3-1/4 x 4 inches

TK-555, Optional Telegraph Key \$1.95

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73, Martin F. Jue, K5FLU

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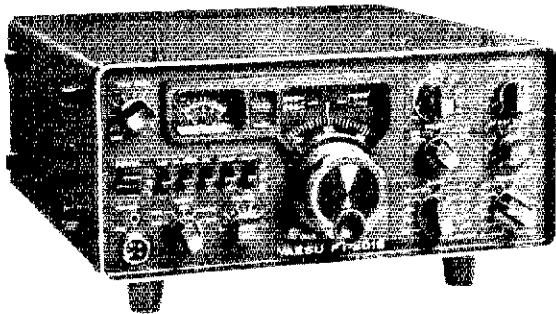
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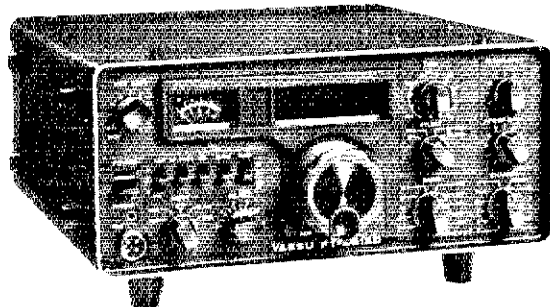
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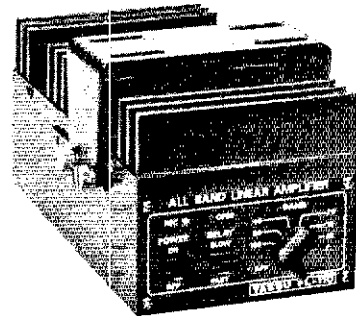
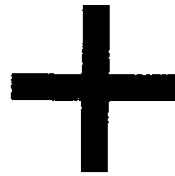


FT-301S
Analog Dial-20 Watts PEP

OR



FT-301SD
Digital Dial-20 Watts PEP

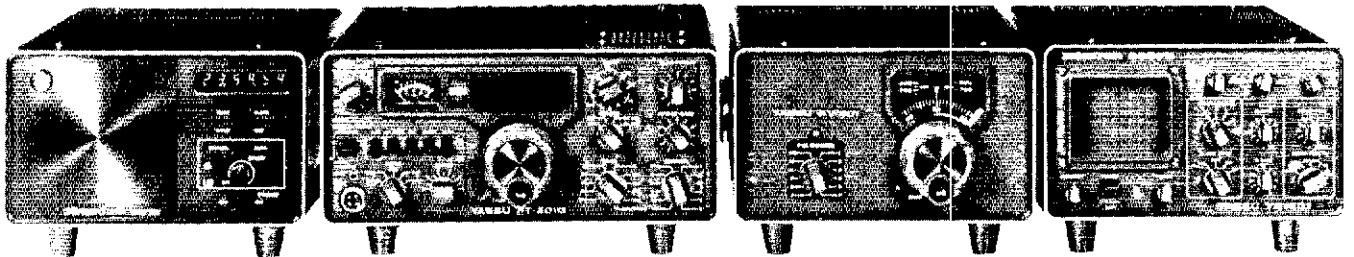


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200 Watts Output-Power When You Need It

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Do your part in Uncle Sam's energy conservation program. Obey FCC rules that tell you not to run more power than is needed. But when the going gets tough, switch in the linear!

Yaesu's Deluxe Accessories Complete Your Station



Shown above: Deluxe Power Supply/Speaker/Digital Clock and Programmable CW Identifier
• FT-301SD Transceiver • External VFO • Monitorscope

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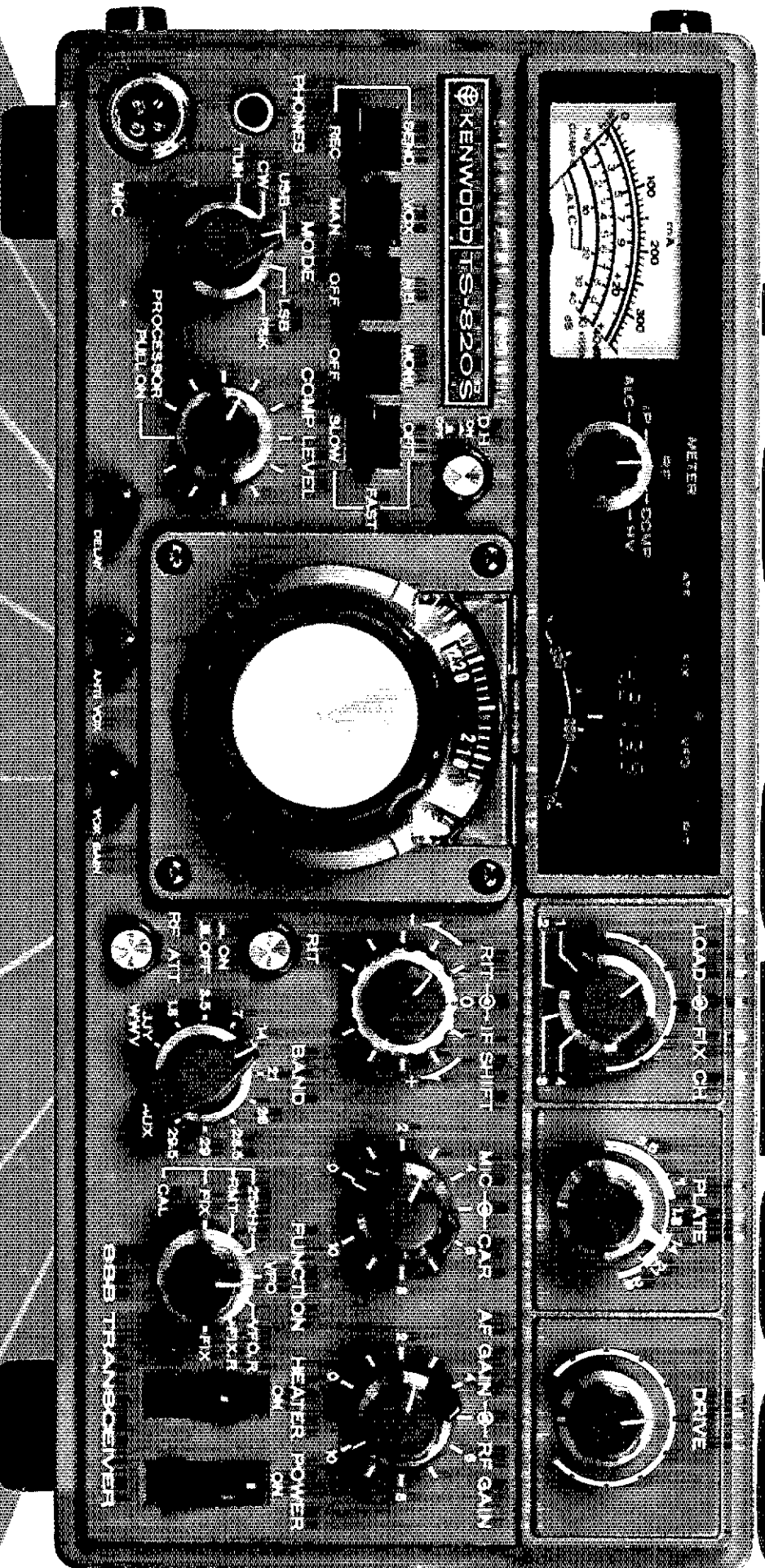
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TS-820S



In little more than one year, the TS-820 has become the most sought after transceiver in the world. And as a result of hundreds of customer requests, it's now available with the digital readout factory-installed on the TS-820S. Also, in response to its unprecedented acceptance, production has been increased, so the long waits over. The same quality standards, superb performance, dependability and innovative engineering are still built into every TS-820S. ***** Now it's time to treat yourself to the best.

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